DRUG THERAPY PROBLEMS ASSOCIATED WITH CORTICOSTEROID USE AMONG PATIENTS ADMITTED IN MEDICAL WARDS AT KENYATTA NATIONAL HOSPITAL

CHRISTINE JEPKOECH CHEPKONGA (BPHARM)

U56/34578/2019

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER OF PHARMACY IN CLINICAL PHARMACY IN THE SCHOOL OF PHARMACY OF THE UNIVERSITY OF NAIROBI

NOVEMBER 2021

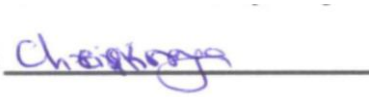
DECLARATION OF ORIGINALITY

Name of Student:	Christine Jepkoech Chepkonga
Registration Number:	U56/34578/2019
College:	College of Health Sciences
School:	Pharmacy
Department:	Pharmaceutics and Pharmacy Practice
Course Name:	Master of Pharmacy in Clinical Pharmacy
Title of Work:	Drug therapy problems associated with corticosteroid use among patients admitted in medical wards at Kenyatta National Hospital

DECLARATION

I, Christine Jepkoech Chepkonga, declare that:

1. I understand what plagiarism is and I am aware of the university's policy in this regard.
2. I declare that this research proposal is my original work and has not been submitted elsewhere for examination nor award of a degree publication. Where other people's work or my work has been used, this has been properly acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed and shall not allow anyone to copy my work, with the intention of passing it off as his / her work.
5. I understand that any false claim in respect of this work shall result in disciplinary action in accordance with the university plagiarism policy.

Signature  Date 22 -11- 2021

APPROVAL BY SUPERVISORS

This research proposal has been submitted for review with our approval as University of

Nairobi supervisors:

1. Signature:  Date: 22/11/2021

   Dr. George A. Mugendi, PhD

   Department of Pharmaceutics and Pharmacy Practice,

   School of Pharmacy,

   The University of Nairobi.

2. Signature_  Date 22/11/2021

   Dr. Peter N. Karimi, PhD

   Senior Lecturer,

   Department of Pharmaceutics and Pharmacy Practice,

   School of pharmacy,

   The University of Nairobi.

DEDICATION

I dedicate this work to my loving husband Walter Klervy Mususi for encouragement and support, and to our children Renee and Hellon, my parents Joseph Chepkonga and Sophia Chepkonga for being a strong pillar of support**.**

ACKNOWLEDGEMENT

I would like to primarily express my utmost gratitude to Almighty God for enabling me to complete this dissertation.

The success and outcome of this research were possible by guidance and support from many people. It required a lot of effort from each individual involved in this research, and I would like to thank them.

I express my gratitude to my supervisors Dr. G.A Mugendi and Dr. P.N Karimi for their teaching. Mentorship and guidance throughout the course. Am also grateful for their able support and guidance in the development of the research proposal and your constant positive criticism throughout the research until the summit of this research dissertation.

I am grateful to my husband Walter, children Mmbone and Hellon, parents, and siblings for their unwavering support and love. I also thank my cousin Dr. M. J Kangongo who supported and encouraged me continuously.

My gratitude goes to the entire University of Nairobi School of pharmacy and the department of pharmaceutics and pharmacy practice for indispensable teaching and mentorship and the provision of a conducive learning environment.

Finally, I would like to thank the Kenyatta National Hospital management for allowing me to conduct the study in the hospital and I thank staff members of medical wards for their cooperation as I collected data.

God bless you all.

TABLE OF CONTENTS

DECLARATION OF ORIGINALITY ..... **ii**
DECLARATION ..... **ii**
APPROVAL BY SUPERVISORS ..... **iii**
DEDICATION ..... **iv**
ACKNOWLEDGEMENT ..... **v**
LIST OF TABLES ..... **ix**
ABBREVIATIONS AND ACRONYMS ..... **xi**
OPERATIONAL DEFINITIONS ..... **xii**
ABSTRACT ..... **xiv**
CHAPTER ONE: INTRODUCTION **1**
1.1 Background 1
1.2 Problem statement 2
1.3 Purpose of the study 2
1.4 Research questions 3
1.5 Objectives 3
1.5.1 Main objective 3
1.5.2 Specific objectives 3
1.6 Justification of the study 3
1.7 Significance of the study 4
1.8 Limitations of the study 4
1.9 Conceptual framework 4
CHAPTER TWO: LITERATURE REVIEW **6**
2.1 Introduction 6
2.2 The burden of DTPs 6
2.3 Classification of DTPs 6
2.4 Corticosteroids 9
2.4.1: Physiological functions of corticosteroids 10
2.4.2 Classification of Corticosteroids 11
2.4.3 Toxic effects of corticosteroids 12
2.4.4: Tapering of corticosteroids 13
2.5 DTPS associated with corticosteroid use 13

2.5.1 Unnecessary drug therapy 13
2.5.2 An additional drug therapy needed 13
2.5.3 Ineffective drug therapy 14
2.5.4 Dosage Too Low 14
2.5.5 Dosage too high 15
2.5.6 Adverse drug reaction 16
2.5.7 Adherence 17
2.6 Risk factors associated with DTPs in corticosteroid use 17
2.7 Summary and Literature Gap 17
CHAPTER 3: METHODOLOGY 18
3.1 Introduction 18
3.2 Study design 18
3.3 Location of the study 18
3.4 Target Population and study population 18
3.4.1 Inclusion criteria 19
3.4.2 Exclusion criteria 19
3.5 Sampling 19
3.5.1 Sample size calculation 19
3.5.2. Sampling technique 21
3.6 Research instruments 21
3.7 Pretest 21
3.8 Validity 21
3.9 Reliability 21
3.10 Data collection technique 22
3.11 Data management 22
3.12 Data analysis 22
3.13 Ethical considerations 22
3.13.1 Ethical approval 22
3.13.2 Informed consent 23
3.13.3 Risks involved 23
3.13.4 Confidentiality 23

CHAPTER FOUR: RESULTS 24
4.1 Introduction 24
4.2 Sociodemographic and clinical characteristics 24
4.3 Drug Therapy Problems 26
4.4 Associations between sociodemographic and clinical characteristics and the presence of DTPs 29
4.5 Risk factors associated with DTPs 31
CHAPTER FIVE: DISCUSSION, SUMMARY, CONCLUSION, AND RECOMMENDATION 33
5.1: Introduction 33
5.2 Discussion 33
5.3 Conclusions 35
5.4 Recommendations 35
5.4.1: Recommendations for policy and practice. 35
5.4.2: Recommendation for further research 36
REFERENCES 37
APPENDICES 42
Appendix 1: Eligibility Screening Form 42
Appendix 2a: Participant Information And Consent Form 44
Appendix 2b: Ridhaa Ya Kushiriki Katika Utafiti 48
Appendix 3: Questionnaire 52
Appendix 4: Ethical Approval 63
Appendix 5: Similarity Index 65

LIST OF TABLES

Table 2.1: Classification of Drug therapy problems 7
Table 2.2: Categories and common causes of Drug Therapy Problems 7
Table 2.3: Glucocorticoids Primary effects 10
Table 2.4: Classification of corticosteroids based on their structure 11
Table 2.5: Classification of steroids based on their relative activity 12
Table 2.6: Therapeutic uses of corticosteroids 12

LIST OF FIGURES

Figure 1.1: Conceptual Framework 5

Figure 2 1: Mode of action of corticosteroid. 9

ABBREVIATIONS AND ACRONYMS

ADR	Adverse drug reaction
BP	Blood pressure
COPD	Chronic Obstructive Pulmonary Disease
COVID 19	Coronavirus disease 2019
CS	Corticosteroid
CVA	Cardiovascular accident
CVD	Cardiovascular disease
DNA	Deoxyribonucleic acid
EENT	Eye, ear, nose, and throat
GU	Genital-urinary
HPV	Human Papilloma Virus
HR	Heart rate
IP	Inpatient
MOPC	Medical outpatient clinic
mRNA	Messenger ribonucleic acid
pbm	Parts per million
PCNE	Pharmaceutical Care network Europe
PCP	*Pneumocystis jirovecii* pneumonia
PIPC	Peters institute of pharmaceutical care
SJS	Stephen Johnsons Syndrome
TEN	Toxic epidermal necrosis
TIA	Transient ischemic attack
UoN	University of Nairobi

OPERATIONAL DEFINITIONS

Adverse drug reaction is an unwanted or harmful reaction experienced following the administration of a drug or combination of drugs under normal conditions of use and is suspected to be related to the drug.

Compliance (Adherence) is the degree to which a patient follows a treatment regimen as agreed upon between the patient and the prescriber.

Contraindication is a condition or a factor that renders the use of a drug product improper or undesirable in the care of a particular patient.

Corticosteroids are man-made drugs that closely resemble cortisol, a hormone that adrenal glands produce naturally.

Dosage is the prescribed administration of a specific amount, number, and frequency of doses over a specific time.

A dose is a specified amount of medication taken at one time.

Dosing interval is the frequency of intermittent drug administration based on the drug half-life

A drug is a therapeutic agent or any substance used in prevention, diagnosis, alleviation, treatment, or cure of disease.

Drug-related morbidity is the incidence and prevalence of disease and illness associated with drug therapy.

Drug-related mortality: death associated with incidence and prevalence of illness and disease.

Drug-related needs are key pati requirements that should be met for medication therapy. They include; appropriate indication, effective medication, safe medication, and willingness/ability to comply with the regimen

Drug therapy problems are any undesirable event experienced by a patient that involves drug therapy and that interferes with achieving the desired goals of therapy and requires professional judgment to resolve.

The goals of therapy are desired outcome of drug therap**y**.

Half-life is the period required for a drug in the body to be reduced by half its initial amount.

A health care worker delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians.

Incidence is the proportion or rate of persons who develop a disease during a particular period.

A Prescriber is an individual currently licensed, registered, or otherwise authorized to prescribe and administer drugs in the course of professional practice.

Prevalence refers to the proportion of persons who have a disease at or during a particular period

ABSTRACT

Background: Drug therapy problems (DTPs) are any unwanted incident related to medication therapy that actually or potentially affects the desired goals of treatment. These treatment goals include cure of disease, resolution or reduction of symptoms, slowing of disease progression and prevention of disease or symptoms. DTPs are major causes of morbidity, increased cost of health care, increased hospital stay, and mortality, hence medical practitioners need to identify prevent and resolve DTPs.

Study objectives: The study aimed to determine the prevalence, describe drug related factors, and risk factors of drug therapy problems associated with corticosteroid use among patients admitted in medical wards at KNH.

Methodology: A descriptive cross-sectional study was carried out where a simple random sample was used to recruit patients who used corticosteroids and met the inclusion criteria at medical wards at KNH. A questionnaire modified from the Helper and Strand tool was administered by the principal investigator and was also used to extract data from patients' files. The data collected were entered into Microsoft Excel and analyzed using STATA version 13, the level of significance (alpha) was set at 0.05 and logistic regression analysis was used to determine the risk factors for DTPs. Categorical variables were summarized as frequencies and percentages and the continuous variables as median and IQR. Pearson's, Chi, and Fisher's exact tests were applied to determine the associations between the predictor and the outcome variables.

Results: Among the 155 participants females were the majority (60%), and the median age was 39 [25.0-54.0] years, with a range of 18-80 years. The prevalence of DTPs was 71.1%. The most common DTP category was the adverse drug reaction (39.4%) followed by non-adherence (35.5%) and dosage too low (16.1%). In multivariate logistic analysis found the significant risk factors associated with DTPs were the primary level of education (95% Cl 1.1-10.0, p=0.032) and family history of diabetes (95% Cl 1.2-2.8,p=0.03)

Conclusion: The prevalence of drug therapy problems associated with corticosteroid use is high in KNH. Adverse drug reaction was the most prevalent type of DTP.

Recommendations: To prevent DTPs principles of rational drug use such as appropriate dose calculation for the individual and the medical indication and screening for drug-drug interactions should be encouraged amongst the prescribers. Well-structured adherence counseling should be carried out to ensure that patients are compliant with their prescriptions

CHAPTER ONE: INTRODUCTION

1.1 Background

Pharmaceutical care is defined by Helper and Strand as the "provision of drug therapy to achieve definite outcomes which improve patient's quality of life" (1)A Drug therapy problem (DTP) is any undesirable occurrence associated with medication therapy that may affect the desired goals of treatment. DTPs occur during the process of drug prescribing, dispensing, and patient use. In a study conducted in Ethiopia at least one DTP was experienced by three out of four admitted patients. Patients discharged with DTPs were about 22% of the patients and in the emergency department, a third of the visits were problems related to drugs. Increased patient morbidity and mortality are frequently caused by DTPs (2). Patient participation is vital in the pharmaceutical care process to enhance the quality of care and to minimize DTPs associated with their treatment (3).

Corticosteroids are a class of drugs used for the treatment of inflammatory disorders; and suppress undesirable immune system actions. These drugs are indicated for the following disorders in the body; allergy, dermatologic, endocrine, gastrointestinal, hematologic, rheumatologic, ophthalmic, and others (4). The adrenal gland produces cortisol, an endogenous glucocorticoid through cholesterol metabolism. The common pathway of cholesterol metabolism also produces aldosterone, male and female sex hormones. Therapeutic doses of cortisol and its analogs present with side effects associated with the common pathway of metabolism they share and structural similarities (5).

Globally, there is inappropriate prescription and dispensing of more than half of available medications, most are beneficial with excellent safety profiles (3). In the primary health care system, DTPs are serious issues, they may reduce the quality of life, increase the number of hospitalizations and overall cost of health care, and even lead to increased morbidity and mortality if not identified and resolved (3,6).

Hence, it is crucial to identify the prevalence, various types, and risk factors of DTPs associated with corticosteroid use to guarantee a rational use of these drugs and limit DTP occurrence in this population.

1.2 Problem statement

Drug therapy problems are a public health concern globally and their magnitude has increased significantly over the past few decades. Prescription of an appropriate drug is increasingly challenging because drug therapy is growing more complex, hence the intended beneficial outcome of treatment is not achieved by most patients. DTPs necessitate frequent doctor's visits and hospitalization which cause both unnecessary suffering and huge expenditures to the patient, the hospital and the society (7). In a study done in Ethiopia around 5–10% of admitted patients were estimated to be due to DTPs, in which half of the admissions could be avoided. A wide range of adverse effects of oral corticosteroids has been documented (3).

The clinical use of corticosteroids differs with patients' conditions; however, most clinicians rely on their clinical expertise in the dosing and adjustment of corticosteroids instead of evidence-based practice. This may lead to instances of sub-therapeutic management or overdosing which may increase the risks of toxicity among other DTPs.

There is a paucity of data locally concerning corticosteroid use and associated DTPs in general. The study seeks to identify and describe the prevalence and types of DTPs associated with corticosteroid use to improve pharmaceutical patient care.

1.3 Purpose of the study

Strand and Linda form was utilized to describe prevalence, types, and risk factors of DTPs associated with corticosteroid use in this study and suggest ways of improving their rational use. There is a need to be cautious when prescribing and dispensing corticosteroids by identifying an association between patients' therapy and medical condition. The aim was to inform the approach to DTPs identification, resolving, and prevention in Kenyan hospitals by answering the research question.

1.4 Research questions

1. What is the prevalence of DTPs among patients admitted in medical wards using corticosteroids at KNH?

2. What are the drug-related factors associated with DTPs among patients on corticosteroids admitted in medical wards at KNH?

3. What patient risk factors are associated with various DTPs among patients admitted in medical wards using corticosteroids at KNH?

1.5 Objectives

1.5.1 Main objective

To identify and describe DTPs associated with corticosteroid use among patients admitted in medical wards at KNH

1.5.2 Specific objectives

1. To determine the prevalence of DTPs among patients on corticosteroids admitted in medical wards at KNH.

2. To describe the drug-related factors associated with DTPs among patients on corticosteroids admitted in medical wards at KNH.

3. To assess patient risk factors associated with various DTPs among patients on corticosteroids admitted in medical wards at KNH

1.6 Justification of the study

The identification, resolution, and prevention of DTPs assist patients to achieve their possible positive therapeutic outcomes from drug therapy. However, studies on DTPs in corticosteroid use have not been conducted locally and more specifically within this target population. This study seeks to describe the prevalence, types, and risk factors of DTPs associated with corticosteroid use.

1.7 Significance of the study

The findings would help streamline therapy and reduce drug-related morbidity and mortality among patients on corticosteroids by addressing the modifiable risk factors. An institution would come up with treatment protocols on rational corticosteroid use.

Therefore improving patient care and their overall quality of life. The cost of healthcare would be minimized, as a direct or indirect result of rational use, since the number of DTPs associated with corticosteroids will have been reduced. It would also inform policy development at a national level, with the hope that national clinical guidelines on the use of corticosteroids will be formulated and adopted. The findings of this study will be disseminated to all stakeholders including the University of Nairobi and KNH.

1.8 Limitations of the study

Disadvantages of using medical records to collect data are missing or incorrect data and illegible writings. Corticosteroids' adverse effects may exacerbate a medical condition that may be wrongly misinterpreted as the occurrence of DTPs in a real sense may be attributable to the other drugs the patient is receiving. The presence of a language barrier may also limit this study.

1.9 Conceptual framework

Drug Therapy Problems are the main outcome variable in this study and they are defined as any undesirable occurrence associated with medication therapy that may affect the desired goals of treatment. For purposes of this study, DTPs were measured by the criteria defined by Cipolle, Strand, and Moley(8). DTPs may be classified as either "unnecessary drug therapy, additional treatment needed, use of ineffective dosage form, Dosage is too low, adverse drug reactions, dosage too high and adherence".

The independent variables that may determine the occurrence of DTPs in patients on corticosteroid therapy may be classified into risk factors of DTPs and drug-related factors. Socio-demographic characteristics are a risk factor that includes the patient's age, gender, family history, occupation, monthly income, possession of an insurance cover, and education status. Age may correlate with DTPs associated with corticosteroid use due to increased comorbidities. Education level is a tool for literacy level estimation, this will influence patient understanding and adherence to corticosteroid use. Income status and insurance will affect medication

affordability and compliance. Comorbidities such as osteoporosis and hyperglycemia are risk factors for DTPs in corticosteroid use. Drug-
related factors include the type of drugs, dose, time of administration, drug therapy duration, and route of administration.

The relationship between the predictor and outcome variables has been shown in the conceptual framework (**Figure 1.1)**

Predictive variables **outcome**

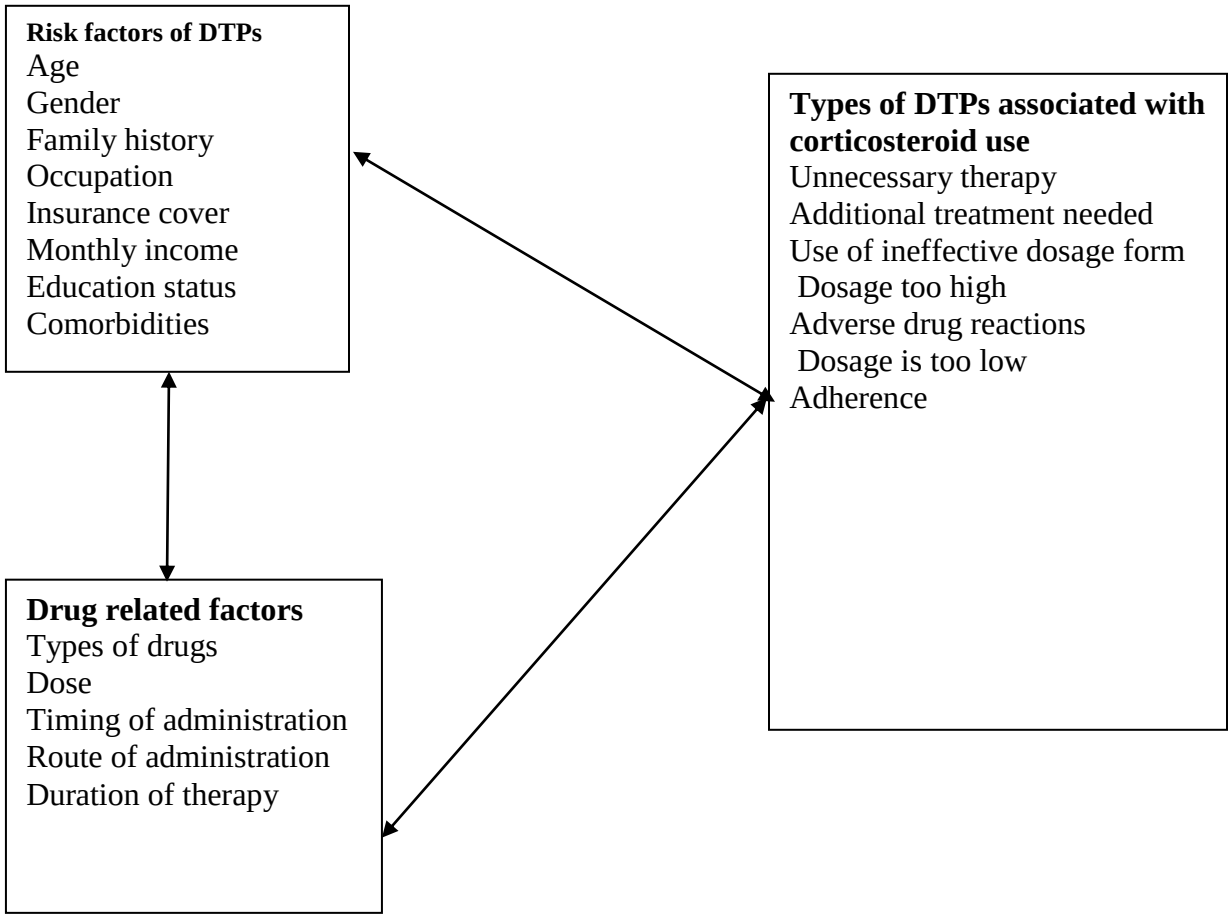


Figure 1.1: Conceptual Framework
Source: Author, 2021

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the Epidemiology of DTPs, types of corticosteroids, DTPs associated with corticosteroid use, risk factors associated with DTPs in corticosteroid use, and a summary and literature gap.

2.2 The burden of DTPs

The definition of a DTP is a therapeutic intervention that fails to produce the intended outcome, which may lead to both treatment failure and the emergence of new medical problems(10). DTPs worsen patient health, prolong hospital stay, increase medical care costs, reduce patient's quality of life, and may cause death(11)

Approximately 45,000 pharmaceutical encounters in 2002 were registered in the US [by Strand and Co.] with over 19,000 DTPs with significant financial impacts were detected, prevented, and resolved(11).

In a systematic review, 28 % of patients in the emergency section were drug-related cases, 70% of the cases would be prevented and 24% of the patients were admitted (12). In a 3-month study carried out in Ethiopia, drug therapy problems found were 159, the most prevalent being " the need for additional drug therapy (35.85%), followed by unnecessary drug therapy (30.19%) and dosage too low (13. 2%) "(2). A cross-sectional study conducted at the oncology department of KNH found that 48.2% of patients treated with a chemo-radiation regimen presented with DTPs. The most prevalent DTPs were 69.1% drug reactions and 46.9% drug interactions. Approximately $528.4 billion US dollars in the year 2016 were annual cost of morbidity and mortality caused by prescription of medicine that was non optimized in the US. (13).

2.3 Classification of DTPs

The categorization of DTPs was done in the year 1990 by the research group of the PIPC at the University of Minnesota. DTPs were classified into indication, effectiveness, safety, and compliance (adherence). However, in 1990, Helper and Strand classified DTPs into 7 classes

namely; “unnecessary drug therapy, need for additional treatment, dosage too low,dosage too high, adverse drug reaction, non-adherence and needs additional drug therapy”(14).

Table 2.1: Classification of Drug therapy problems

Patient needs	**Categories of DTPs**
Indication **Effectiveness**	1. Needs additional drug therapy 2. Unnecessary drug therapy 3. Ineffective drug 4. Dosage too low
Safety	5. Dosage too high 6. Adverse drug reaction
Adherence	7. Non-adherence/non-compliance

Table 2.2: Categories and common causes of Drug Therapy Problems

Categories of DTPs	**Causes of DTPS**
Unnecessary drug therapy	• Identical therapy: polypharmacy use for a condition that requires single therapy • When there is no medical indication requiring pharmacotherapy • Addiction to drugs or recreational drug use • Nondrug treatment • Treating avoidable adverse reaction
Additional therapy needed	• Prophylaxis to prevent the development of new disease • Initiate therapy for the untreated • A disease that requires additional drugs to attain similar effects
Drug ineffectiveness	• Drug available is ineffective • Resistant drug to disease and an effective drug is needed • Inappropriate dosage form

	• Contraindication present • Ineffective drug for the medical condition.
Dosage too low	• The dose not optimal produce the desired therapeutic response • The dosing frequency is inappropriate • Drug administered by wrong route or method • Drug interaction leads to ineffectiveness in the patient • The Drug product is incorrectly stored and lost potency • The short duration of drug therapy to produce the desired response
Dosage too high	• The drug dose is too high resulting in toxicity • Need for drug therapy monitoring • Too short dosing frequency. • The duration of therapy is too long for the patient. • Drug interactions
Adherence	• The patient doesn't understand the instructions on how to use the drug • Cost implications of the drug therapy prescribed. • The patient refuses to take the drug therapy instructed. • The patient forgets to take sufficient doses of the medication. • Drug stockouts. • The patient is not able to swallow or administer the drug therapy as required.

Source: Morley, Robert J. Cipolle; Linda M. Strand; Peter C. Pharmaceutical Care Practice: The Patient-Centered Approach to Medication Management Services, 2012; (D): 1-30

2.4 Corticosteroids

These classes of steroid hormones are synthesized and released from the adrenal cortex and they include glucocorticoids and mineralocorticoids. Clinically, they are usually referred to as glucocorticoids, because of their effect on carbohydrate metabolism. They regulate diverse cellular functions including "development, homeostasis, metabolism, cognition, and inflammation". Due to their profound immune-modulatory actions, glucocorticoids are one of the most widely prescribed drugs worldwide(15).

The mechanism of action of corticosteroids is complex, they act by penetrating the cell membrane and binding to receptors of glucocorticoids which causes a conformational change. The complex penetrates the nucleus and binds to glucocorticoid response elements(5). Suppression, or stimulation of the transcription of sensitive genes, results in changes in the synthesis of mRNA and protein. These steps are necessary for GC to produce most cellular responses which take hours to days to develop. Inflammatory cytokines synthesis reduction and up-regulation of annexin A1 synthesis mediate immunomodulatory and anti-inflammatory glucocorticoids effects.

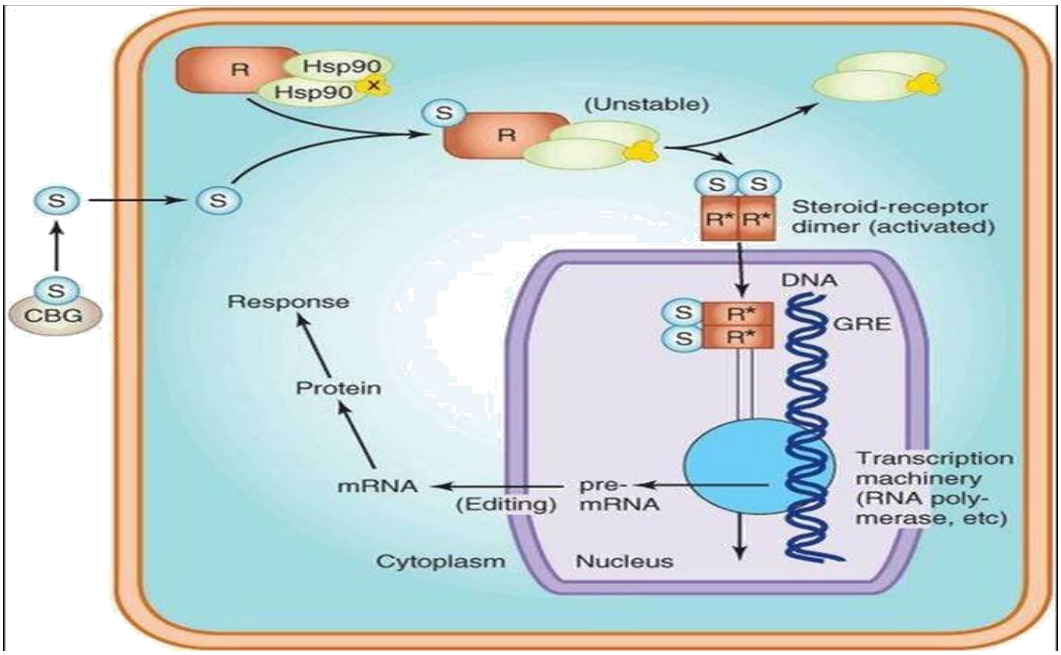


Figure 2 1: Mode of action of corticosteroid.
Source:– Katzung & Trevor- Pharmacology Examination and Board Review, 9th ed. Corticosteroids and Antagonists(16)

Corticosteroids also form a protein that inhibits phospholipase A2 an enzyme important for arachidonic acid supply, a substance that is essential for the formation of inflammatory mediators. Corticosteroids alter ion permeability on the cell membrane and modify neurohormones production(4).

2.4.1: Physiological functions of corticosteroids

The physiological effects of corticosteroids are numerous. They include lipid, protein, and carbohydrate, the preservation of normal function of the kidney, central nervous systems musculoskeletal, endocrine, cardiovascular, immune, and the and the maintenance of fluid and electrolyte balance systems. They also enable the body to resist stressful and noxiousstimuli and environmental changes. Stresses such as infection, trauma, and extremes in temperature can be fatal in situations where there is inadequate secretion of corticosteroids from the adrenal cortex (17).

Table 2.3: Glucocorticoids Primary effects

Effect	**Description or mode of action**
Inhibition of inflammation	They block actions of or induce inflammatory mediators.
Immunosuppression	Affect T-lymphocytes
Inhibit proliferation	Epidermal cell turnover and DNA synthesis inhibition
Vasoconstrictive	Inhibit histamine action and other vasoconstrictive mediators

Source: Liu et al. A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy (18).

2.4.2 Classification of Corticosteroids

In 1989, Coopman *et al* classified corticosteroids into four groups based on the results of patch tests and the chemical structure of the drugs(19,20)**.**

Table 2.4: Classification of corticosteroids based on their structure

Class A: Hydrocortisone and tixocortol type	**Class B: Triamcinolone acetonide type**	**Class C: Betamethasone type**	**Class D: Hydrocortisone–17-butyrate and clobetasone-17-butyrate type**
Cortisone	Triamcinolone acetonide	Betamethasone	Hydrocortisone butyrate
Cortisone acetate	Triamcinolone alcohol	Betamethasone – disodium phosphate	Hydrocortisone valerate
Hydrocortisone	Halcinonide	Dexamethasone	Clobetasone butyrate
Hydrocortisone acetate	Fluocinonide	Dexamethasone – disodium phosphate	Clobetasol propionate
Methylprednisolone	Flucinonide acetonide	Fluocortolone	Betamethasone valerate
Methylprednisolone acetate	Desonide		
Prednisolone	Budesonide		Betamethasone dipropionate
Prednisolone acetate	Amcinonide		Fluocortolone hexanoate
Tixocortol pivalate			Fluocortolone pivalate
			Prednicarbate
			Alclometasone dipropionate

Table 2.5: Classification of steroids based on their relative activity

Short-acting (half-life <12 hours)	**Intermediate-acting (half-life 12-36h)**	**Long-acting (half-life >36h)**
Hydrocortisone Cortisone	Prednisolone Methylprednisolone Triamcinolone	Betamethasone Dexamethasone

2.4.3 Toxic effects of corticosteroids

The therapeutic use of glucocorticoids may result in two categories of toxic effects; steroid therapy withdrawal and continued use at supraphysiological doses. They are potentially life-threatening hence risk versus benefit assessment is important. (17)

Table 2.6: Therapeutic uses of corticosteroids

Body organ	**Disorders**
Respiratory System	Asthma, COPD, allergic rhinitis, atopic dermatitis, urticarial, anaphylaxis, nasal polyps, hypersensitivity pneumonitis, sarcoidosis, interstitial lung disease.
Skin	Dermatitis, psoriasis, pemphigus vulgaris
Endocrine system	Adrenal gland insufficiency
Joint and Connective tissue disorders	Rheumatoid arthritis, systemic lupus erythematosus, polymyositis, dermatomyositis, polymyalgia rheumatic
Eye	Uveitis, conjunctivitis, cataracts
Blood	Leukemia, lymphoma, hemolytic anemia, .idiopathic thrombocytopenic purpura
Gastro-intestinal	IBD, autoimmune hepatitis, ulcerative colitis, Crohn's disease
Others	Prevention of organ graft rejection, antenatal lung maturation, nephrotic syndrome, cerebral edema, and multiple sclerosis

Source A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy((18).

2.4.4: Tapering of corticosteroids

In cases of prolonged courses or an intensive therapy of systemic corticosteroid use, dose tapering is recommended to prevent adrenal insufficiency. Tapering also prevents exacerbation of the condition that is being treated(5)

2.5 DTPS associated with corticosteroid use

2.5.1 Unnecessary drug therapy

If there is no clinical indication for the drug in a patient, therapy is considered unnecessary. Causes of unnecessary drug therapy may be due to, polypharmacy, no medical indication at that time is required, treating a condition caused by recreational agents, treating an adverse reaction associated with another medication that would be avoided earlier(8).

A cohort study done in the United States from 2006 to 2012; found that 43.2% of the patients presented with severe polypharmacy and this was common in older patients, comorbidity, and steroids use. One potential medication interaction was presented n 73.7% of the patients. Older patients suffering from inflammatory bowel disease (IBD) were at increased risk for severe polypharmacy and potential drug interactions with chronic use of steroids. There is a high prevalence of steroid-maintenance therapy use, with lower utilization of steroid-alternative regimens among older patients with IBD(21). In a retrospective analysis study done in Libya in 2004 on the use and misuse of systemic corticosteroid therapy in hospitalized patients, 28% of the patients were unnecessarily treated with systemic glucocorticoids. CVA patients were also treated unnecessarily with glucocorticoids despite evidence that there is no benefit with its use. The route of administration of glucocorticoid use was intravenous because both the doctors and thepatients probably consider the parenteral therapy more potent and effective, which is not always the case(22).

2.5.2 An additional drug therapy needed

To meet their therapeutic goal, patients require additional drug therapies, for example, prophylaxis, initiation of drug therapy for a medical condition, and need of drug combinations to attain synergistic effects(8).

Patients on a long course of high doses of glucocorticoids should be immunized before the initiation of therapy. In Patients with *Pneumocystis jirovecii* pneumonia (PCP) it is recommended that they should receive prophylaxis for opportunistic infection if they are receiving prednisone 20 mg or more for more than two weeks. Combination of glucocorticoids and several drug classes such as antifungals, antidiabetic agents, NSAIDS, anticoagulants are done cautiously because of significant drug interactions that exist(23).

2.5.3 Ineffective drug therapy

A drug can be ineffective if it is not essential, refractory, inappropriate, and contraindicated. In a study done in Switzerland on glucocorticoid ineffectiveness, it was observed that due to the lack of glucocorticoid receptors in intestinal epithelial cells, the use of dexamethasone in the treatment of inflammatory bowel disease did downregulate chemokine expression (24). There is extensive use of glucocorticoids in the treatment of glomerular diseases even though they are of different subtypes. This may be inappropriate or detrimental to patients' health(25). Important clinical decisions are crucial in selecting a drug that would be effective for the patient. The effectiveness of a drug can be realized if the drug and dosage are selected to produce the desired outcome in a patient. Drug product selection for a patient that is likely to be effective requires a thorough understanding of medical condition pathophysiology and drug pharmacology. If a drug showed to be effective in 75% of patients with certain medical conditions, 25% of the patient will not respond, hence a drug thought to be the drug of choice would be ineffective for all patients(8).

2.5.4 Dosage Too Low

The major causes of the use of dosages that are too low include infrequent dosing to produce positive outcomes, the wrong route of administration, drug interaction inactivating the active ingredient, and poor drug storage (8). There is continued adrenal insufficiency if glucocorticoids are under-dosed(26).

Glucocorticoid dosing should be individualized and the use of minimum effective dose and duration should be embraced. There is no evidence to support an optimal dose and duration for most indications. General guidelines and recommendations provided are primarily based on expert opinion. Use of ideal body weight in obese patients on long course therapy for indications with weight-based dosing is recommended.

Lack of effectiveness of a drug produces an undesired therapeutic outcome and this applies to patients who receive it. In a dosage regimen; the dose of the drug, the dosing interval, and the duration of therapy, must be relevant to produce a desired pharmacological effect. Patients suffer through ineffective drug therapy because guidelines publish very conservative doses, individualization of drug dosage is crucial in pharmaceutical care. (8)
To ensure that the patient receives desired therapeutic outcome rational, comprehensive, and effective methods should be practiced which is missing from our health care systems(8)

2.5.5 Dosage too high

Exposure to high doses may harm the patient. Common causes include too high dose, drug interaction from a toxic reaction, short dosing frequency, and prolonged duration of therapy. Prospective data collected in the United States reported hyperglycemia (17.6%) and the use of high-dose prednisolone for a prolonged period is associated with weight gain as an adverse effect for the treatment of autoimmune inner ear disease (27).

In a retrospective study done in Korea, treatment of patients with methylprednisolone 48 mg/day for a period of one to two weeks was reviewed. The observed adverse effects include; "abdominal discomfort (26.8%), skin rash (14.7%), swelling (13.4%), and hot
flush (6.9%)". In the first week, patients presented with abdominal discomfort and hot flush, and skin rash detection was on the third week(28).

High-dose long-term use of inhaled corticosteroids potentially causes systemic side effects namely; impaired thinning and bruising of the skin, and cataracts. It also causes suppression of the hypothalamic pituitary adrenal axis. (29). In a study done in patients with severe COVID 19, the use of high-dose corticosteroids was found to potentially increase the mortality rate of the patients(30)

Oral corticosteroids cause more catastrophic effects; topically applied or inhalers have fewer effects. At-risk to these adverse effects are those taking for a longer duration of treatment and high doses. In a prescription, more than 5 mg oral prednisolone and the long-term duration of treatment for more than a month are defined as a high dose. The Patient' "Weight, blood

pressure, triglycerides, glucose and urea, and electrolytes" parameters should be monitored in primary care(31)

2.5.6 Adverse drug reaction

Adverse drug reactions may arise if a patient takes a drug that is not safe. A situation where this can occur includes; if the drug product causes an undesirable reaction, drug interaction, incorrect administration of a drug, drug hypersensitivity reaction, and the use of a contraindicated drug.

In a study done at the Kenyatta National Hospital**,** various adverse drug reactions of corticosteroids were observed, metabolic disorders (89%), cutaneous reactions (61%), mineral bone disease (37%), GIT (36%), neuropsychiatric (32%), adrenal suppression (24%), ophthalmic (21%), and myopathy at 18% (32).

A study done in Egypt on **s**evere cutaneous adverse drug reactions found that the most common side effects of systemic corticosteroid use were peptic ulcers (55.5%), and hypertension (51.8%). The mortality rate was 100% in toxic epidermal necrolysis (TEN), 33.3% in overlap Stevens-Johnson syndrome (SJS)/TEN, and 16.3% in SJS(33).

Portuguese Pharmacovigilance System performed a retrospective, observational, and descriptive study between January 2009 and December 2018. It was observed that 89.1% of the ADRs serious, prednisolone, was the most commonly reported corticosteroid. Slightly more than a third of adverse reactions were infections and infestations. The ones who got cured were 42.7% and the mortality rate was at 9.3%(34).

The most common corticosteroid adverse effects in adults include: osteoporosis, HPA-axis suppression, Cushing features, high blood glucose cardiovascular disease and dyslipidemia myopathy, cataracts, mental disturbances immune suppression, intestinal and skin disorders(18).

In a study on the clinical impact of fluconazole and prednisone combination in one large tertiary care hospital, it was found that 70.3% of patients experienced potential fluconazole with prednisone interaction. There was a 50% reduction in methylprednisolone dose when combined with ketoconazole in the same study(35).

2.5.7 Adherence

The non-adherent patient may not be willing to take the medication as intended. This may be due to the patient not understanding the instructions, cannot afford the drug, refusing to take the medication, forgetfulness, unavailable drug, and severely ill patients who cannot swallow the drug, In the treatment of asthma with inhaled corticosteroids and oral corticosteroids, non-adherence to medications is common and may lead to increased morbidity and mortality. Non-adherence may cause inappropriate labeling of refractory asthma steroid resistance this may lead to inappropriate escalation of therapy(36)**.**

2.6 Risk factors associated with DTPs in corticosteroid use

Risk factors for infection such as the elderly, diabetics, and those suffering from other co-morbidities should avoid corticosteroid therapy or limit their use. Rheumatic diseases patients who are on corticosteroids are at high risk of serious bacterial infections. PJP, herpes zoster; and tuberculosis infections are higher in patients taking corticosteroid therapy(37). The risk of infection could be limited by proper patient selection, vaccination, and screening of any patient taking corticosteroid therapy. Nine studies focusing on the level of adherence to inhaled corticosteroids (ICS) found that age was associated with the lowest level of adherence. Poor adherence was observed in younger than older subjects, mild asthma, poor communication with healthcare providers, being African American, and formal education of below twelve years(38).

2.7 Summary and Literature Gap

There is a high prevalence of DTPs in corticosteroid use. These DTPs are associated with several risk factors such as age, level of education, and comorbidities. To the best of our knowledge, no study has been conducted in KNH on the prevalence, types, and risk factors of corticosteroid use. This study seeks to fill this gap.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter entails details on how the study was conducted. It describes the study design, location, target, and population, inclusion, and exclusion criteria, duration of the study, sample size, sampling technique, research instruments, validity, reliability, and data collection, and analysis. It also includes details on logistical and ethical considerations, quality assurance, and data dissemination plans

3.2 Study design

A cross-sectional design was conducted to identify and describe DTPs associated with corticosteroid use among patients admitted to medical wards at KNH. A cross-sectional study is relatively quick and easy to conduct, data on all variables are collected at once the prevalence, types, and risk factors of DTPs associated with corticosteroid use in patients in the medical wards will be determined.

3.3 Location of the study

The study was conducted at Kenyatta National Hospital, Nairobi, Kenya, in the medical wards. It has a bed capacity of 1800 with 8 medical wards located on the 7^{th} and 8^{th} floors. Patients referred to the facility and requiring admission are admitted to medical wards 7 and 8 A-D. A multidisciplinary team is involved in providing health care services to patients at the hospital. It is also a training centre for the College of Health Sciences of the University of Nairobi.

3.4 Target Population and study population

The target population was all adult patients above the age of 18 years on corticosteroids in Kenyatta National Hospital. The study population was patients admitted at the medical wards 7 and 8 at KNH who were on corticosteroid therapy for any indication.

3.4.1 Inclusion criteria

Patients characteristics included in the study:

1. Age of 18 years and above
2. Admitted to the medical wards at KNH
3. Patients on corticosteroids

3.4.2 Exclusion criteria

Patients who did not participate in the study**:**

1. Critically ill patients.
2. Patients who refused to provide written informed consent

3.5 Sampling

3.5.1 Sample size calculation

The sample size for this study was based on a prospective observational study which was conducted among hospitalized patients in the medical ward in Ethiopia, DTP prevalence of 75.51% was observed (2).

Cochran formula was used for the sample size calculation for descriptive studies (39).

$$n_o = \frac{Z^2 p(q)}{e^2}$$

Where:

n0 is desired sample size

Z is the standard deviation for a 95% confidence interval which is 1.96

P is the prevalence of corticosteroid use from previous studies which is 75.51 q is the accepted level of precision that is 1-p e is an acceptable margin of error that is 5%

Computing these values yields the proposed sample size of the study

$$n_o = \frac{1.96^2 \times 0.7551(1-0.7551)}{0.05^2}$$

$$n_o = 284 \text{ participants}$$

The Cochran formula for finite populations correction was applied to calculate the sample size(39) The medical wards in KNH have 8 medical wards with approximately 42 patients per patient per ward bringing the total to about 340 patients. This necessitated the use of the formula for finite populations since the study population was small.

$$n = \frac{n_o}{1 + \frac{n_o - 1}{N}}$$

Where:

n = adjusted sample size

n0 = calculated sample size

N = population size

$$n = \frac{284}{1 + \frac{284-1}{340}}$$

$$n = 155 \text{ participants}$$

3.5.2. Sampling technique

A simple random technique was employed to recruit participants. A sampling frame was drawn from all patients' files on corticosteroids in the medical wards, these files were then assigned sequential numbers which were put in a computer program (Minitab version 19.2020.1) to generate random numbers for patient selection until the estimated sample size was achieved.

3.6 Research instruments

A principal administered questionnaire was used to collect data. The Helper and Strand form was applied during data collection to determine the DTPS risk factors associated with them during corticosteroid use.

3.7 Pretest

Few questionnaire copies were administered to 10 patients of the study population at the medical wards. Modification of any discrepancies was done to ensure complete and good-quality data collection.

3.8 Validity

External validity was established by making that appropriate sample size was selected for the study by conducting consecutive sampling. The desired sample size was determined using the Cochran formula. This ensured that the study results were generalizable. Internal validity was established by ensuring that the data collection tool was well structured and relevant to study objectives.

3.9 Reliability

The pre-testing of the research instrument carried out on a subset of the study sample established the reproducibility of the results. Changes were done to the data collection tool for efficiency and effectiveness if there were any discrepancies.

3.10 Data collection technique

After random sampling of patients, data collection was conducted through an interview carried out by the principal investigator, the tool used was an interviewer-administered questionnaire, and the data was entered in a collection form. Physical examination of the patient was done and abstraction of data from the patients' medical records was also used to obtain some details namely, height, weight, BMI. The tool will capture data on; socio-demographic characteristics of the participant, medications, type of DTP present, and the patient associated risk factors. The Helper and Strand form was being used to collect data.

3.11 Data management

Participants' confidentiality and privacy were guaranteed by using unique codes for each participant's form, which also helped to avoid duplication of data during data entry. Coded data were entered into Microsoft Excel within 24 hours. The spreadsheet was checked regularly and corrected promptly to ensure the accuracy of the data. Data were cleaned and validated before export to the data analysis software. Passwords were used to secure stored information. All data were backed up regularly to ensure that none of that data was lost.

3.12 Data analysis

The data collected was entered into a Microsoft Excel 2016 after which it was exported to STATA version 13 for analysis. Categorical variables were summarized as frequencies and percentages and the continuous variables as means and standard deviation. Association tests were applied to determine the associations between the predictor and the outcome variables. The results were presented in the form of tables, figures, and graphs.

3.13 Ethical considerations

3.13.1 Ethical approval

Authorization to carry out the study was sought from the KNH administration after approval from the KNH-UON Ethics and Review Committee had been obtained.

3.13.2 Informed consent

Informed consent was obtained from the participants before any information was collected. The decision to take part in the study was voluntary and those who refused to participate were not discriminated against. All participants who agreed to take part in the study were guided through information regarding the study, the purpose of the study, and their role in the study was explained to them. A consent form was filled and signed by the eligible participant.

3.13.3 Risks involved

The participants were not exposed to any risk, since data was obtained through patient interviews and data abstraction from the patients' health records. No invasive procedures were involved in the study. All Covid-19 pandemic precautions such as the use of sanitizers, frequent hand-washing, and the wearing of masks were employed to protect both the investigator and the participants.

3.13.4 Confidentiality

The participant was interviewed in a separate room from other patients in the wards by the principal investigator. During data abstraction from patients' files, unique codes identifiers were used to conceal their details. Data collected was treated with confidentiality by restricting access to it. All data collection materials were safely kept in an identified cabinet that was lockable. The database was password protected.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter contains the results obtained after analysis of the data obtained from 155 participants. It includes patients' sociodemographic and clinical characteristics, the prevalence of DTPs and their causes as well as logistic regression analysis for the risk factors associated with DTPs

4.2 Sociodemographic and clinical characteristics

The sociodemographic and clinical characteristics are summarized in **Table 4.1**. The majority of study participants were females (93, 60%), married (79, 51%), and had attained a secondary level of education (65, 41.9%). The median age was 39.0 [25.0-54.0] years. The young participant was 18.0 years, while the older was 80.0 years of age. About two-thirds of the participants were of normal weight (100, 64.5%), and most of them (132, 85.2% had never smoked a cigarette).

Forty-one (26.5%) participants reported having a positive family history of a chronic illness, with hypertension (22, 14.2%) and diabetes mellitus (19, 12.3%) being the most common.

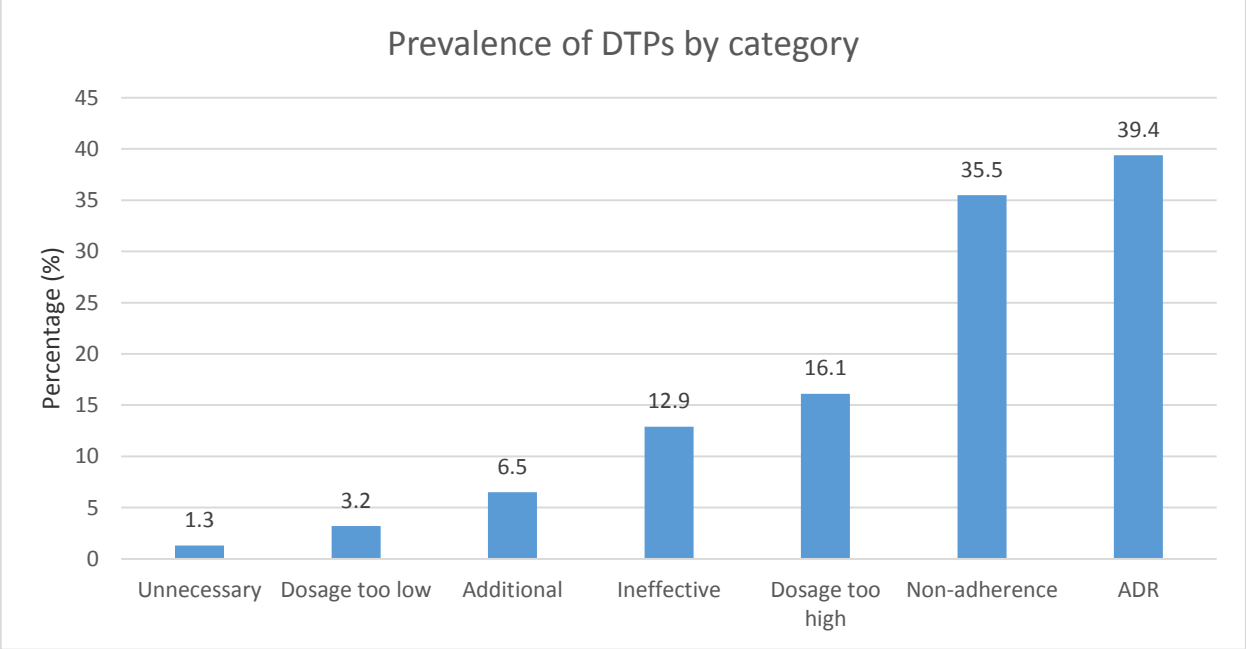
Table 4. 1 Demographic characteristic of the study participants

Characteristics	**Frequency (n)**	**%**
Age *(median, IQR)*	39.0	[25.0, 54.0]
Sex		
Female	**93**	**60.0**
Male	62	40.0
Marital status		
Single	60	38.7
Married	**79**	**51.0**
Widowed/Separated/Divorced	16	10.3

Highest education		
Informal	5	3.2
Primary	52	33.6
Secondary	65	41.9
Tertiary	32	20.7
Occupation		
Self-employed	53	34.2
Employed	15	9.7
Unemployed	73	47.1
Retired	14	9.0
BMI		
Underweight	4	2.6
Normal	100	64.5
Overweight	48	31.0
History of familial chronic illness		
Yes	41	26.5
No	77	49.7
I don't know	36	23.2
Hypertension in the family	22	14.2
Diabetes in the family	19	12.3
History of smoking		
Never	132	85.2
Current smoker	7	4.5
Former smoker	16	10.3
Alcohol intake	15	9.7

4.3 Drug Therapy Problems

In this study, 110 (71.0%) participants had DTPs (**Table 4.2**). About a third of the participants had one DTP. As shown in **Figure 4.1**, the most common DTP category was adverse drug reactions (61, 39.4%) followed by non-adherence (55,35.5%) and dosage too high (25,16.1%).



Key: Unnecessary: Unnecessary drug therapy, Additional: Need for additional drug therapy, Ineffective: Ineffective drug therapy, ADR: Adverse drug reactions

Figure 4. 1 The prevalence of DTPs by category

The most prevalent cause of DTP was undesirable side effect (54, 34.8%), followed by non-adherence to drug therapy (35, 22.6%) caused by either forgetfulness or inability to afford (28, 18.1%) and refractoriness to the prescribed drug (17, 11.0%).

Table 4. 2 Causes of DTPs associated with corticosteroids use.

DTP	Frequency (n)	Percent (%)
Yes	**110**	**71.0**
No	45	29.0
DTP		
Unnecessary drug therapy		
Duplicate therapy	1	0.7
No medical indication	1	0.7
Needs additional therapy		
Untreated condition	7	4.5
Synergistic therapy	3	2.0
Ineffective drug		
Effective drug available	2	1.3
Condition refractory to drug	17	11.0
Contraindication present	1	0.7
No indication for the condition	1	0.7
Dosage too low		
Ineffective dose	3	1.9
Frequency inappropriate	2	1.3
Incorrect administration	1	0.7
ADR		
Undesirable effect	**54**	**34.8**
Unsafe drug	3	1.9
Drug interaction	**16**	**10.3**
Allergic reaction	1	0.7
Dosage too high		
Dose too high	9	5.8
Needs additional monitoring	2	1.3
Duration too long	**16**	**10.3**

Drug interaction	1	0.7
Adherence		
Does not understand instructions	9	5.8
Cannot afford drug product	**28**	**18.1**
The patient prefers not to take	9	5.8
The patient forgets to take	**35**	**22.6**
Drug products not available	4	2.6

The cause of DTPs in more than half (85, 54.8%) of the participants was that they did not know the dose of medication they were taking, but only a few (9, 5.8%) of them did not know the frequency of their medication. The majority of them (78.7, 79.4%) did not know the duration of the medication they were taking, and 66 (42.6%) did not know the name of their medication. There were 48 (31.0%) participants who sometimes forget to take their medications. The results of other problems are shown in **Table 4.3**

Table 4. 3 Drug-related factors associated with DTPs

	Yes, *n (%)*	**No, *n (%)***
Dose of medication	70 (45.2)	85 (54.8)
Frequency of medication	146 (94.2)	9 (5.8)
Duration of medication	32 (20.6)	122 (78.7)
Name of medication	89 (57.4)	66 (42.6)
Forget taking medication	48 (31.0)	107 (69.0)
Days not taking medication past 2 weeks	54 (34.8)	100 (64.5)
Stopped medication without telling the doctor	52 (33.5)	103 (66.5)
Forget medication when traveling	30 (19.4)	125 (80.6)
Took medication the previous day	142 (91.6)	13 (8.4)
Stop medication when health is good	111 (71.6)	44 (28.4)
	Often, *n (%)*	**Rare, *n (%)***
Difficulty remembering taking all medication	33 (21.3)	122 (78.7)

4.4 Associations between sociodemographic and clinical characteristics and the presence of DTPs

Pearson's chi ( ) and Fisher's exact tests were used to determine associations between having a DTP and the sociodemographic and clinical characteristics of the participants. The level of significance was set at 0.05. No significant association was found.

Table 4. 4 Associations between sociodemographic characteristics and DTPs.

Variable	**Presence of DTP**		**Fisher's (F) or Chi^2 ( ) test p-value**
	Yes n (%)	**No n (%)**	
Age (years)			
≤39	58 (73.4)	21 (26.6)	0.493 ( )
>39	52 (68.4)	24 (31.6)	
Gender			
Female	67 (72.0)	26 (28.0)	0.718 ( )
Male	43 (69.4)	19 (30.7)	
Marital status			
Single	47 (78.3)	13 (21.7)	0.270 (F)
Married	52 (65.8)	27 (34.2)	
Widowed/separated/divorced	11 (68.8)	5 (31.6)	
Highest level of education			
Informal	4 (80.0)	1 (20.0)	0.192 (F)
Primary	42 (80.8)	10 (19.2)	
Secondary	43 (66.2)	22 (33.9)	
Tertiary	20 (62.5)	12 (37.5)	
Occupation			
Self-employed	35 (66.0)	18 (34.0)	0.416 (F)
Employed	9 (60.0)	6 (40.0)	

Unemployed	56 (76.7)	17 (23.3)	
Retired	10 (71.4)	4 (28.6)	
BMI category			
Underweight	2 (50.0)	2 (50.0)	0.724 (F)
Normal	71 (71.0)	29 (29.0)	
Overweight	34 (70.8)	14 (29.2)	
History of smoking			
Never	96 (72.7)	36 (27.3)	0.389 (F)
Current smoker	5 (71.4)	2 (28.6)	
Former smoker	9 (56.3)	7 (43.8)	
Alcohol consumption			
Yes	8 (53.3)	7 (46.7)	0.113 ( )
No	102 (72.9)	38 (27.1)	
Family history of chronic illness			
Yes			
No	33 (80.5)	8 (19.5)	0.098 ( )
I don't know	49 (63.6)	28 (36.4)	
	28 (77.8)	8 (22.2)	
Family history of hypertension (n=39)			
Yes			
No	14 (82.4)	3 (17.7)	0.508 (F)
	17 (77.3)	5 (22.8)	
Family history of diabetes mellitus (n=39)			0.134 ( )
Yes	14 (70.0)	6 (30.0)	
No	17 (89.5)	10 (10.5)	

4.5 Risk factors associated with DTPs

Logistic regression analysis was used to come up with the most parsimonious model using forward stepwise model building of the risk factors associated with DTPs within this population. Having a primary level of education was not associated with DTPs in bivariable analysis (cOR= 2.6, 95% CI 1.0-7.0, p=0.061). However, on multivariable analysis, it was found that persons with a primary level of education had 3.3 times the odds (95% CI 1.1-10.0, p= 0.032) of having a DTP. Persons with family history diabetes had 5.8 times the odds (95% CI 1.2-28.0, p=0.030) of having DTPs that those who did not have on multivariable analysis. None of the other variables yielded a statistically significant association on either bivariable or multivariable analysis.

Table 4. 5 Bivariable and multivariable logistic regression analysis of factors associated with DTPs

Variable	Bivariable analysis cOR (95% CI)	p-value	Multivariable analysis aOR (95% CI)	p-value
Age				
≤ 39.0	1.3 (0.6– 2.6)	0.494		
>39.0 (Ref)				
Gender				
Female	1.1 (0.6– 2.3)	0.718		
Male (Ref)				
Marital status				
Single	1.6 (0.5– 5.6)	0.426	3.2 (0.8 –12.7)	0.099
Married	0.9 (0.3- 2.8)	0.821	1.2 (0.3 – 4.2)	0.814
Widowed/Sep./Div. (Ref)				
Highest education				
Informal	2.4 (0.2– 24.1)	0.457	2.1 (0.2 –23.5)	0.545
Primary	2.6 (1.0– 7.0)	0.061	3.3 (1.1 – 10.0)	**0.032**

Secondary	1.2 (0.5– 2.8)	0.723	0.9 (0.3 – 2.4)	0.817
Tertiary (Ref)				
Occupation				
Self-employed	0.8 (0.2– 2.8)	0.703		
Employed	0.6 (0.1– 2.8)	0.519		
Unemployed	1.3 (0.4– 4.7)	0.673		
Retired (Ref)				
BMI				
Underweight	0.4 (0.1– 3.2)	0.398		
Normal	1.0 (0.45 – 2.2)	0.983		
Overweight (Ref)				
History of family chronic illness				
Yes	1.3 (0.5– 3.9)	0.608		
No	0.6 (0.2– 1.4)	0.202		
I don't know (Ref)				
Hypertension				
Yes	1.5 (0.5– 4.2)	0.484		
No (Ref)				
Diabetes mellitus				
Yes	4.2 (0.9– 18.9)	0.061	5.8 (1.2 – 28.0)	**0.030**
No (Ref)				
History of smoking				
Never	2.1 (0.7– 6.0)	0.177		
Current smoker	1.9 (0.3– 13.2)	0.496		
Former smoker (Ref)				
Alcohol intake				
Yes	0.4 (0.1– 1.3)	0.121	0.3 (0.1 – 1.0)	0.054
No (Ref)				

CHAPTER FIVE: DISCUSSION, SUMMARY, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

This chapter discusses the findings of the study and compares them to other studies done in different populations and a summary of the study findings. Recommendations for practice and further research are also included.

5.2 Discussion

The prevalence of DTPs was found to be 71%. This was similar to two other studies conducted in Ethiopia (2, 6). About a third of the participants had at least one DTP. This was comparable to findings in a study by Belayneh *et al.* (2). Similar studies carried out in the same hospital found a prevalence that was above 90% (40, 41).

The majority of the patients on corticosteroids were females similar studies conducted in the same hospital yielded comparable results (41, 42) and also agree on findings from Ethiopia (2). A larger proportion of the participants were married, unemployed, had never smoked or consumed alcohol (43). The median age was 39.0 [25.0-54.0] years. This population was slightly younger than other comparable studies (2, 44).

The most common DTP category was adverse drug reaction. According to Helper and Strand, ADRs may occur as a result of an undesirable effect, an unsafe drug, a drug interaction, or an allergic reaction (10). Studies conducted in India and Germany were comparable in this aspect (45–47). However, Gathua *et al*. found that the prevalence of this DTP was quite low (42). The high incidence of ADRs may be attributed to the complexity and immunosuppressive effects of corticosteroids.

The commonest cause of ADRs was an undesirable effect, nature, and severity of the underlying disease being treated and other concurrent medications. The causality to corticosteroids alone cannot always be established (48). Undesirable effects in patients on corticosteroids may be attributed to its supra-physiologic doses, long term use of low to moderate doses. Adverse effects of these drugs are both dose and time-dependent. Most participants presented with cushingoid features, leg edema, hyperglycemia, hypertension, gastric disturbances, osteoporosis, and one patient presented with steroid-induced psychosis. The clinical use of corticosteroids differs with

patients' conditions. However, most clinicians rely on their clinical expertise in the dosing and adjustment of corticosteroids instead of evidence-based practice, hence the high incidence of undesirable effects.

Drug interactions were the second most common cause of ADRs. This finding concurs with a study conducted by Njeri *et al* as well as another one in Palestine (7, 49). Structural modifications of corticosteroids enhance its P-gp affinity and cellular efflux, increasing its susceptibility to pharmacokinetic drug-drug interactions.

Non-adherence to drug therapy was the second most common DTP category. This was in agreement with findings by Karimi *et al* (40) A study done by Kamau in the same hospital, found that non-adherence accounted for 51.1% of the DTPs while other studies found it to be among the top three DTP categories (42,44,49). A study done on asthmatic patients on inhaled corticosteroids found non-adherence to be a major DTPs (31, 50).

The main cause of non-adherence was forgetfulness. This finding was much lower compared to a study conducted by Degu *et al* (40). The majority of the patients did not know the duration of therapy and more than half were ignorant of the doses and others did not know the name of the medication. These reasons also contributed to non-adherence.

The third DTP was high dosage. High-dose corticosteroid use was implicated in the mortality in severely ill COVID 19 patients (30). Some studies have associated steroid-induced psychosis with high doses of corticosteroid use (51). A study carried out in the same hospital found out that low dose was a common DTP (42), which is contrary to this study. The long duration of treatment contributed to a high dosage of corticosteroids. This means medication-related problems are the main causes of treatment failures in the hospital as found by studies carried out in the same hospital (41, 42). The least identified DTP was unnecessary drug therapy, which was in contrast with a study conducted in Ethiopia (2).

A primary level of education was found to be a risk factor for DTPs in this population. People with a lower level of education may have lower comprehension of the disease state and why they need to take medications. They may also not understand instructions on how to take their

medication instructions and what to do to avoid ADRs (52). This is in contrast to one study conducted in Ethiopia that found no correlation being education and having a DTP (53).

In this study, a positive family history of diabetes mellitus was found to be associated with having a DTP. Studies that have focused on either DTPs in diabetic patients or having a history of diabetes as comorbidity has found it to be a significant risk factor (54,55). Additionally, hyperglycemia, an adverse effect of long-term corticosteroid may add to this risk (17).

This study was cross-sectional and it could not report the incidence of drug therapy problems. Additionally, this study heavily relied on patients' information to measure drug adherence levels. This introduced an element of reporting bias. However, this study is the first to be done locally on drug therapy problems associated with corticosteroid use among patients admitted in medical wards at KNH.

5.3 Conclusions

There was a high prevalence of Drug therapy problems associated with corticosteroid use
Adverse drug reactions, non-adherence, and dosage too high were the most prevalent drug therapy problems associated with corticosteroid use.

A primary level of education and a positive family history of diabetes was found to be associated with DTPs.

5.4 Recommendations

5.4.1 Recommendations for policy and practice.

In this study, the most common DTPs were ADRs, non-adherence, and dosages that were too high during corticosteroid use. To prevent this the principles of rational drug use such as appropriate dose calculation for the individual and the medical indication and screening for drug-drug interactions should be encouraged amongst the prescribers. Additionally, well-structured adherence counseling should be carried out to ensure that patients are compliant with their prescriptions. Other strategies such as medication reminders and financial assistance programs for those who are unable to afford their medication may be employed to improve adherence.

Measures to prevent DTPs should be tailored specifically to those with lower levels of education as this was found to be a risk factor.

5.4.2 Recommendation for further research

A prospective case-control study to assess morbidity and mortality rates associated with corticosteroid use is to be done. This can provide insight into demonstrating the effects of long-term corticosteroid use.

REFERENCES

1. Allemann SS, Van Mil JWF, Botermann L, Berger K, Griese N, Hersberger KE. Pharmaceutical care: The PCNE definition 2013. Int J Clin Pharm. 2014 Apr; 36(3):544–55.

2. Belayneh, Yaschilal Muche, Amberbir G, Agalu A. A prospective observational study of drug therapy problems in the medical ward of a referral hospital in northeast Ethiopia. BMC Health Serv Res. 2018 Oct; 18(1).

3. Niriayo YL, Kumela K, Kassa TD, Angamo MT. Drug therapy problems and contributing factors in the management of heart failure patients in Jimma University Specialized Hospital, Southwest Ethiopia. Frey R, editor. PLoS One. 2018 Oct; 13(10):e0206120.

4. Hodgens A, Sharman T. Corticosteroids. StatPearls. StatPearls Publishing; 2020.

5. Williams DM. Clinical pharmacology of corticosteroids. Respir Care. 2018 Jun; 63(6):655–70.

6. Tefera GM, Zeleke AZ, Jima YM, Kebede TM. Drug Therapy Problems and the Role of Clinical Pharmacist in Surgery Ward: Prospective Observational and Interventional Study . Drug Healthc Patient Saf. 2020 May; Volume 12:71–83.

7. R. Khdour M, S. Jarab A, O. Adas H, Z. Samaro E, L. Mukattash T, O. Hallak H. Identification of Drug-Related Problems: A Prospective Study in Two General Hospitals. Curr Clin Pharmacol. 2012 Nov; 7(4):276–81.

8. Morley RJCLMSPC. Chapter 1. Medication Management Services Medication

   Management Services Emerge : A Definition. Pharm Care Pract Patient-Centered Approach to Medication Manag Serv 3e. 2012 ;(Part D):1–30.

9. Björkman IK, Sanner MA, Bernsten CB. Comparing 4 classification systems for drug-related problems: Processes and functions. Res Soc Adm Pharm. 2008 Dec;4(4):320–31.

10. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. Am J Hosp Pharm. 1990 Mar; 47(3):533–43.

11. Ezeudo Ewuziem Nwaozuzu , Mathew J. Okonta CNA. Impact of pharmaceutical care interventions on the occurrence and resolution of side/adverse drug effects associated with antiretroviral drug therapy. Int J Dev Sustain. 2012;1(3):1170–86.

12. Patel P, Zed PJ. Drug-related visits to the emergency department: How big is the problem? Pharmacotherapy. 2002 Jul;22 (7):915–23.

13. Watanabe JH, McInnis T, Hirsch JD. Cost of Prescription Drug-Related Morbidity and Mortality. Ann Pharmacother. 2018 Sep; 52(9):829–37.

14. Ewuziem Nwaozuzu E, Mathew Okonta J, Aguwa CN. Opportunities and responsibilities in pharmaceutical care. Vol. 2, International Journal of Development and Sustainability Online. 2013.

15. Ramamoorthy S, Cidlowski JA. Corticosteroids. Mechanisms of Action in Health and Disease. Vol. 42, Rheumatic Disease Clinics of North America. W.B. Saunders; 2016. p. 15–31.

16. Corticosteroids and Antagonists - Katzung & Trevor's Pharmacology Examination and Board Review, 9th Edition.

17. Laurence L. Brunton, Randa Hilal-Dandan BCK. Goodman & Gilman's: The

Pharmacological Basis of Therapeutics, 13e | AccessMedicine | McGraw-Hill Medical.

18. Liu D, Ahmet A, Ward L, Krishnamoorthy P, Mandelcorn ED, Leigh R, et al. A practical guide to the monitoring and management of the complications of systemic corticosteroid therapy. Vol. 9, Allergy, Asthma and Clinical Immunology. BioMed Central; 2013. p. 1–25.

19. Marks JG Jr, Elsner P, DeLeo VA: Contact and occupational dermatology, ed 3, St Louis, 2002 M. Corticosteroid Classes - Minars Dermatology.

20. Chagoya Rodrigo C, Ruben Alejandro CP, Romero Javier H, Oviedo Cristobal L, Gutierrez Rosa Isela C, Medina Andrea V, et al. Hypersensivity Reactions to Steroids: Review. Glob Vaccines Immunol. 2018; 3(1).

21. Parian A, Ha CY. Older age and steroid use are associated with increasing polypharmacy and potential medication interactions among patients with inflammatory bowel disease. Inflamm Bowel Dis. 2015 Apr; 21(6):1392–400.

22. Rafik R. Elmehdawi. (PDF) Use and misuse of systemic glucocorticoid therapy in hospitalized medical patients.

23. Yasir M, Sonthalia S. Corticosteroid Adverse Effects. StatPearls. StatPearls Publishing; 2019.

24. Sunil Y, Ramadori G, Raddatz D. Influence of NFκB inhibitors on IL-1β-induced chemokine CXCL8 and -10 expression levels in intestinal epithelial cell lines: Glucocorticoid ineffectiveness and paradoxical effect of PDTC. Int J Colorectal Dis. 2010 Mar; 25(3):323–33.

25. Ponticelli C, Locatelli F. Glucocorticoids in the treatment of glomerular diseases: Pitfalls and pearls. Vol. 13, Clinical Journal of the American Society of Nephrology. American Society of Nephrology; 2018. p. 815–22.

26. Elizabeth A Liotta MCEWDJ. Dermatologic Aspects of Addison Disease Medication: Corticosteroids.

27. Alexander TH, Weisman MH, Derebery JM, Espeland MA, Gantz BJ, Gulya AJ, et al. Safety of high-dose corticosteroids for the treatment of autoimmune inner ear disease. Otol Neurotol. 2009 Jun; 30(4):443–8.

28. Min KH, Rhee CK, Jung JY, Suh MW. Characteristics of adverse effects when using high dose short term steroid regimen. Korean J Audiol. 2012 Sep; 16(2):65– 70.

29. Dahl R. Systemic side effects of inhaled corticosteroids in patients with asthma. Vol. 100, Respiratory Medicine. W.B. Saunders; 2006. p. 1307–17.

30. Li S, Hu Z, Song X. High-dose but Not Low-dose Corticosteroids Potentially Delay Viral Shedding of Patients with COVID-19. Clin Infect Dis. 2020 Jun;

31. Allen-Ramey FC, Nelsen LM, Leader JB, Mercer D, Kirchner HL, Jones JB. Electronic health record-based assessment of oral corticosteroid use in a population of primary care patients with asthma: An observational study. Allergy, Asthma Clin Immunol. 2013 Aug; 9(1).

32. Ilovi CS, Mecha JO, Kigamwa P, Mutai K, Mwachinga M, Genga EK, et al. Knowledge of health care workers on corticosteroid adverse drug events in rheumatologic, respiratory and dermatologic clinics in a teaching hospital in Nairobi, Kenya | African Journal of Rheumatology.

33. Abou-Taleb DAE, El-Sayed AM, Ghabesha AA, Hassan SB. Severe cutaneous adverse drug reactions: Incidence, clinical patterns, causative drugs and modalities of treatment in Assiut University Hospital, Upper Egypt. Dermatol Ther. 2020 Nov; 33(6).

34. Gonçalves C, Monteiro C, Santos JL. Suspected Adverse Drug Reactions From Corticosteroids: Analysis of Reported Notifications to the Portuguese Pharmacovigilance System. J Clin Pharmacol. 2020 Oct; 60(10):1367–75.

35. Van Matre ET, Satyanarayana G, Page RL, Levi ME, Lindenfeld J, Mueller SW. Pharmacokinetic drug–drug interactions between immunosuppressants and anti-infective agents: Antimetabolites and corticosteroids. Vol. 23, Annals of Transplantation. International Scientific Information, Inc.; 2018. p. 66–74.

36. Lindsay JT, Heaney LG. Non-adherence in difficult asthma and advances in detection. Vol. 7, Expert Review of Respiratory Medicine. 2013. p. 607–14.

37. Youssef J, Novosad SA, Winthrop KL. Infection Risk and Safety of Corticosteroid Use. Vol. 42, Rheumatic Disease Clinics of North America. W.B. Saunders; 2016. p. 157–76.

38. Bårnes CB, Ulrik CS. Asthma and adherence to inhaled corticosteroids: Current status and future perspectives. Vol. 60, Respiratory Care. American Association for Respiratory Care; 2015. p. 455–68.

39. Israel GD. Determining Sample Size.

40. Degu A, Njogu P, Weru I, Karimi P. Assessment of drug therapy problems among patients with cervical cancer at Kenyatta National Hospital, Kenya. Gynecol Oncol

Res Pract [Internet]. 2017 Dec 18; 4(1):15. Available from: http://gynoncrp.biomedcentral.com/articles/10.1186/s40661-017-0054-9

41. A.B. R, P.N K, B.K A, A.O. M. Impact of medi-Rela Probcationlems on Individualised Dispensing at Kenyatta National Hospital. Pharm J Kenya. 2015; 22(3):73–7.

42. Gathua E, Francis N. Prevalence of drug therapy problems and determination of outcomes among patients attending the medical outpatient clinic at Kenyatta National Hospital. 2018; 31.

43. Kiprono G. Medication Related Problems Among Patients On Antibiotic Therapy In The Medical Wards At Kenyatta National.

44. Kamau SK. Drug Therapy Problems among Patients With Thyroid Disorders in Kenyatta National Hospital. 2020;

45. Paradkar S. Reported Adverse Drug Reactions during the Use of Corticosteroids in a Tertiary Care Hospital. Ther Innov Regul Sci [Internet]. 2019 Jan

31; 53(1):128–31.Available from:

http://link.springer.com/10.1177/2168479018776262

46. Aryal, Keshav S 2017. (PDF) Assessment, Monitoring and Reporting Adverse Drug Reactions of Corticosteroids: A Prospective Observational Study. 315808574.

47. RG S, J J, R L. Health care use and costs of adverse drug events emerging from outpatient treatment in Germany: a modeling approach. BMC Health Serv Res. 2011; 11.

48. Major side effects of systemic glucocorticoids - UpToDate.

49. LW N, WO O, DG N, SA O, AR B. Medication-related problems among adult chronic kidney disease patients in a sub-Saharan tertiary hospital. Int J Clin Pharm. 2018 Oct; 40(5):1217–24.

50. Toelle BG, Marks GB, Dunn SM. Psychological and Medical Characteristics Associated with Non-Adherence to Prescribed Daily Inhaled Corticosteroid. J Pers Med 2020, Vol 10, Page 126. 2020 Sep; 10(3):126.

51. Bostwick JM, Warrington TP. Psychiatric Adverse Effects of Corticosteroids. Mayo Clin Proc. 2006; 81(10):1361–7.

52. Alkatheri AM, Albekairy AM. Do the patients' educational level and previous counseling affect their medication knowledge? Ann Thorac Med. 2013; 8(2):105–8.

53. Tegegne GT, Yimam B, Yesuf EA, Gelaw BK, Defersha D. Drug Therapy Problem among Patients with Cardiovascular Diseases in Felege Hiwot Hospital. Int J Pharm Teach Pract. 2014; 5(3):989–96.

54. Mechessa DF, Kebede B. Drug-related problems and their predictors among patients with diabetes attending the ambulatory clinic of Gebre tsadik shawo general hospital, southwest Ethiopia Diabetes, Metab Syndr Obes Targets Ther. 2020; 13:3349–57.

55. Demoz GT, Berha AB, Woldu MA, Yifter H, Shibeshi W, Engidawork E. Drug therapy problems, medication adherence and treatment satisfaction among diabetic patients on follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. PLoS One [Internet]. 2019; 14(10):1–17. Available from: http://dx.doi.org/10.1371/journal.pone.0222985

APPENDICES

APPENDIX 1: ELIGIBILITY SCREENING FORM

IP/OP number _____

Date _____

	Remark
Criteria	Yes or

18 years and above of age

Patient on corticosteroid drug therapy

Consent given

APPENDIX 2A: PARTICIPANT INFORMATION AND CONSENT FORM

Study title: Drug therapy problems associated with corticosteroid use among patients admitted in medical wards at Kenyatta National Hospital.

Institution: Department of pharmaceutics and pharmacy practice, school of pharmacy, University of Nairobi, P.O BOX 30197-00400, Nairobi.

Principal Investigator: Dr. Christine Jepkoech Chepkonga, Master of Pharmacy (Clinical Pharmacy) second-year student at the University of Nairobi P.O BOX 30197-00400, Nairobi

Supervisors: Dr. George A. Mugendi, PhD and Senior Lecturer, Dr. Peter N. Karimi, PhD. **Introduction**

My name is Christine Jepkoech Chepkonga, a postgraduate student at the school of pharmacy at the University of Nairobi. I am conducting a study to determine the prevalence, types, and risk factors associated with corticosteroid use among patients admitted to the medical wards of KNH.

The purpose of the study

Corticosteroids are drugs used by the majority of patients. DTPs may hinder patients from achieving their drug therapy goals while using these drugs. Health care workers need to identify, prevent, and resolve DTPs caused by corticosteroids.

Procedure

Should you agree to participate in the study, the questions asked in the interview will take approximately 20mins. You are free to skip any question that you are not comfortable answering. All information collected will be treated with confidentiality and restricted for access.

Risks involved

There will be no invasive procedures involved in the study. All Covid-19 pandemic precautions such as the use of sanitizers, frequent hand-washing, and the wearing of masks will be employed to protect both the investigator and the participants.

Benefits from the study

The study findings will improve patients' drug therapy outcomes by health workers identifying, resolving, and preventing drug therapy problems caused by corticosteroids. It will also improve patients' quality of life, reduce the number of hospitalizations, reduce general cost on health and reduce morbidity and mortality caused by DTPs associated with corticosteroids**.**

Assurance of confidentiality

The interview will be carried out in a private room in the wards, all information will be highly confidential, and accessing them will be restricted. Unique codes identifiers will be used to conceal their identity and all data collected will be kept under key and lock and use of password-protected database

Your rights as a participant:

1. Participation in the study is voluntary.

2. You may withdraw at his or her convenience from participating in the study

3. There will be no penalty of any kind if you refuse to participate in the study.

4. You are free to ask any question or clarification concerning the study if he or she does not understand.

Contacts

In case of any questions about your rights as a research participant you may contact

1. Dr. Christine Jepkoech Chepkonga; phone number.0720259698 Email: *jepkoech14@students.uonbi.ac.ke*

2. Lead Supervisor: Dr. George A. Mugendi, PhD

   Department of Pharmaceutics and Pharmacy Practice, School of Pharmacy, University of Nairobi.

3. The chairperson, KNH/UoN Ethics and Research Committee, P.O Box 20723-00100, Nairobi. Telephone number,020-726300-9/020-716450 Ext. 44102.Email: *uonknh-erc@uonbi.ac.ke*

4. I now request you to sign the attached consent form.

DECLARATION FORM

Participant's Statement

Having read the consent form and explained in a language that I understand, my participation in this study is voluntary and I am free to withdraw at any time without injustice or loss of any benefit. The purpose, benefits, and risks have been explained to me. I understand that all my data information will be confidential. I agree to participate in this study and the information gathered will be solely for this study.

Name of participant…….

Date…… Signature of participant…….

Researcher statement

I confirm that I have explained the details of the research to the participant and that he/she has understood.

Name of participant…….

Date……...

Signature of researcher……

APPENDIX 2B: RIDHAA YA KUSHIRIKI KATIKA UTAFITI

Kichwa cha somo

Shida za tiba ya dawa zinazohusiana na matumizi ya corticosteroid kati ya wagonjwa wanaolazwa katika Hospitali ya Kitaifa ya Kenyatta.

Taasisi: Idara ya dawa na mazoezi ya dawa, shule ya maduka ya dawa, Chuo Kikuu cha Nairobi, P.O BOX 30197-00400, Nairobi.

Mchunguzi Mkuu

Daktari Christine Jepkoech Chepkonga, Mwalimu wa Pharmacy (Clinical Pharmacy) mwanafunzi wa mwaka wa pili katika Chuo Kikuu cha Nairobi P.O BOX 30197-00400, Nairobi

Wasimamizi

Dk George A. Mugendi, PhD na Mhadhiri Mwandamizi, Dk Peter N. Karimi, PhD.

Utangulizi

Jina langu ni Christine Jepkoech Chepkonga, mwanafunzi aliyehitimu masomo, shule ya kitengo cha dawa katika Chuo Kikuu cha Nairobi. Ninafanya utafiti ili kujua kuenea, aina na sababu za hatari zinazohusiana na matumizi ya corticosteroid kati ya wagonjwa katika hospitali ya kitaifa ya Kenyatta

Kusudi la utafiti

Corticosteroids ni dawa zinazotumiwa na wagonjwa wengi, DTP zinaweza kuzuia wagonjwa kufikia malengo yao ya tiba ya dawa wakati wa kutumia dawa hizi. Ni muhimu kwa wafanyikazi wa huduma ya afya kutambua, kuzuia na kutatua DTPs zinazosababishwa na corticosteroids.

Utaratibu

Ikiwa unakubali kushiriki katika utafiti, maswali yaliyoulizwa katika mahojiano yatachukua takriban dakika 20. Uko huru kuruka swali lolote ambalo hauko vizuri kujibu. Habari zote zilizokusanywa zitatibiwa kwa usiri na kuzuiliwa kufikia.

Hatari zinazohusika

Hakutakuwa na taratibu za uvamizi zinazohusika katika utafiti. Tahadhari zote za janga la Covid-19 kama vile matumizi ya dawa za kusafisha, kunawa mikono mara kwa mara na kuvaa vinyago zitatumika ili kumlinda mpelelezi na washiriki.

Faida kutoka kwa utafiti

Matokeo ya utafiti yataboresha matokeo ya matibabu ya dawa za wagonjwa na wafanyikazi wa afya wanaotambua, kutatua na kuzuia shida za tiba ya dawa inayosababishwa na corticosteroids. Pia itaboresha maisha ya wagonjwa, kupunguza idadi ya kulazwa hospitalini, kupunguza gharama ya jumla kwa afya na kupunguza magonjwa na vifo vinavyosababishwa na DTP zinazohusiana na corticosteroids.

Uhakikisho wa usiri

Mahojiano hayo yatafanywa katika chumba cha faragha kwenye kata, habari zote zitakuwa za siri sana na kuzipata zitazuiliwa. Vitambulisho vya nambari maalum vitatumika kuficha utambulisho wao na data zote zitakazokusanywa zitawekwa chini ya ufunguo na kufuli na kutumiwa ya hifadhidata inayolindwa na nywila

Haki zako kama mshiriki:

1. Kushiriki katika utafiti ni hiari.

2. Unaweza kujiondoa kwa urahisi wake kutoka kushiriki katika utafiti

3. Hakutakuwa na adhabu ya aina yoyote ikiwa utakataa kushiriki katika utafiti.

4. Uko huru kuuliza swali lolote au ufafanuzi kuhusu utafiti ikiwa haelewi.

Mawasiliano

Ikiwa kuna maswali yoyote juu ya haki zako kama mshiriki wa utafiti unaweza kuwasiliana

1. Dk Christine Jepkoech Chepkonga; nambari ya simu.0720259698 Barua pepe: jepkoech14@students.uonbi.ac.ke

2. Msimamizi Kiongozi: Dk George A. Mugendi, PhD

Idara ya Dawa na Pharmacy Mazoezi, Shule ya Duka la dawa, Chuo Kikuu cha Nairobi.
3. Mwenyekiti, Kamati ya Maadili na Utafiti ya KNH / UoN, P.O Box 20723-00100, Nairobi. Nambari ya simu, 020-726300-9 / 020-716450 Ext. 44102. Barua pepe: uonknh-erc@uonbi.ac.ke

4. Sasa naomba utia saini fomu ya idhini iliyoambatishwa.

FOMU YA TAMKO

Taarifa ya Mshiriki

Baada ya kusoma fomu ya idhini na kuelezea katika lugha ambayo ninaelewa, ushiriki wangu katika utafiti huu ni wa hiari na niko huru kutoa wakati wowote bila udhalimu au

kupoteza faida yoyote. Kusudi, faida na hatari nimeelezewa. Ninaelewa kuwa habari yangu yote ya data itakuwa siri. Ninakubali kushiriki katika utafiti huu na habari itakayokusanywa itakuwa kwa madhumuni ya utafiti huu.

Jina la mshiriki ……. Tarehe

…… Saini ya mshiriki …….

Taarifa ya mtafiti

Ninathibitisha kuwa nimeelezea maelezo ya utafiti kwa mshiriki na kwamba ameelewa.

Jina la mshiriki …….

Tarehe……...

Saini ya mtafiti ……

APPENDIX 3: QUESTIONNAIRE

RESEARCH TOPIC: Drug therapy problems associated with corticosteroid use among patients at Kenyatta National Hospital.

SECTION A: PATIENT INTERVIEW

Date _____

Questionnaire Code _____

SECTION A: BIODATA

Part 1 Patient-Demographic status

1. Age: _____ years
2. weight kg
3. height _____ in cm
4. BMI _____ Kg/M^2
5. BMI category <18.5 underweight, 18.5-24.9 normal, 25-29.9,overweight 30.0-34.9, class one obesity, 35-39.9 class II obesity
6. Sex: Female ☐ Male ☐
7. Marital status: Single ☐ Married Widowed ☐ separated ☐ divorced

8. Highest education qualification: Informal ☐ incomplete primary ☐ complete primary ☐ incomplete secondary ☐ complete secondary ☐ tertiary ☐

9. Occupation: self-employed ☐ employed ☐ unemployed ☐ retired ☐

10. On average how much do you earn per month? _____

11. Do you have health insurance? No ☐ Yes ☐

Questions 12-14 for female participants

12. Are you pregnant? No ☐ Yes ☐

13. If yes, which trimester? 1st ☐ 2nd ☐ 3rd ☐

14. Are you breastfeeding? No ☐ Yes ☐

15. Do any of your family members have a chronic illness? Yes ☐ No ☐ I don't know ☐

16. If yes, which conditions(s)? Hypertension ☐ Diabetes ☐ osteoarthritis ☐ other (specify)

Part 2:Drug related factors

17. Do you know the dose (s) of the medication(s) you are taking? Yes ☐ No ☐

18. Do you know the frequency of taking the medication? Yes ☐ No ☐

19. Do you know the duration you should take the medication Yes ☐ No ☐

20. Do you know the name of the medications you are taking? Yes ☐ No ☐

21. Do you sometimes forget to take your medications?

22. For the past two weeks, were there any days when you did not take your medications?

23. Have you ever stopped taking your medications without telling your doctor?

24. When you travel do you sometimes forget to carry your medications?

25. Did you take your medications yesterday? When you feel like your health is in good condition do you stop taking your medications?

26. How often do you have difficulty remembering to take all your medications?

Part 4: patient's immunization status

Vaccine	yes	No
Hepatitis B		
Typhoid		
Influenza		
Tetanus		
Rabies		
HPV		

27. Is the patient on all current adult immunization? Yes No

Social drug use

28. History of smoking Never Current smoker

29. If yes, how much do you smoke? 0-1 packet

Attempting to quit

30. Do you take alcohol? Yes No

31. If yes, which one is your preferred alcoholic drink? Beer

Former smoker

local brew other

> 1 packet per day

spirits wine

If yes, how much? <2 drinks per week 2-6 drinks per week > 6 drinks

per week ☐ History of alcohol dependence ☐

32. Caffeine use? Yes ☐ No ☐

☐ ☐

If yes, how much? <2 cups per day ☐ 2-6 cups per day >6 cups per day

History of caffeine dependence ☐

☐

33. Another recreational drug use? Yes

No ☐

34. If yes, which drug? _____

SECTION B: PATIENT PHYSICAL ASSESSMENT

General systems		Poor appetite	**GU/reproductive**		Dysmenorrhea/menstrual bleeding
		Weight change			incontinence
		pain			impotence
		headache			Decreased sexual drive
		Dizziness(vertigo)			Vaginal discharge or itching
EENT		Change in			Hot flashes

		vision			
		Hearing loss	**Kidney/urinary**		Urinary frequency
		Ringing in the ears(tinnitus)			Blood in urine
		Bloody nose(epistaxis)	**Hematopoietic symptoms**		Excessive bruising
		Allergic			bleeding
		glaucoma			anemia
		Bloody sputum (hemoptysis)			

Cardiovascular		Chest pain	**musculoskeletal**		back pain
		hyperlipidemia			arthritis
		hypertension			Painful muscle
		MI			
		asthma	**Neuropsychiatric**		Numbness
Pulmonary		COPD			Tingling sensation
		Difficulty in breathing			
		heartburn			Tremor
Gastrointestinal		Abdominal pain			Loss of balance
		constipation			Stroke/TIA
		diarrhea			seizure
		vomiting			Anxiety, nervousness
		nausea			Inability to concentrate
Integumentary system		eczema			Memory loss
		psoriasis	**Infectious disease**		HIV/AIDS
		itching			Malaria
		rash			Tuberculosis
					Chlamydia
					gonorrhea

Endocrine system		Diabetes			
		Thyroid disease			
		Menopausal symptoms			
Hepatic		Cirrhosis			
		Hepatitis			
Nutrition/fluid/electrolyte		Dehydration			
		edema			
		Electrolyte deficiency			

SECTION C: EVALUATION OF DTPs

35. Did the patient have any DTP? Yes [ ] No [ ]

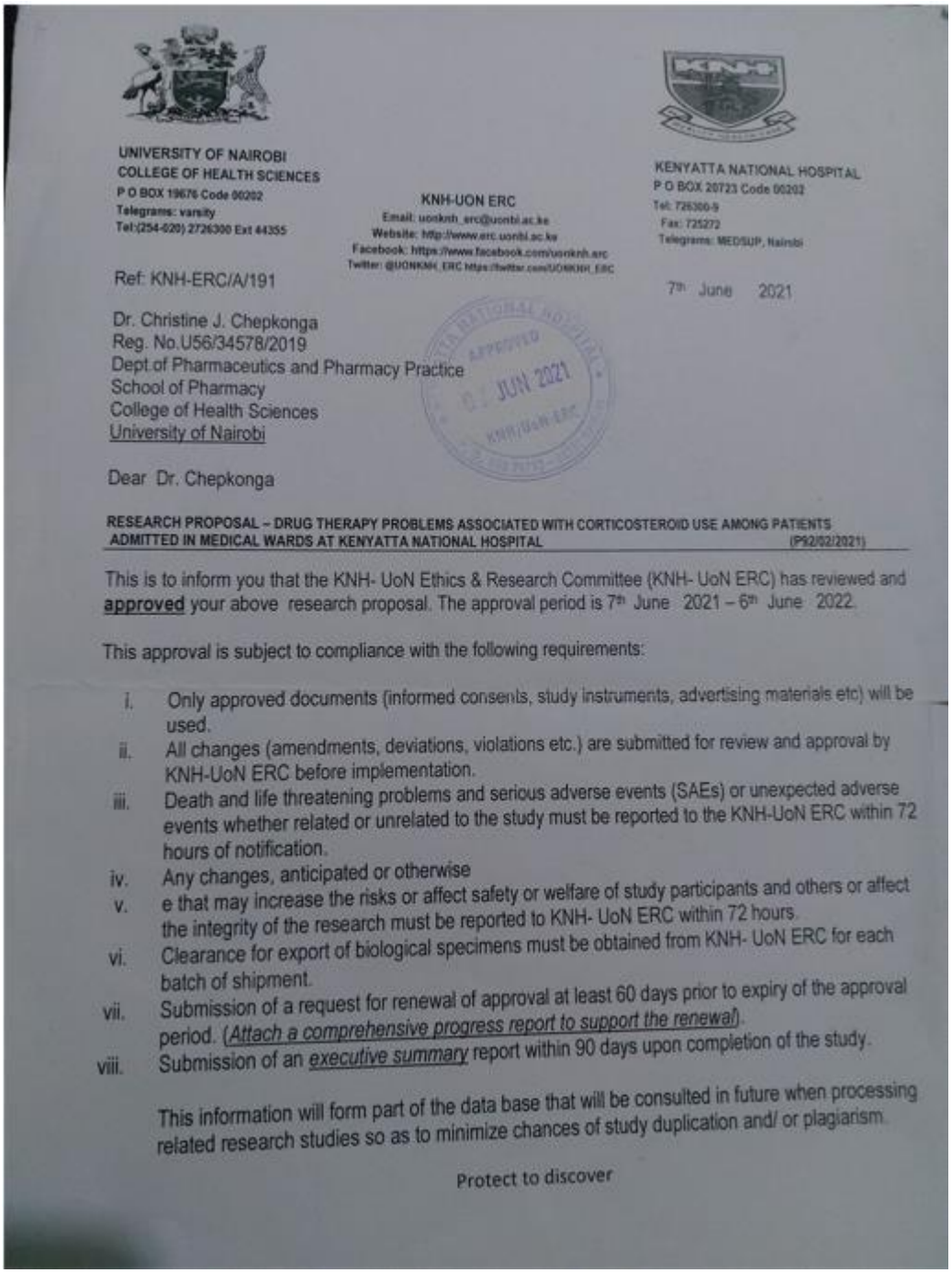
36. If yes, classify the DTP type according to the table shown

DTP	CODE	CAUSE	CODE	COMMENT
Unnecessary drug therapy	1	Duplicate therapy No medical indication Non-drug therapy I more appropriate Treating avoidable ADR Addiction/recreational drug use	0 1 2 3 4	
Needs additional therapy	2	Prophylaxis Untreated condition Synergistic therapy	5 6 7	

Ineffective drug	3	Effective drug available Condition refractory to drug Dosage form inappropriate Contraindication present Drug not indicated for the condition	8 9 10 11 12	

Dosage too low	4	Ineffective dose Needs additional monitoring Frequency inappropriate Incorrect administration Drug interaction Incorrect storage Duration inappropriate	13 14 15 16 17 18 19	
ADR	5	Undesirable effect Unsafe drug Drug interaction Incorrect administration Allergic reaction Dosage increase/decrease too fast	20 21 22 23 24 25	
Dosage too high	6	Dose too high Needs additional monitoring Frequency too short Duration too long Drug interaction	26 27 28 29 30	
Adherence	7	Does not understand instructions Cannot afford drug product The patient prefers not to take The Patient forgets to take Drug products not available Cannot swallow/administer	31 32 33 34 35 36	

APPENDIX 4: ETHICAL APPROVAL



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/191

7th June 2021

Dr. Christine J. Chepkonga
Reg. No.U56/34578/2019
Dept of Pharmaceutics and Pharmacy Practice
School of Pharmacy
College of Health Sciences
University of Nairobi

APPROVED 07 JUN 2021 KNH/UoN-ERC

Dear Dr. Chepkonga

RESEARCH PROPOSAL – DRUG THERAPY PROBLEMS ASSOCIATED WITH CORTICOSTEROID USE AMONG PATIENTS ADMITTED IN MEDICAL WARDS AT KENYATTA NATIONAL HOSPITAL (P92/02/2021)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 7th June 2021 – 6th June 2022.

This approval is subject to compliance with the following requirements:

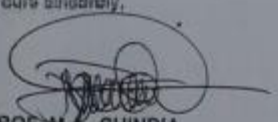
i. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
ii. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
iii. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
iv. Any changes, anticipated or otherwise
v. e that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
vi. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
vii. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
viii. Submission of an *executive summary* report within 90 days upon completion of the study.

This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

For more details consult the KNH- UoN ERC website http://www.erc.uonbi.ac.ke

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Senior Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information Dept, KNH
The Dean, School of Pharmacy, UoN
The Chair, Dept.of Pharmaceutics and Pharmacy Practice, UoN
Supervisors: Dr. George A. Mugendi, Dept.of Pharmaceutics and Pharmacy Practice, UoN
Dr. Peter N. Karimi, Dept.of Pharmaceutics and Pharmacy Practice, UoN

Protect to discover

APPENDIX 5: SIMILARITY INDEX

9/11/2021