

**ASSESSMENT OF RATIONAL USE OF EYE MEDICATION BY HEALTH CARE
WORKERS IN PUBLIC HEALTH FACILITIES IN MACHAKOS TOWN SUB-
COUNTY.**

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**A Thesis submitted in partial fulfillment for the award of degree of master of medicine in
Ophthalmology, University of Nairobi**

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DECLARATION

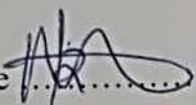
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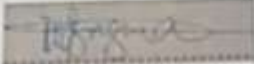
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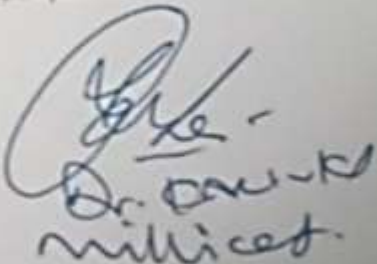
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Dedication

I dedicate this work to my parents Mr. and Mrs. Gituma, my wife Janice and my sons Randy Muriira and Ryan Munene for their prayers and support throughout the residency program.

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I thank the almighty God for good health throughout the residency program.

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ABBREVIATIONS AND ACRONYMS

EDL	Essential Drugs List
FBO	Faith Based Organization
HCWs	Health Care Workers
INRUD	International Network for Rational Use of Drugs
KEML	Kenya Essential Medicine List
KEPH	Kenya Essential Package Of Health
KMHFL	Kenya Master Health Facility List
KNH	Kenyatta National Hospital
LMIC	Low and Middle-Income Countries
OPDs	Outpatient Departments
OCOs	Ophthalmic clinical officers
PHCFs	Public Health Care Facilities
UCs	Urban Clinics
UON	University of Nairobi
WHO	World Health Organization

OPERATION DEFINITIONS

Dispensaries

The lowest level of the public health system and the first point of contact with patients. They are run by enrolled nurses, public health technicians and dressers. This is a level 2 health facility according to Kenya's health structure.

Dispenser

A staff working in the pharmacy who is licensed to process the medical prescriptions, can be a pharmaceutical technologist or a pharmacist.

Eye medication

Medicines used to diagnose, treat or prevent eye diseases. They can be applied topically, taken orally, or injected intracamerally, intravitreal or intravenously.

Generic Name/ Brand Name

Generic name refers to the drug's chemical name, while brand name refers to different names drug companies use to advertise their medications.

Health care workers

Qualified medical personnel who offer preventive, curative and palliative care to patients. They include medical consultants, medical officers, clinical officers, nurses, pharmacists, pharmaceutical technologists, counsellors, and physiotherapists.

Health centers

This is a level 3 health facility according to Kenya's health structure.

Health centers staff include midwives or nurses, clinical officers, and occasionally doctors.

They provide preventive, curative, basic reproductive health services as well as basic eye care.

Level 5 hospital

A level 5 hospital, according to Kenya's health structure system, is a county referral hospital providing specialized medical and surgical services, teaching and referral to the national referral centers.

Primary eye care

Primary eye care is a vital component of primary health care, which includes promoting eye health care, prevention, treatment and referral of conditions that may lead to visual disability.

Public health facility

A health care institution funded and run by the county government of Machakos.

ABSTRACT

Background: Irrational use of medicines remains a significant global problem and more so in Low and Middle-Income countries where the burden is higher. It can cause serious harm to patients through suboptimal treatment outcomes.

Broad Objective To assess the rational use of eye medications by health care workers in public health facilities in Machakos town sub – County using the WHO/INRUD core drug indicators.

Study design: This study was a hospital-based descriptive cross-sectional study design to determine the rational eye medication use in public health facilities within Machakos town sub-county.

Study site: The study was conducted in ten PHCFs in Machakos Town Sub- County in Machakos County, Eastern Kenya.

Participants and Methods: The WHO/INRUD core indicators was used to explore drug use in PHCFs. These were categorized into 3 groups; prescription indicators, health facility indicators and patient-care indicators.

A total of 690 prescriptions were analysed and the information obtained was used to provide information on the prescription indicators. Ten drug dispensers working at the public health care facilities (one per facility) were interviewed and their responses provided information on health facility indicators. 300 patients were interviewed and their responses provided information on patient care indicators.

The data collected about the specific indicators was analyzed using STATA version 14.1.

Results.

An average of 1.2 eye medications were prescribed per patient encounter which was less than the WHO/INRUD recommended range of 1.6 – 1.8 drugs while 75.2% of the eye medications were prescribed from the KEML. The percentage of eye medications prescribed by generic names was 18.2%. The percentage encounters with an ophthalmic antibiotic prescribed was 62.2% which was above the recommended WHO/INRUD value of 20.0% – 26.8%.

In the 10 selected facilities only one facility had prescribers specialized in management of eye illnesses while two facilities had qualified drug dispensers. KEML copies were available in only 30% of the selected facilities while only two facilities had key eye medications available.

The average consultation time was 5.5 minutes which was less than the WHO/INRUD optimal value of ≥ 10 minutes. The average dispensing time was 115 seconds which was within the WHO/INRUD optimal value of ≥ 90 seconds. 29.6% of the prescribed eye medications were actually dispensed of which 96% were adequately labelled and 94.7% of the patients had correct knowledge of eye medications dispensed to them.

Conclusion

Most of the prescribing indicators, facility-specific indicators and patient care indicators in this study deviated from the WHO/INRUD optimal values.

Recommendations.

The prescribers should be sensitized to prescribe drugs by their generic names, promote rational prescribing of ophthalmic antibiotics and prescribe eye medications adhering to the KEML.

The county government should equip all health facilities with enough copies of the KEML and mobilize resources to supply all essential eye medications in the PHCFs.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND INFORMATION

Appropriate and rational use of drugs is essential in attaining quality medical and health care for the communities(1). The World Health Organization 1989, characterized rational use of drugs as patients receiving medications appropriate to their clinical needs, in doses that meet their

requirements, for an adequate time and at the lowest prices to them and their community(2). Irrational medication use consists of over prescriptions, multi-drug prescriptions (polypharmacy) in cases where fewer drugs could be effective, unnecessarily expensive drugs, antibiotics use without clinical indications and injections in cases where oral formulations are effective(3).

Irrational medicines can harm patients through suboptimal therapeutic outcomes and unnecessary side effects that can lead to hospital admissions, wastage of the often scarce resources and deaths. Evidence-based recommendations to avoid irrational medication use are available, though many are not implemented(4). Such policies need to be implemented in order to attain universal access to essential medicines. Tackling irrational use of eye medications in public health requires assessing the current trends and resources available in public facilities.

In 1989, WHO established the International Network for Rational Use of Drugs (INRUD) to oversee the designation, test and dissemination of effective strategies for effective prescription, dispensation and use of drugs(5). The network guidelines inform rational medications use, especially in the Low and Middle-Income Countries (LMIC). Kenya being an LMIC, is a member of INRUD; hence rational use of all medication in healthcare facilities is paramount and often taken serious(5).

According to WHO/INRUD, core indicators of rational drug use are to be used to explore drug use in PHCFs. These are categorized into three groups; prescription, health facility and patient-care indicators(5). The prescription-specific indicators look into prescriptions per patient encounter, drug names used in prescription, prescription of antibiotics and the duration of antibiotics. Facility-based- specific indicators of rational medication use include preparing the consultation and dispensing areas, availability of prescribed medications and designing prescribed drugs. Patient care indicators include consultation duration, dispensing time, drug labeling and patient education on the drug indications, dosages and side effects.

TABLE 3: CORE DRUG INDICATORS

WHO core drug indicators	Components and WHO optimum values
Prescribing indicators	<ul style="list-style-type: none"> • The average number of drugs per encounter = 1.6 – 1.8 • % of drugs prescribed by generic name = 100% • % of encounters with an antibiotic prescribed = 20.0 – 26.8 % • % of encounters with an injection prescribed = 13.4 – 24.1 % • % of drugs prescribed from the essential drugs list = 100%
Patient care indicators	<ul style="list-style-type: none"> • Average consultation time = ≥ 10 minutes • Average dispensing time = ≥ 90 seconds • % of drugs actually dispensed = 100% • % of drugs adequately labelled = 100% • Patients' knowledge of correct dosage = 100%
Facility indicators	<ul style="list-style-type: none"> • Availability of copy of Essential Drugs List (EDL)/facility formulary = 100% • Availability of key drugs = 100%

(WHO, 1989)

Globally about 2.2 billion people are living with vision impairment. Up to 90% of them are suffering vision impairment due to preventable or treatable causes, of which at least 1 billion could have been prevented(6). Ophthalmology-related conditions are eight times as common in LMICs as in high-income nations and more proportionately in Africa. In fact, eastern, western, and sub-Saharan Africa accounts for 80% of eye-related conditions and diseases(7). In Kenya, eye problems are among the top ten reasons for outpatient visits.

Kenya's public healthcare delivery system hierarchy involves community services, dispensaries, health centers, sub-county health facilities, county-referral hospitals and national referral

hospitals(8). Hence, Public Health Care Facilities (PHCFs) remain an integral part of delivering eye care services to ophthalmic patients.

In Machakos town Sub - County, there were 3 ophthalmologists all based at the level 5 hospital. In the other PHCFs, the eye clinical service providers were principally clinical officers and nurses(9). In addition to skilled eye specialist's shortage, PHCFs lacked medicines and diagnostic equipment leading to suboptimal management of eye conditions. It had been shown that diagnoses made at these PHCFs were majorly based on presenting complaints, history-taking and clinical examinations(10). This challenged early accurate detection and management of ocular disorders by HCWs. Hence, eye illnesses including refractive errors, glaucoma and diabetic retinopathy may have been missed resulting in complications.

Topical eye medications are also governed by the INRUD guidelines, as well as medications administered by other routes. Indications for prescription of eye drops and eye ointment include lubrication, analgesia, diagnostic procedures and therapeutic. Eye medications are useful for these indications and many more hence HWCs should prescribe them paying careful attention to prevent drug errors. Therefore, HCWs should understand the indications, mechanism of action, dosages, side effects and interactions of eye medications they prescribe. Their proper use is important for optimum therapeutic function among the patients.

1.2 PROBLEM STATEMENT

Irrational use of eye medications remains a global problem which is harmful and wasteful. For the primary care delivered in developing countries, only less than 40% of patients in the public sector and 30% of patients in the private sector followed the standard clinical guidelines translating to more than 50% of the medicines being used inappropriately(3). The private sector was shown to have a higher percentage of inappropriate use of medicines despite having been shown to offer an increased proportion of health care to the community. Another major problem was many initiatives globally aimed to increase essential medications access forgetting to tackle the widespread and fundamental problem of inappropriate use.

The magnitude of unmet ophthalmic care in Kenya being magnified by shortage of eye care specialists in the PHCFs to manage eye conditions.(11). The populations visiting these PHCFs were usually clients with lower income, less educated and oftenly with chronic health problems

with limited health care access. It was reported that low economic investment and political attention was being directed towards tackling the problem of irrational eye medications use by consumers, prescribers and dispensers.

Over time, lifestyle changes, aging and rapid population growth are set to increase global demand for eye-care in the future(12). In Kenya, the problem of irrational use of eye medications could be exacerbated by inadequate drug policy and limited resources(13). Irrational use of medications is proven to be harmful, resulting in poor patient outcomes. This remains a challenge in Machakos town Sub - County and even a double burden among ophthalmic patients with potential risks to visual impairment and blindness. Nevertheless, there existed neither an explicit nor comprehensive rational eye medications use policy to guide HCWs in treating eye conditions.

Of note is that the irrational medicines use is a global challenge with severe implications such as adverse drug reactions and interactions, colossal wastage of resources and increased antimicrobial resistance. The dramatic increase in antimicrobial resistance majorly contributed by the inappropriate use of antibiotics, has been associated with high morbidity, mortality and economic burdens hence qualifying it an important public health concern(4). Such harm can be significantly reduced by taking adequate measures promoting the rational eye medicines use. Although many HCFs in Machakos town Sub - County offer eye care treatment, their rational use of eye medications was unknown.

To confound all these, there was a lack of population-based data on the rational use of eye medications by the HCWs. No comprehensive research existed that could inform policy on the best practices for managing eye conditions at the PHCFs. The central problematic issue about the rational use of eye medications is that there were limited research findings in sub-Saharan Africa, especially in Kenya. Furthermore, no published research material about the rational use of medications had been done in Machakos town Sub - County.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This section reviews information about rational use of medications as a public health challenge by reviewing the description of the core drug indicators as they impact directly on patient treatment outcomes.

In ophthalmology, irrational use of eye drops specifically for chronic conditions such as glaucoma has become an imminent problem, with over half of ophthalmic patients using unsuitable treatment.

Health care workers may have very rational justifications for the irrational use of eye medications. Causes of inappropriate use include inadequate knowledge and skills, dependent information, open availability of medicines without restrictions, overworking of health personnel and improper promotion of medicines by profit-motivated sellers(4). An important aspect of promoting rational use of eye medications in PHCFs is for the HCWs to determine the indicators of medication consumption and most importantly, understand their pharmacoepidemiological profile. HCWs in PHCFs should be trained on pharmaceutical applications, dosages, spotting adverse effects and patient education.

Studies showed that at the PHCFs there was an unsatisfactory number of patients being treated according to the standard treatment guidelines for many common conditions with no improvement over years(4,14–16). Therefore, eye conditions were not an exception. To illustrate, less than half of all patients with acute diarrhea were given oral rehydration salts, while more than half were treated with antibiotics. For pneumonia, only about 50% of the patients received rational antibiotics, yet more than 50% of patients with upper respiratory tract infections of viral cause received antibiotics inappropriately(14). Although many studies signify the irrational use of medications, only a few recommended interventions to aid rational use of medicines.

2.2 PRESCRIPTION INDICATORS

A study by Aravamuthan, A., Arputhavanan, M., Subramaniam, K., Johnson, S. & Chander, U. assessed the prescribing patterns using drug use core and complementary indicators by WHO in pharmacies in India. 1052 patients were interviewed prospectively in 5 busy pharmacies and the WHO guidelines used to analyze their prescriptions. The study measured trends of medication utilization using both complementary and WHO core drug use indicators. Results showed that, out of the total drugs prescribed (3936), only 2.5 % (100) drugs were prescribed by generic name. The

mean number of drugs per encounter was 3.7. The use of antibiotics was 22 %, the percentage of encounters with injection was 7.2 % and the percentage of drugs prescribed from the formulary was 99.8 %. They concluded that prescriptions containing the brand name were dominant in the rural facilities and therefore key medicines should be stocked and essential guidelines availed(17).

Guyon et al. conducted a baseline survey in 1992 in PHCFs in rural Bangladesh to assess the rational use, affordability, availability and quality drug use. Availability of essential medicines was reported as very low and there was a common practice of drugs over-prescription(18).

A follow-up study in Bangladesh by Ahmed, S. M. & Islam, Q. S. was done in 2012 to track the changes and investigate the availability and rational use of drugs and the common people's affordability in rural and urban PHC facilities. In Dhaka metropolitan area, 30 rural facilities and 20 clinics in the urban setup were randomly selected using convenient sampling. Essential medications available were relatively low at 6% in rural facilities (UHCs) to about 15% in urban clinics (UCs). The proportion of dispensed medications was 76% UHCs and 44% for UCs(10).

A retrospective cohort study in 2012 by AA El Mahalli. in ten health centers in Eastern province, Saudi Arabia, checked the drug prescribing performance of PHCFs using the WHO/INRUD Drugs core drug prescribing indicators. A total of 1000 prescribing encounters were investigated from January to December 2010. The mean number of drugs per encounter was 2.4, while drugs prescribed by generic name were estimated at 61.2%. The encounters with antibiotics were 32.2% and encounters with injection ranged at 2%. About 99.2% of the total drugs were prescribed either from the national essential drugs list or facility formulary(19).

A survey conducted by Desalegn, A. A. determined the prescribing patterns at Hawassa University Teaching and Referral Hospital, Ethiopia. They prospectively reviewed 1290 patient encounters for two years. Data was collected from prescriptions stored in the hospital's pharmacy. They identified that 1.9 (1-4) medications were written per patient on average. An antibiotic or injection was prescribed in 58.1% and 38.1% (n = 491), respectively, showing a deviation from the WHO standard recommendations. The percentage of medications written by generic name was 98.7%, while those written from Ethiopia's essential drug formula were 96.6%. Antibiotics commonly prescribed were gentamicin, ampicillin, chloramphenicol and amoxicillin, with over 11% each.

Injections commonly used were cloxacillin, ampicillin, crystalline penicillin, ceftriaxone, gentamicin, diclofenac, chloramphenicol and furosemide(20).

2.3 FACILITY SPECIFIC INDICATORS

Ahmed S.M. & Islam. QS in 2012 in Bangladesh found that although most of the dispensed drugs weren't labeled appropriately, >70% of patients and caregivers had the correct understanding of the dosage. The copy of the list of essential drugs available was higher in UCs at 55% compared to 47% for UHCs, with more than 60% of the drugs being prescribed from the list. Polypharmacy was lower in the UHCs (33%) than in the UCs (46%). An antibiotic was prescribed in 44% of encounters, more frequently for fever (36-40%) and common cold (26-34%) than for lower respiratory tract infections, such as pneumonia (10-20%). The prices of key essential drugs differed widely by brands with up to five times, which was unaffordable to the low-income people(10).

Two studies by Atif, M. et al. in 2016 in Pakistan investigated the facility-specific indicators. They reported that all health centers had a copy of the EDL, but there were an estimated 72.4 %(21) and 82%(22) of the key drugs available in stock. These studies showed the necessity of implementing the WHO/INRUD 12 core interventions recommended to nurture the rational use of medications.

In rural Kenya, the problem of irrational drug use has been demonstrated by a study done by Nyabuti, A. O., Okalebo, F. A. & Guantai, E. M. in 2020 (13). They did evaluate medication use patterns in 10 PPHCs in Kisii County utilising the WHO/INRUD core drug tool. They reviewed 900 prescriptions written from October to December 2018 observed and interviewed patients and dispensers in the facilities. Only 20% of the facilities had a copy of the Kenya Essential Medicine list with 80% of the essential medicines available.

They noted inappropriate use of medicines, particularly antibiotics overuse, polypharmacy, short consultation time, prescription of non-generic drugs, unavailability of key drugs and essential drug list and inadequate labeling of drugs.

2.4 PATIENT-CARE INDICATORS

A cross-sectional study in Pakistan by Muhamad Atif et al. assessed and characterized patterns of medicine use in the Outpatient Departments of Civil Hospital and Bahawal Victoria hospital employing WHO/INRUD drug indicators. Six hundred patients were randomly selected and all

pharmacists were interviewed. The study reported irrational medication use in the two facilities. They observed that the average consultation time was 1.2 min (SD = 0.8), the average dispensing time was 8.7s (SD = 4.9), the percentage of drugs dispensed was 97.3 %, the rate of drugs adequately labeled was 100 % and the patients' knowledge of correct dosage schedule was 61.6 % (21).

A similar study in Pakistan by Muhamad Atif et al. in 10 primary health care centers found irrational use of drugs in all the ten facilities assessed. They found average time on consultation = 2.2 min, the average time taken in dispensing 38 s. They showed 90.9% of medications were dispensed, the percentage of drugs adequately labeled was optimal, but the patients' knowledge of the correct dosage schedule was 62.1% (22).

A study conducted in rural Bangladesh by Guyon et al. to assess the care quality and drug use patterns in 80 public facilities explored the patient care indicators among other core indicators. Forty union sub-centres and 40 Thana health complexes (the lowest in PHCFs) were randomly selected. The study recorded the average consultation time to be 54 seconds; 37% of the patients received adequate examination, with only 41% being treated according to the standard care guidelines. Twenty-three seconds was the average time of dispensing drugs and only 55% reported adequate knowledge of the correct dosage. The study didn't report what percentage of medicines were dispensed or whether the medicines were adequately labeled.

2.5 JUSTIFICATION OF THE STUDY

Most studies found that drug use practices were irrational, hence negatively influencing patient outcomes. All the studies evaluated the rational use of overall drugs, especially antibiotics, but none specifically sought to explore eye medications' rational use. They still did not highlight the rational use of eye medications, especially in the public health facilities where most individuals seek health care. This study evaluated eye medications' rational use and narrowed to PHCFs in Machakos town sub-county.

To the best of our knowledge, no study had been performed in PHCFs in Machakos town sub-county measuring the practical aspects of eye medication use. Therefore, the indicators measured in this study can be used as a baseline for continuous monitoring of eye medications' rational use.

2.6 RESEARCH QUESTIONS

The study aimed to answer these questions;

1. What are the prescription indicators of the rational eye drug utilization in eye care in public healthcare facilities in Machakos town sub-county?
2. What are the facility indicators of rational eye drug utilization in eye care in public healthcare facilities in Machakos town sub-county?
3. What are the patient indicators of rational eye drug use in eye care in public healthcare facilities in Machakos town sub-county?

2.7 OBJECTIVES

2.7.1 BROAD OBJECTIVE

The study aimed to assess the rational use of eye medications by health care workers in government health facilities in Machakos town sub-county using the WHO/INRUD core drug indicators.

2.7.2 SPECIFIC OBJECTIVES

The specific objectives were;

1. To determine the prescription indicators of rational use of eye medications in public health facilities in Machakos town sub-county using the WHO/INRUD core drug indicators.
2. To determine the facility indicators of rational use of eye medications in Machakos town sub-county public health facilities using the WHO/INRUD core drug indicators.
3. To determine patient care indicators of rational use of eye medications in Machakos town sub – County public health facilities using the WHO/INRUD core drug indicators.

CHAPTER THREE: METHODOLOGY

3.1 STUDY DESIGN

This study was a hospital-based descriptive cross-sectional study design to determine the rational eye medication use in government health facilities within Machakos town sub - county at a specific point in time. This design was used as it is relatively inexpensive, less time-consuming, and versatile.

3.2 STUDY AREA

The study was conducted in PHCFs in Machakos Town Sub- County; one of eight sub- counties in Machakos County, Eastern Kenya. Machakos town Sub County was chosen for this study because it comprises of both rural and urban population which gave an insight on the eye care in both populations.

FIGURE 2: A MAP OF MACHAKOS COUNTY



Sub-counties bordering Machakos town sub-county were; Kathiani to the north, Mavoko in the west, County of Kajiado in the southwest, and County of Makueni in the southeast. It comprises 7 administrative wards; Kalama, Kola, Machakos Central, Mua, Mutituni, Kiima Kimwe/Muvuti, and Mumbuni North.

According to the 2020 Master Health Facility List, Machakos Town sub-county had 83 operational health facilities; 42 were private practice, eight were faith-based organizations, five were institutional facilities, and 28 were run by the county government Machakos.

Public health facilities that were run by the county government in Machakos town Sub County included 24 dispensaries, 3 health centers, and one county referral and Teaching hospital.

The clientele of these PHCFs was drawn from the sub county's population of 170,606 people as of 2019 census and also from the neighboring sub counties. Majority of the people who living here being the Kamba ethnicity.

3.3 STUDY POPULATION

The study was done in ten public health care facilities in Machakos town sub-county. These included one level 5 hospital, 2 health centers and 7 dispensaries. Private, faith-based and institutional facilities were excluded because of the anticipated challenges of getting authorization to carry out the study in the facilities.

A HCW dispensing drugs was interviewed on the facility indicators and also requested to provide prescription copies for the period starting 1st November 2021 to 30th November 2021 for Machakos level 5 and period between 1st January 2021 and 31st December 2021 in the other 9 facilities from which data on prescribing indicators was extracted.

Patients who were treated with eye medications during the study period at each facility were recruited to provide information on patient care indicators.

3.3.1 INCLUSION CRITERIA

1. Ten PHCFs within Machakos town sub-county.
2. Prescriptions with any eye medications written in the period from 1st November 2021 to 30th November 2021 for Machakos level 5 and period starting 1st January 2021 to 31st December 2021 in the other 9 facilities.
3. Drug dispensers working at the selected PHCFs.
4. Patients treated with eye medications on the study day at each of the selected PHCFs.

3.3.2 EXCLUSION CRITERIA

1. Non-consenting individuals.

3.4 SAMPLING METHOD

3.4.1 SAMPLING PHCFs

Ten facilities were selected for this study on rational use of eye medications²³. A stratified random sampling technique was adopted to select 10 facilities from the total 28 facilities within the sub-

county. One level 5 hospital, one dispensary in each of the 7 administrative wards and 2 out of the 3 health centers were selected for the study making a total of 10 facilities (table 2). A list of the public health facilities in Machakos town sub - county is tabulated in appendix VIII.

TABLE 4: SELECTED HEALTH FACILITIES

Serial no.	Facility	Level	Administrative ward
1	Machakos level 5 hospital	5	Machakos central
2	Mutituni health center	3	Mutituni
3	Kola health center	3	kola
4	Konza dispensary	2	Kalama
5	Mbuani dispensary	2	kola
6	APDK Dispensary	2	Machakos central

7	Peoples park dispensary	2	Mumbuni North
8	Mua hills Dispensary	2	Mua
9	Kamuthanga Dispensary	2	Mutituni
10	Muvuti Dispensary	2	Muvuti/Kiima Kimwe

3.4.2 DISPENSERS AND PATIENTS SAMPLING

WHO recommends a minimum of 300 patients be included in a cross-sectional study on rational use of medications²³. We included 300 patients who were treated with eye medications in the 10 PHCFs in the month of April 2021. Convenience sampling technique was used to recruit patients encountered during the study period who were treated with eye medications. The participants were approached to participate in the study sequentially. Information related to the study was availed prior to study participation.

The principal researcher recruited one drug dispenser from each PHCF who was on duty during the survey visit day to provide information on key eye medications available as well as availability of KEML copies.

3.4.3 PRESCRIPTIONS SAMPLING

WHO recommends sampling of not less than 600 prescriptions to study rational use of medications²³. In this study 694 prescriptions were analyzed which was higher than the minimum WHO/INRUD recommendation.

The drug dispensers or health records staff usually sort the prescriptions chronologically by the month of prescription and store them safely for 2 years before they are eventually destroyed.

Machakos level 5 attends to an average of 70 patients in the eye clinic with various eye diseases. There were eight prescribers in the eye clinic in the month of November 2021; 3 consultant ophthalmologists and 5 ophthalmic clinical officers. All prescriptions books written from 1st November 2021 to 30th November 2021 were obtained from the pharmacy and those from the eight prescribers in the eye clinic extracted for further sampling. 25 prescriptions of each prescriber

attending to patients in the eye clinic written in the month of November 2021 were randomly picked for analysis. This made a total of 200 prescriptions for Machakos level 5 hospital.

In the remaining 9 facilities which included 2 health centers and 7 dispensaries, purposive sampling was used to identify all the prescriptions of patients treated with eye medications in the period from 1st January 2021 to 31st December 2021. All the prescriptions written in the study period were obtained and those with eye medications extracted for further sampling. A total of 494 prescriptions were analyzed in the 9 facilities and a grand total of 694 prescriptions analyzed for this study.

3.5 DATA COLLECTION PROCEDURE

A structured, pilot-tested questionnaire capturing all the core indicators was used to collect data. This helped in standardizing the data collected since each respondent answered a similar question. The questionnaire was divided into three parts: prescription, facility and patient care indicators of rational medicine use.

The principal researcher interviewed one dispenser in each PHCF and filled the health facility indicator form.

Eye medicine prescriptions written starting 1st November 2021 to 30th November 2021 for Machakos level 5 and from 1st January 2021 to 31st December 2021 in the other 9 facilities were purposively reviewed and data extracted from them by the principal researcher.

One research assistant per facility was trained to collect data and fill the patient care indicator questionnaire. They administered questionnaire to patients who met the inclusion criteria, counted the consulting time using a stop watch and filled in responses in the patient care form. In addition, another research assistant (a pharmaceutical technologist) was trained to collect data on dispensing time, number of drugs dispensed, drug labelling and patient's knowledge on correct drug use at Machakos level 5 hospital since it was the only facility where eye medications were dispensed. The Participants' responses were reviewed and verified on completion.

Data collection on facility indicators was collected only once in one day per facility which is the WHO INRUD recommendation for a study on rational use of medications (19).

3.6 DATA COLLECTION INSTRUMENTS

A standard structured WHO core indicators form was used as the data collection instrument. The questions therein were read to the participants, and the responses marked accordingly on the forms. Prescriptions of eye medications were reviewed for the period from 1st November to 30th November 2021 for Machakos level 5 and from 1st January to 31st December 2021 in the remaining 9 facilities.

3.7 PILOT TEST

A Pilot test was done in one of the public health care facilities to determine the validity and reliability and verify the questionnaires' accuracy.

3.8 ETHICAL CONSIDERATIONS

The following ethical principles guided this study:

3.8.1 ETHICAL APPROVAL

The study's ethical approval was sought from the KNH/UON Research and Ethics Committee.

Research license was obtained from the National Commission for Science, Technology and Innovation (NACOSTI).

Authorization to carry out the study was obtained from Machakos County Government.

3.8.2 CONFIDENTIALITY

Confidentiality of information gathered from participants was safeguarded. In the course of the study, only the research team had access to confidential information. We ensured that all data was confidential and de-identified to prevent harm. Data collected during this study may be used to support new research, but number codes will replace details that could identify individuals. A local or national expert committee must first approve any future research using data from this study to ensure that participants' interests and their institutions are protected.

3.8.3 PLAGIARISM

Duly acknowledging of people's works has been done. The research findings will be fully disseminated to all the stakeholders in this study without any bias.

3.8.4 CONSENT

Each participant was informed what the study was about, what was required of them and their rights and obligations as the study participants. Explanatory forms and consent forms were then provided to each respondent. Each respondent was requested to read through the consent form and

then allowed to consider the information, ask any questions or seek any clarifications. Once they were satisfied with the information and guarantees provided and all their questions being fully addressed, they signed the consent form in writing to acknowledge their voluntary approval of participation. It's then and only then that they were included in the study. The participants were also free to withdraw even after signing the consent form anytime without reprisal.

3.9 DATA PROCESSING AND ANALYSIS

The data collected about the specific indicators was entered into an excel sheet exported into Stata version 14.1. Data was presented as percentages, means, frequencies and standard deviations. Data was then presented in the form of tables and graphs. Lastly, interpretation, recommendation and dissemination of findings to relevant authorities, groups and individuals was made.

CHAPTER FOUR

4.0 RESULTS

4.1 CHARACTERISTICS OF SELECTED PHCFs

The study was carried out at ten randomly sampled public health care facilities (PHCFs) in Machakos town sub - County. The facilities included one level 5 hospital, two health centers (level 3 facilities) and 7 dispensaries (level 2 facilities). Table 3 shows the facility level according to the Kenya's health structure, the administrative ward the facility is located, distance from the County health headquarters and rural/ urban settings of the selected PHCFs. The county health headquarters are hosted at Machakos level 5 hospital. Machakos level 5 hospital and APDK dispensary were the only facilities located in an urban setting, while the other facilities are located in rural settings as per the county data.

Table 3; Characteristics of the selected PHCFs (N=10).

PHCFs	Level	Administrative ward	Distance (km)	Setting
Machakos level 5 hospital	5	Machakos central	0	Urban
Mutituni health center	3	Mutituni	9.7	Rural

Kola health center	3	kola	34	Rural
Konza dispensary	2	Kalama	25	Rural
Mbuani dispensary	2	kola	37	Rural
APDK Dispensary	2	Machakos central	1.9	Urban
Peoples park dispensary	2	Mumbuni North	5.1	Rural
Mua hills Dispensary	2	Mua	20	Rural
Kamuthanga Dispensary	2	Mutituni	17	Rural
Muvuti Dispensary	2	Muvuti/Kiima Kimwe	8	Rural

4.2 PRESCRIBING INDICATORS

4.2.1 OUTPATIENT ATTENDANCE AT SELECTED PHCFs

A total of 384,749 patients (new and revisits) attended the outpatient departments (OPD) at the selected PHCFs in the year 2021. Machakos level 5 recorded the highest attendance of patients (242,475) while People's park dispensary registered the least (2,580).

A total of 2,869 patients were treated for eye ailments in the 10 PHCFs of which 1,519 patients were seen at the Machakos level 5 eye clinic from 1st to 30th November 2021 and 1350 were seen in the other 9 facilities from 1st January to 31st December 2021 (Table 4).

Table 4; Patients with eye illnesses seen in PHCFs in the study period (N=2,869).

PHCFs	Eye patients seen in the study period	Percentage
Machakos L5 hospital	1,519	52.9
Mutituni health center	346	12.1
Kola health center	335	11.7
Konza dispensary	149	5.2

Muvuti Dispensary	138	4.8
Kamuthanga dispensary	121	4.2
APDK Dispensary	109	3.8
Mua hills Dispensary	71	2.5
Mbuani dispensary	67	2.3
Peoples park dispensary	14	0.5

4.2.2. PRESCRIPTION SELECTION IN THE SELECTED PUBLIC HEALTH FACILITIES.

A total of 1,519 patients were seen from 1st to 30th November 2021. There were 8 prescribers in that month; 3 ophthalmologists and 5 ophthalmic clinical officers (OCOs). Prescription books for the 8 prescribers were retrieved from the hospital pharmacy. A total of 1,136 eye medication prescriptions were written in the month of November from which 200 prescriptions were purposively selected (25 for each prescriber).

A total of 1350 prescriptions were written in the level 2 and 3 facilities for the period starting 1st January to 31st December 2021.

For People's park dispensary all the 14 prescriptions written in the study period were selected. In the other eight facilities, 60 prescriptions (the first 5 prescriptions of each month were selected), making a total of 494 prescriptions.

Mutituni health center had the highest number of prescriptions (346) while people's park dispensary had the least prescriptions (14) written in the study period (table 4).

Therefore, a total of 694 prescriptions were included in the survey of the 10 PHCFs for prescribing indicators. These sampled prescriptions were a good representative of the total retrieved prescriptions and were above the WHO/ INRUD recommended number (at least 600 prescriptions) needed for the survey.

4.2.3. DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS IN THE PRESCRIPTION SURVEY.

Of the 694 eye medication prescriptions encountered, 404 (58.2%) were prescribed for females and 290 (41.8%) for male patients.

The age range for the participants was 2 weeks to 98 years and majority of them were below 20 years of age.

The distribution of prescriptions of patients served at the PHCFs with regard to age and gender is shown in Table 5.

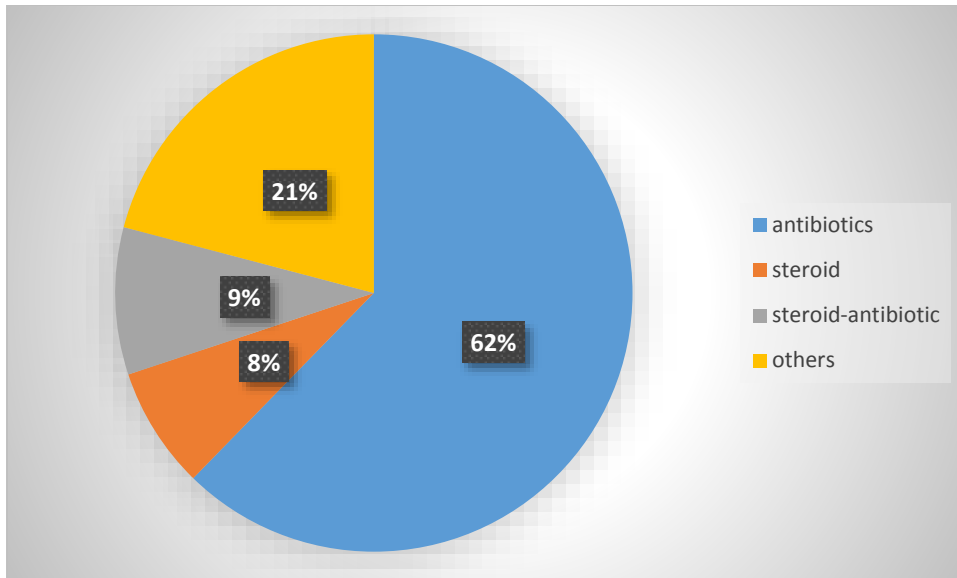
Table 5; Demographic characteristics of participants in the prescription survey (N=694).

Demographic Characteristic	Frequency (%)
Age group (years)	
0-19	369 (53.2)
20-39	90 (12.9)
40-59	115 (16.6)
60-79	95 (13.7)
Above 80	25 (3.6)
Mean age (years)	27.32
Range	2 weeks - 98years
Sex	
Male	290 (41.8)
Female	404 (58.2)

4.2.4 CATEGORIES OF EYE MEDICATIONS PRESCRIBED.

Cumulatively, 826 eye medications were prescribed in the 694 prescription encounters. The majority of the prescribed eye drugs were antibiotics 514 (62.3%), followed by steroid – antibiotic combination 76 (9.2%) while steroids were the least prescribed 63 (7.6%) Figure 2. Other prescribed medications included lubricants, antihistamines, mast cell stabilizers, NSAIDS and anti-glaucoma.

Figure 2; Categories of eye medications prescribed (N=826).



The commonly prescribed ocular antibiotic, steroid and steroid - antibiotic combination were Tetracycline eye ointment, dexamethasone and neomycin - polymyxin B - dexamethasone respectively (Table 6).

Table 6; commonly prescribed eye medications in the PHCFs.

Drug	Frequency	Percentage
Antibiotics (n=514)		
Tetracycline eye ointment	459	89.3
Ciprofloxacin	29	5.6
Gentamycin	9	1.7
Moxifloxacin	8	1.6
Chloramphenicol	6	1.2
Ofloxacin	2	0.4
Levofloxacin	1	0.2
Steroid -antibiotic (n=76)		
Neomycin and Polymyxin B Sulfates and Dexamethasone	34	44.7
Tobramycin Dexamethasone	13	17.1

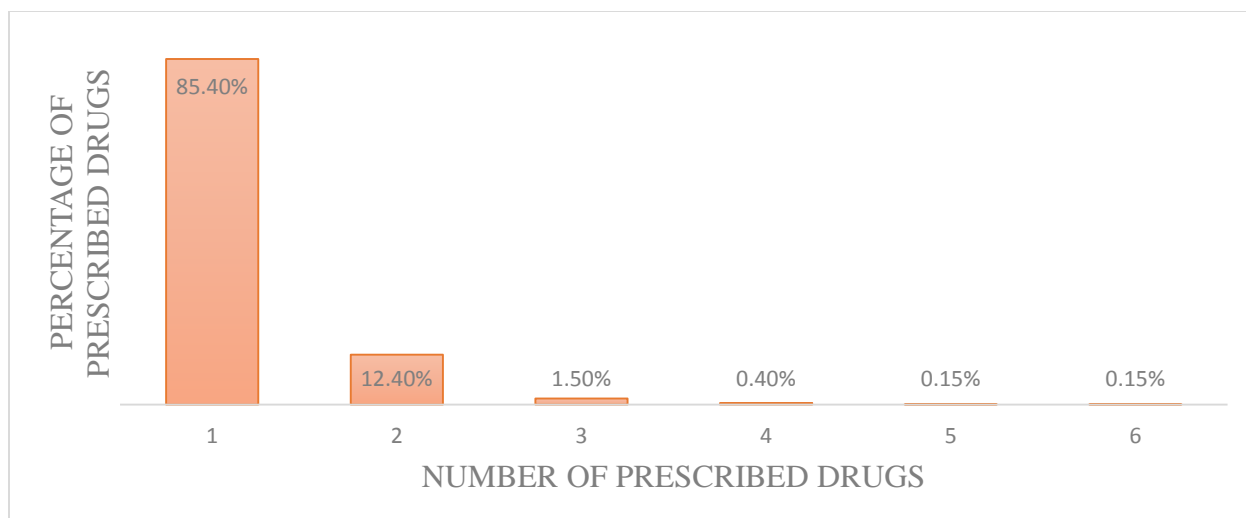
Chloramphenicol Dexamethasone	9	11.9
Dexamethasone Gentamycin	8	10.5
Neomycin dexamethasone	5	6.6
Ciprofloxacin dexamethasone	4	5.3
Ofloxacin dexamethasone	2	2.6
Betamethasone neomycin	1	1.3
Steroids (n= 63)		
Dexamethasone	30	47.6
Prednisolone	15	23.8
Hydrocortisone	15	23.8
Fluorometholone	3	4.8

4.2.5. NUMBER OF EYE MEDICATIONS PRESCRIBED PER PATIENT ENCOUNTER.

The overall average number of drugs prescribed per patient encounter was 1.2.

Machakos level 5 had the highest average number of drugs prescribed per prescription (1.6). The highest number of drugs prescribed in all the 694 encounters was 6 drugs (Machakos level 5 hospital). All the level 2 facilities had no prescription with more than one drug (Figure 3).

Figure 3; Number of eye medications per patient encounter in the selected PHCFs (N=826).



4.2.6. PERCENTAGE OF DRUGS PRESCRIBED BY GENERIC NAME.

Out of the 826 prescribed drugs, 150(18.2%) were written in their generic names, 459(55.5%) had their generic names abbreviated and 217(26.3%) were prescribed by brand names.

All tetracycline eye ointment prescriptions were abbreviated as TEO.

Machakos level 5 hospital had the highest number (37%) of drugs prescribed by generic names. 6 dispensaries had 100% drugs prescribed by generic names abbreviated (table 7).

Table 7; Number of drugs prescribed by generic name (N=826).

PHCFs	Total number of drugs prescribed	Percentage of drugs prescribed by generic name	Percentage of drugs prescribed by generic name abbreviated	Percentage of drugs prescribed by brand name
Machakos Level 5	327	37	1.2	61.8
Mutituni	61	29.5	70.5	0
Kola	64	14.1	85.9	0
Mbuani	60	3.3	96.7	0
Konza	60	0	100	0
APDK	60	0	100	0

Mua hills	60	0	100	0
Kamuthanga	60	0	100	0
Muvuti	60	0	100	0
Peoples park	14	0	100	0
Total	826	18.2	55.5	26.3

4.2.7. PERCENTAGE OF DRUGS PRESCRIBED FROM KENYA ESSENTIAL MEDICINES LIST 2019.

Out of the 826 drugs prescribed, 621 (75.2%) were prescribed from the (Kenya essential medicines list) KEML 2019. All the facilities had almost all the drugs prescribed from the KEML. Machakos level 5 hospital had the least (41.9%) of the drugs prescribed from the 2019 KEML (table 8).

Table 8; Percentage of eye medications prescribed from KEML 2019 per facility (N=826).

PHCFs	Total number of drugs prescribed	Drugs prescribed from KEML (%)
Machakos Level 5	327	137 (41.9)
Mutituni	61	60 (98.4)
Kola	64	55 (85.9)
Konza	60	55 (91.7)
Mbuani	60	60 (100)
APDK	60	60 (100)
Mua hills	60	60 (100)
Kamuthanga	60	60 (100)
Muvuti	60	60 (100)
Peoples park	14	14 (100)

Generally, the facilities performed well with regard to the number of drugs prescribed and adhering to the KEML 2019. However, they performed poorly on antibiotic prescribing and prescribing by generic names.

4.3; FACILITY INDICATORS

4.3.1 DISTRIBUTION OF PRESCRIBERS AND DISPENSERS AT THE SELECTED PHCFs.

The prescribers were grouped into ophthalmologists, ophthalmic clinical officers (OCOs), medical officers (MOs), nurses and clinical officers (COs) (Table 9) while the dispensers were grouped into pharmacists and pharmaceutical technologists (Table 10).

Only Machakos level 5 hospital and Mutituni health centers had a pharmacist or a pharmaceutical technologist dispensing drugs at the facilities. For the rest of the facilities, the nurses were dispensing medications.

The highest qualified prescribers were ophthalmologists and ophthalmic clinical officers at Machakos level 5 while the other facilities did not have prescribers with specialized ophthalmic training.

Table 9; Distribution of prescribers in selected PHCFs.

Facility	Ophthalmologists	OCOs	MOs	COs	Nurses	Total
Machakos L5	3	6	-	-	-	9
Mutituni	0	0	1	9	-	10
Kola	0	0	0	2	9	11
Konza	0	0	0	0	2	2
Mbuani	0	0	0	0	2	2
Apdk	0	0	0	0	2	2
People's Park	0	0	0	1	2	3
Mua Hills	0	0	0	0	4	4

Kamuthanga	0	0	0	0	4	4
Muvuti	0	0	0	0	2	2
Total	3	6	1	12	27	49

Table 10; Distribution of dispensers in selected PHCFs.

Facility	Pharmacists	Pharmaceutical Technologists	Total
Machakos Level 5 Hospital	12	7	19
Mutituni health Center	1	1	2
Kola Health Center	0	0	0
Konza, Mbuani, APDK, People's Park, Mua Hills, Kamuthanga and Muvuti Dispensaries	0	0	0
Total	13	8	21

4.3.2 AVAILABILITY OF KENYA ESSENTIAL MEDICINES LIST 2019.

Of the ten sampled PHCFs, only three (30%) of the facilities had the 2019 KEML namely Machakos level 5 hospital, Mua hills dispensary and People’s park dispensary.

4.3.3 OPHTHALMIC DRUGS AVAILABLE IN THE PHCFs ON THE SURVEY DAY.

Of the ten selected PHCFs only two (20%) of the facilities had an ophthalmic drug in their pharmacy during the survey day (Machakos level 5 hospital and Mutituni health center). Mutituni health center had only one bottle of Timolol in the pharmacy. The available ophthalmic drugs at Machakos level 5 hospital were ciprofloxacin eye drops, tetracycline eye ointment, Neomycin sulfate – dexamethasone drops and hydrocortisone acetate 1% eye drops.

4.4 PATIENT – CARE INDICATORS

4.4.1; PATIENT CARE INDICATORS PARTICIPANTS.

A total of 300 patients were observed and interviewed on the patient specific indicators in the 10 PHCFs during the survey period in the month of April 2022. Machakos level 5 had the highest number of patients while People’s park had the least number of patients (Table 11).

Table 11; Number of patients interviewed per PHCFs (N=300).

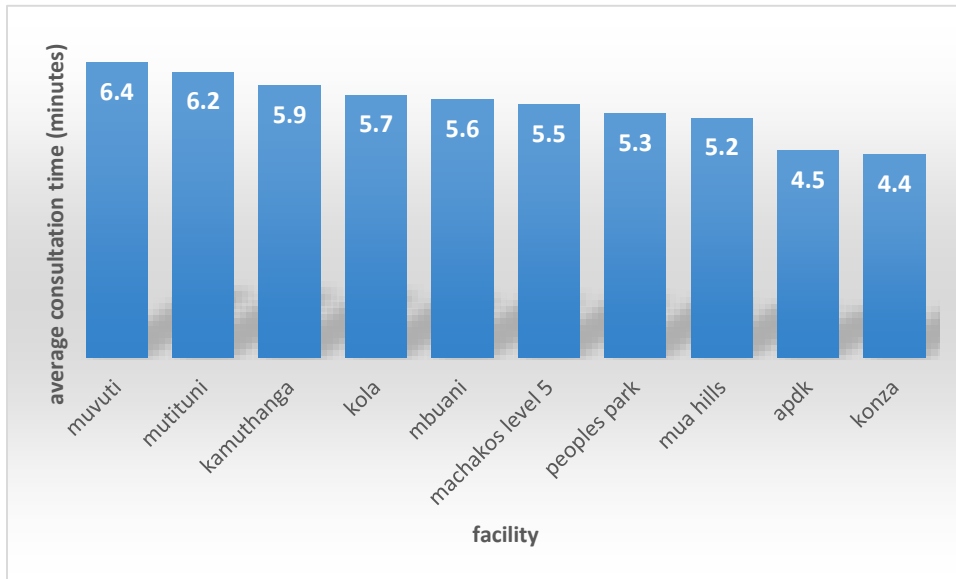
Facility	Number of patients interviewed
Machakos Level 5 hospital	174 (58.0%)
Mutituni health center	28 (9.3%)
Mua Hills dispensary	17 (5.7%)
Kola health center	16 (5.3%)
Konza dispensary	15 (5.0%)
Kamuthanga dispensary	14 (4.7%)
Muvuti dispensary	12 (4.0%)
Apdk dispensary	12 (4.0%)
Mbuani dispensary	8 (2.7%)
People's Park dispensary	4 (1.3%)

4.4.2. CONSULTATION TIME.

On the survey visit, between one to three prescribers were available at the selected facilities. The overall average consultation time at the PHCFs was 5.5 (range 3, 12) minutes. Muvuti dispensary had

the highest average consultation time while Konza dispensary had the lowest average consultation time (Figure 4).

Figure 4; Comparison of consulting time across the ten PHCFs.



4.4.3. DISPENSING TIME

The average dispensing time is defined as the time difference of the time when a patient submits the prescription to the dispenser on the pharmacy counter and the time the patient leaves the counter with a drug(s).

Dispensing time was only assessed at Machakos level 5 hospital where patients received eye medications. Of the 174 patients who were observed and interviewed, 95 (54.6%) had eye medications dispensed from the pharmacy.

For the other nine facilities no eye medications were dispensed during the study period.

The average dispensing time in Machakos level 5 hospital was 115 (range 60, 240) seconds.

4.4.4. EYE MEDICATIONS ACTUALLY DISPENSED

Out of 412 eye medication prescribed, 122 (29.6%) drugs were dispensed to the patients. Machakos level 5 hospital was the only facility where patients received eye medication from the pharmacy.

In the other 9 health facilities the prescribed eye medications were unavailable during the study period and the patients were advised to buy from chemists.

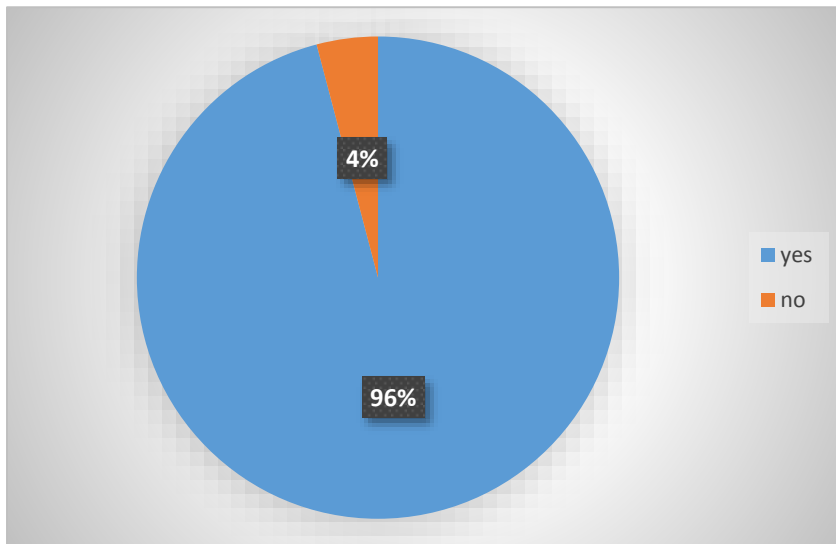
4.4.5. EYE MEDICATIONS ADEQUATELY LABELED

Data on drugs adequately labelled was only collected at Machakos level 5 hospital which was the only facility where eye medications were dispensed during the study period. On the survey days there were both pharmacists and pharmaceutical technologists dispensing drugs at Machakos level 5 hospital pharmacy. Out of the 122 drugs dispensed, 117 (95.9%) were adequately labeled (Figure 5).

A drug was adequately labeled if the information found on the label of the dispensed drug observed during patient exit interview had the following details; the eye to be instilled, frequency of administration and duration of use. In all the prescription encounters, the patient name was not indicated on the drug envelope.

In this survey we were not able to assess the drug labelling performance for facilities that did not have pharmacists or pharmaceutical technologists due to unavailability of eye medicines in the facilities.

Figure 5; Percentage of eye medications adequately labelled.



4.4.6. PATIENT KNOWLEDGE OF DRUGS DISPENSED.

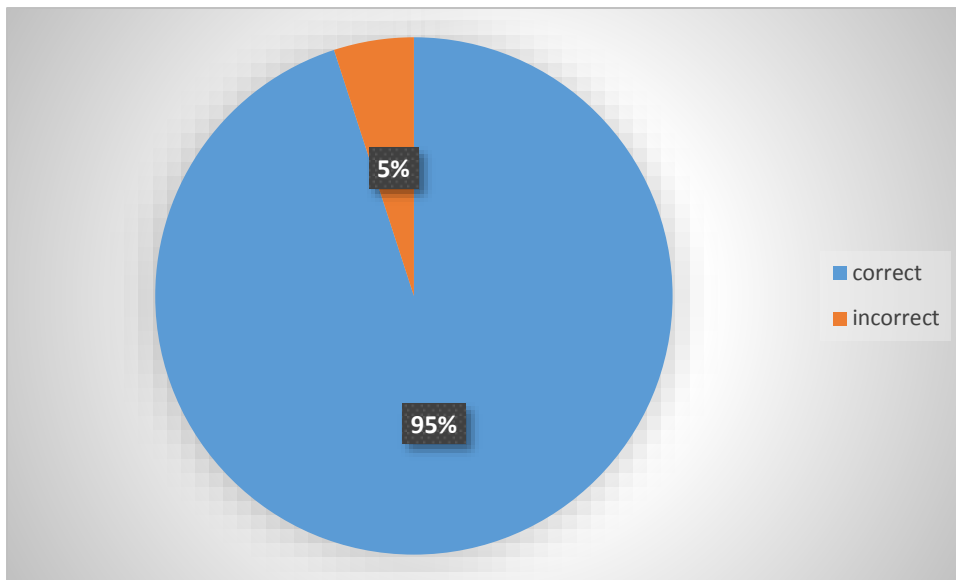
Ninety-five patients who received eye medications were also interviewed to collect data on their level of knowledge concerning the drugs dispensed to them. They were assessed in the following areas; the

eye they were to instill the medication(s), how many times in a day they were to use the medication(s) and the duration they were to use the medication(s).

This data was only collected at Machakos level 5 hospital where patients received eye medications during the study period. Of the 95 patients, 90(94.7%) had the correct knowledge on use of the prescribed medications (Figure 6).

Five patients (5.3%) could not correctly tell the number of times they were to use the medication(s). However, they correctly said the eye to be instilled and the duration to use the medication. The average age was 71.6 years, one had attained primary school education level while the other four had no formal education.

Figure 6; Patient’s knowledge of dispensed eye medication use.



CHAPTER FIVE

5.0 DISCUSSION

Worldwide, irrational drug use causes harm to patients. The WHO/ INRUD Core drug use have provided simple and suitable measures used to assess the optimal use of drugs at healthcare centers (5). In this study, the core indicators were used to describe the current management practices of patients with eye illnesses as well as the facilities' performance with regards to the WHO/ INRUD set standard of practice.

5.1 PRESCRIBING INDICATORS

Prescribing practices impacts on patients' compliance and therapeutic outcome. High quality prescribing practices should be safe, effective, cost-effective and patient-centered (5).

A total of 694 prescriptions were analyzed in this study; there were more females than males; 58.2 %, 41.8% respectively. This was similar to a survey conducted in Kisii County, Kenya (13) where the proportions for both females and males were 59.3% and 40.7% respectively. In both studies, it can be noted that females sought healthcare services more than males.

The percentage of encounters with ophthalmic antibiotics prescribed was 62.3% (Figure 2). Tetracycline eye ointment was the commonly prescribed antibiotic (Table 6). Machakos level 5 hospital had the least percentage of antibiotics prescribed (11.6%) followed by Mutituni health center (77.1%) and kola health center (85.9%). In the 7 dispensaries 100% of the prescribed eye medications were antibiotics.

The WHO/ INRUD standard value for percentage encounter with an antibiotic prescribed is 20 - 26.8% (5). Antibiotic prescription at Machakos level 5 hospital was within the WHO/INRUD standard value while in the other nine facilities it was found to be very high. This was probably because Machakos level 5 hospital had more qualified prescribers in management of eye diseases than the health centers and dispensaries. Another reason would be, the health centers and dispensaries attended to patients with less complicated eye illnesses who did not require other classes of eye medications. The misuse and overuse of ophthalmic antibiotics can lead to increased antibiotic resistance and wastage of scarce resources (7).

The percentage was found to be lower compared to a study done in Kisii County, Kenya where 84.8% of the drugs prescribed were antibiotics (13). Findings in this survey were comparable to a survey done at Hawassa university teaching and referral hospital, Ethiopia where 58.1% of the prescribed drugs were antibiotics (20) and higher than in a survey done in eastern province, Saudi Arabia where 32.2% of the prescribed drugs were antibiotics (19).

However, these studies surveyed on general drugs and none specifically narrowed on eye medications.

The percentage of encounters with an ophthalmic steroid prescribed was 7.6% (Figure 2). The commonly prescribed ocular steroid was dexamethasone (Table 6). Only three facilities had ophthalmic steroids prescribed during the survey period namely Machakos level 5 hospital, Mutituni health center and kola health center. These facilities were the highest levels of care sampled in this survey, had more qualified prescribers and attended to a large number of eye patients compared to the seven dispensaries which could explain the use of steroids by the prescribers.

Ophthalmic steroids should be used with caution because of serious adverse effects like steroid induced glaucoma, cataract and worsening of corneal infections leading to perforation that can potentially lead to blindness. It was encouraging to find out that prescribers at the sampled dispensaries in Machakos town sub-county did not misuse ophthalmic steroids. The WHO/ INRUD does not have a standard value for percentage encounters with a steroid prescribed.

The percentage of encounters with an ophthalmic steroid - antibiotic combination was 9.2% in this survey (Figure 2). The commonest prescribed ocular steroid antibiotic combination was neomycin polymyxin B dexamethasone (Table 6). Just like ophthalmic steroids, only three facilities had

steroid – antibiotic combination prescribed during the survey period namely Machakos level 5 hospital, Mutituni health center and kola health center. These facilities were the highest levels of care sampled in this survey, had more qualified prescribers and attended to a large number of eye patients compared to the seven dispensaries which could explain the steroid - antibiotic use by the prescribers.

The average number of drugs prescribed per prescription was 1.2. This figure was below the optimal range of 1.6 – 1.8 recommended by the WHO/ INRUD (5). Machakos level 5 hospital recorded the highest average number of drugs per prescription (1.6 drugs) which was within the range recommended by the WHO/ INRUD. The other facilities had a lower average number of drugs prescribed than the WHO/ INRUD recommended optimal range. The maximum number of eye medications prescribed in this survey was 6 drugs at Machakos level 5 hospital in a 74 year old male who had cataract surgery complications. Rational prescribing is encouraged by the WHO/ INRUD to avoid wastage of drugs and probable adverse effects on the patients (3).

In other studies, the average number of drugs per prescription was higher than the optimum WHO/INRUD value and ranged between 1.9 and 3.7 for example 2.9 Kisii Kenya (13), 1.9 Southern Ethiopia (20), 2.4 Eastern province, Saudi Arabia (19) and 3.7 in southern India (17). However, these studies were on general medications and none specifically surveyed on eye medications.

According to WHO/INRUD 100% of drugs that should be prescribed by their generic name. The percentage of drugs prescribed by generic name in this survey was 18.2% while 55.5% had their generic names abbreviated and 26.3% were prescribed by brand names. Table 7. The findings of this study were below the recommended value.

Machakos level 5 hospital had the highest number of drugs prescribed by generic names (37%) followed by Mutituni 29.5%, kola 14.1% and Mbuani 3.3% while the other facilities had 100% drugs prescribed by generic names abbreviated (Table 7).

Based on the findings of this study, the prescribers in PHCFs' in Machakos town sub - county rarely prescribe eye medication by their generic names. This might be attributed to the prescriber's experience with individual drug brands, extensive promotional activities by medical

representatives of drug companies to the prescribers or prescription of specific drug brands that were available in the facility pharmacies.

In a study done in Kisii Kenya, 27.7% were prescribed by generic names, 9.6% had their generic names abbreviated while 63.6% were prescribed by brand names (13).

In studies carried out in other countries, the percentage of drugs prescribed by generic name ranged from 2.5% to 98.7%. For example, 2.5% India (17), 61.2% Saudi Arabia (19) and 98.7% Ethiopia (20).

The percentage of eye medications prescribed from the Kenya Essential Medicines List 2019 was 75.2%. Machakos level 5 hospital had the least number of eye medications prescribed from KEML 2019 at 41.9%, followed by kola health center (85.9%), Mbuani dispensary 91.7% and Mutituni health center at 98.4%. In the other dispensaries, all the eye medications (100.0%) were prescribed from the KEML (Table 8).

This was lower than in other studies for example in Kisii Kenya 96.7% of the drugs were prescribed from the KEML (13), Hawassa university teaching and referral hospital, Ethiopia 96.6% (20), India 99.8% (17) and Saudi Arabia 99.2% (20).

Prescribing drugs from the KEML is one way of ensuring rational prescribing of drugs since the drugs listed in KEML have been tested for efficacy, safety and are of lower cost. However, prescribers may not always choose drugs in the KEML since these are just basic guidelines which may not apply to all ophthalmic diseases.

5.2 FACILITY INDICATORS

In any health - care center, availability of qualified prescribers and dispensers coupled with adequate supply of key medicines influences the ability to prescribe and dispense medications rationally.

The highest qualified prescribers were ophthalmologists and ophthalmic clinical officers at Machakos level 5 while the other facilities did not have prescribers with specialized ophthalmic training. Most prescribers in the other facilities were nurses (Table 9). Only Machakos level 5 hospital and Mutituni health centers had a pharmacist or a pharmaceutical technologist dispensing drugs at the facilities (Table 10). For the rest of the facilities, the nurses were dispensing

medications. This indicated that the PHCFs in Machakos town sub - county had inadequate number of skilled prescribers and dispensers attending to patients with eye illnesses.

Of the ten sampled PHCFs, only three (30%) facilities had the 2019 Kenya Essential Medicines List (KEML) namely Machakos level 5 hospital, Mua hills dispensary and People's park dispensary. The findings were similar to a survey in Kisii Kenya where only 2 (20%) of the 10 facilities had copies of the KEML 2016 booklets. This was however low compared to Bahawalpur, Pakistan (21) where 100% of the facilities had copies of EML. The WHO/ INRUD requires that all health facilities have copies of EML (5) to guide prescribers on the medicines listed for treatment of various diseases when prescribing. This enhances evidence based management of patients (5).

Of the ten selected PHCFs, only two facilities (Machakos level 5 hospital and Mutituni health center) had ophthalmic medication in their pharmacy on the survey day. Mutituni health center had only one bottle of Timolol eye drops while in Machakos level 5 hospital the drugs available were ciprofloxacin eye drops, Tetracycline eye ointment, Neomycin sulfate – dexamethasone drops and hydrocortisone acetate 1% eye drops. The findings were way below the WHO/ INRUD recommendation of 100% availability of essential drugs at the health facilities (31). The shortage of key drugs is a disadvantage to patients due to delayed commencement of treatment and increased out-of-pocket expenses (5).

The findings in this survey were lower than those found at the Public Health Care Centers in Kisii Kenya where 80% of the essential drugs were available (13) and Pakistan where 82% of the essential drugs were available (22).

5.3 PATIENT – CARE INDICATORS

The time that prescribers and dispensers devote to patients, majorly at the dispensing and prescribing areas, contributes to the quality of disease diagnosis and management. 300 patients were observed and interviewed on patient care indicators

The optimum WHO/ INRUD value for average consultation time is ≥ 10 min (5). The overall average consultation time at the PHCFs in this survey was 5.5 (range 3, 12) minutes. Muvuti dispensary had the highest average consultation time of 6.4 (range 5, 8) minutes followed by Mutituni health center at 6.2 (range 4, 9) minutes. Konza dispensary had the lowest average

consultation 4.4 (range 2, 7) minutes (Figure 4). The time taken by the prescribers at the PHCFs in this study was almost half the optimum WHO/INRUD value. Shorter consultation time can lead to an incomplete examination of patients and subsequently irrational therapy (3). Prescribers need to take sufficient time with patients having eye complaints to carry out comprehensive history taking, patient examination and prescribe the correct medications. The increased workload of the prescriber could be the reasons for the short consultation time.

The consultation time was higher than findings reported in other studies for example Kisii Kenya 4.1 minutes (13), Pakistan 2.2 minutes (22) and 54 seconds in Bangladesh (18).

The average dispensing time is defined as the difference in time when a patient submits the prescription to the dispenser on the pharmacy counter and the time the patient leaves the counter with a drug(s). Dispensing time was only assessed at Machakos level 5 hospital where patients received eye medications. For the other nine facilities no eye medications were dispensed during the study period. The average dispensing time in Machakos level 5 hospital was 115 (range 60, 240) seconds. The optimum value set by the WHO/ INRUD for average dispensing time is ≥ 90 s (5).

In comparison to the WHO/ INRUD minimum time, the dispensers at the Machakos level 5 hospital took sufficient time in processing the prescriptions and ultimately dispensing the prescribed drugs to the patients. This was lower than a survey done in Kisii Kenya where the average dispensing time was 131.5 s. However, it was higher than studies in Pakistan 38 seconds (22) and 23 seconds in Bangladesh (18). Longer dispensing time is important to label the drugs adequately and to explain key information about the drugs to the patients.

In our study, 29.6% of the prescribed ophthalmic drugs were dispensed to patients in this study. Machakos level 5 hospital was the only facility where patients received eye medication from the pharmacy. In the other 9 health facilities the patients did not receive any eye medication from the pharmacy due to stock-out. The WHO/ INRUD recommends 100% of prescribed drugs should be dispensed (5). The percentage of dispensed eye medication was very low in this survey; the reasons reported by the drug dispensers was the drugs were out-of-stock during the survey period due to unavailability at the Kenya Medical Supplies Authority (KEMSA).

This value was lower than in other studies for example in Kisii Kenya 76.3% (13), Pakistan 90.9% (22) and 61% in 20 Upozila health complexes in Bangladesh (10). Lack of essential eye medication in PHCFs could affect the general patient care because patients might be unable to afford these medication (s) in chemists where the drugs are usually sold at higher prices than in public facilities.

Data on drugs adequately labelled was only collected at Machakos level 5 hospital which was the only facility where eye medications were dispensed during the study period. 95.9% of the eye drugs dispensed were adequately labeled.

However, in all the encounters the patient name was not indicated on the drug envelope. The WHO/ INRUD recommends 100% of dispensed drugs should be adequately labelled. The drug dispensers in this survey adhered to the recommendation on rational drug use. Patients should receive clear instructions on drug dosage, the eye to instill, duration to use the drug and this should also be written on the drug packaging. The findings in this survey was higher than in other studies for example in Kisii Kenya 22.6% (13) and northeast Ethiopia 22.7% (20).

Information on patient's knowledge on correct drug use was only collected at Machakos level 5 hospital which was the only facility where patients received eye medications during the study period. 95 patients who received eye medications were interviewed to collect data on their knowledge concerning the drugs dispensed to them. They were assessed on the eye they were to instill the medications, how many times in a day they were to use the medication(s) and the duration they were to use the medication(s). 94.7% of patients had the correct knowledge on use of the prescribed medications. Five patients could not correctly tell the number of times they were to use the medication(s). However, they correctly said the eye to be instilled and the duration to use the medication. The findings were higher than in a study in Kisii Kenya where 54.7% had correct knowledge on the dispensed medication use. The optimal WHO/ INRUD value for patients' percentage knowledge on correct drug dosage is 100% (5). The good knowledge of the patients on the dispensed medication use could be attributed to good drug information by the drug dispensers to the patients.

5.4 STUDY STRENGTHS

The use of WHO/INRUD guidelines on the three core drug use indicators and adherence to the WHO methodology offers more strength to this study. Also adding to the study strength was; sampling of 10 facilities, the use of a large sample size of 694 prescriptions and observations and interviews of 300 patients.

5.5 STUDY LIMITATIONS

Unavailability of eye medications in the PHCFs greatly affected assessment of patient care factors in this survey.

The findings of this survey were compared to studies on general drugs due to lack of previous studies specific to eye medication using the WHO/INRUD guidelines.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

The prescribing indicators in this survey deviated from the WHO/ INRUD recommended optimal values.

- The average number of eye medications prescribed per encounter (1.2 drugs) was less than the recommended range of 1.6 – 1.8 drugs.
- The percentage of eye medications prescribed from the KEML (75.2%) was below the recommended percentage of 100%.
- The percentage of eye medications prescribed by generic names (18.2%) was way less than the recommended one of 100%.
- The percentage encounters with an ophthalmic antibiotic prescribed (62.2%) was way above the recommended 20.0% – 26.8%.

The facility-specific indicators, greatly deviated from the WHO/INRUD optimal values.

- Only one facility had prescribers (ophthalmologists or OCOs) specialized in management of eye illnesses.

- Only two facilities had qualified drug dispensers (pharmacist or pharmaceutical technologist).
- The availability of KEML copies (30%) in the selected facilities was far below the recommended 100%.
- The percentage of key eye medications available (20.0%) was also below the recommended 100%, depicting a serious extent of drug stock-outs.

Finally for the patient care indicators, most of the findings also deviated from the WHO/INRUD optimal values.

- The average consultation time (5.5 minutes) was less than the WHO/INRUD optimal value ≥ 10 minutes, suggesting an inadequate interaction time between the prescribers and the patients in the selected PHCFs.
- The average dispensing time (115 seconds) was within the WHO/INRUD optimal value of ≥ 90 seconds, confirming good dispensing practices by the drug dispensers in Machakos level 5 hospital.
- The percentage of the prescribed eye medications which were actually dispensed (29.6%) was very low compared to the recommended 100%, indicating serious eye medication stock-outs.
- The percentage of eye medications adequately labeled (96%) was almost the recommended 100%, indicating appropriate drug labelling by the drug dispensers.
- The patients' correct knowledge of eye medications dispensed to them (94.7%) was almost the optimal value 100%, suggesting good use of eye medication by patients.

6.2. RECOMMENDATIONS

6.2.1. POLICY AND PRACTICE

The prescribers should be sensitized to prescribe drugs by their generic names, promote rational prescribing of ophthalmic antibiotics and prescribe eye medications adhering to the KEML.

The county government should equip all health facilities with enough copies of the KEML.

The county government should mobilize resources to supply all essential eye medications to improve their availability in the PHCFs.

The drug dispensers need to be encouraged to include the patient's name on the drug package.

6.2.2. FUTURE STUDIES

Periodic prescription surveys and medications utilization studies should be conducted at the health facilities to assist in finding any forms of irrational prescribing and dispensing practices of eye medications.

The findings of such studies should be disseminated to the health care workers in PHCFs, followed by relevant interventions to remedy any problems identified.

This survey was just a baseline for examining core indicators of appropriate eye medication use, further studies in other counties should be carried out for ongoing evaluation and measuring the eye medication use patterns.

APPENDIX I: BUDGET

NO.	ITEM	QUANTITY	PRICE PER ITEM (Ksh)	TOTAL (Ksh)
1	Proposal development			
	Telephone			3,000
	Internet			3,000
	Printing of proposal	50 pages * 6 copies	10	3000
	Binding of proposal	6 copies	200	1,200
	Ethics fee	-	-	2000
2	Data collection			
	Pilot study			8,000
	Printing of consent forms.	9 pages * 1 copy	10	90
	Photocopying of consent forms.	930 pages	5	4650
	Printing of questionnaire	6 pages * 1 copy	10	60
	Photocopying of questionnaire	1050 pages	5	5250
	Research assistant	1	30,000	30,000

	Transport Nairobi to Machakos and back.	4 days	4,000	16,000
	Transport to various health facilities	15 days	1,500	22,500
	Principal researcher's meals and accommodation	20 days	2,500	50,000
3	Results analysis and dissemination			
	Statistician	1	50,000	50,000
	Photocopy results	50 pages * 6 copies	10	3,000
	Binding of final book	6 copies	400	2400
TOTAL				204,150

APPENDIX II: WORK PLAN

	2021	2021	2021	2021	2022	2022
	September	October	November	December	January	February
Activities						
Developing proposal						
Approval by KNH-UON ethics research committee						
Data collection using questionnaires						
Analysis, report writing & submission						

APPENDIX III: REFERENCES

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APPENDIX IV: QUESTIONNAIRE

a) PRESCRIBING INDICATORS QUESTIONNAIRE.

Prescription no..... Age Sex Date Diagnosis

1. How many eye medications were prescribed for the patient?

2. Medicines prescribed by generic name (*tick one*)

- a. Generic name
- b. Brand names
- c. Generic names abbreviated.

3. Was an ophthalmic antibiotic prescribed (*if yes indicate the antibiotic*)

Yes Antibiotic name

No

4. Was an ophthalmic steroid prescribed (*if yes indicate the steroid*)

Yes steroid name

No

5. Was an ophthalmic steroid - antibiotic combination prescribed (*if yes indicate the drug*)

Yes steroid - antibiotic name

No

6. Is the prescribed eye medicine in the Kenya Essential Medicines List 2019?

Yes No

b) FACILITY INDICATORS QUESTIONNAIRE.

Date .../.../.....

Facility name

Dispenser's designation 1) Pharmacist 2) Pharmaceutical technologist

3) Others (specify)

Prescriber's designation (list)

1. Do you have a copy of Kenya Essential Medicines List 2019 in your facility?

Yes No

2. What ophthalmic drugs are currently available in your facility?

DRUG	Available (specify the drug)	Not available
1. Anti-infective agents;		
a. Antibacterial		
b. Antifungal		

c. Antiviral		
d. Steroid-antibiotic		
2. Anti-inflammatory agents		
3. Local anaesthetics		
4. Miotics and Anti-glaucoma medicines		
5. Mydriatics		
6. Anti-VEGF preparations		
7. Anti-allergy medicines		
8. Medications for dry eyes		
9. Other eye medicines		

c) PATIENT CARE INDICATORS QUESTIONNAIRE.

Identification no. **Diagnosis**

Age; (years) **Date .../..../.....**

Sex; Male Female

Education level; None Primary School

Secondary school College/ University

1. Consultation time

How long was the consultation time?

Time in Duration of consultation (minutes)

Time out

2. Dispensing time

How long was the dispensing time?

Time in total dispensing duration (seconds)

Time out

3. Medicines prescribed

How many eye medications were prescribed for you?

4. Medicines actually dispensed

How many of the prescribed eye medication did you get from the pharmacy?

5. Medicines adequately labelled

DETAILS	YES	NO
a. Patient name		
b. Drug name		
c. Dose		
d. Frequency of administration		
e. Eye to be instilled		

6. Patients knowledge of correct doses

a. Which eye will you instill the medications?

Right Left Both

b. How many times in a day will you use the medication(s)?
Correct response incorrect response

c. For how long will you use the medication(s)?
Correct response incorrect response

APPENDIX V: PRESCRIBER’S INFORMATION AND CONSENT FORM

Serial no:

Title of Study: Assessment of rational use of eye medication by health care workers in public health facilities in Machakos town sub - county.

Principal Investigator: Dr Muriungi Gituma MMED Ophthalmology Student University of Nairobi.

Supervisors: Dr Margaret Njuguna and Dr Millicent Kariuki, senior lecturers department of ophthalmology, University of Nairobi.

Description of the research and your participation:

Risks and benefits: There are no known physical risks from participation in this study. We will endeavor to ensure that this study causes minimal disruption to care delivery within the PHCFs.

There are no immediate or direct benefits accrued from taking part in the study. However, this study will give us a better insight into how eye care guidelines can be operationalized. The study will also help us understand the possible gaps in the rational use of eye medications that may be attributable to HCWs’ skills and availability of the drugs. The identified challenges will potentially inform strategies to help develop better guidelines on management of eye conditions and approaches that might address the gaps to enhance rational use of eye medications and services offered in PHCFs

Protection of confidentiality: All your responses will remain strictly confidential and anonymous. It will only be used for research purposes; no one can access it. Your name will not appear on your questionnaire, and your responses will not be linked to your identity at any time.

Voluntary Participation: Your participation is completely voluntary, and you can withdraw after having agreed to participate without any problem. You are free to refuse to answer any question that is asked in the questionnaire.

a) Participant’s statement of consent

I have been adequately explained about the study by the researcher. I understand that my rights will be respected and confidentiality maintained.

I also understand that participation is voluntary, and I can withdraw at any time, with no consequences. I therefore consent to be recruited into the study.

Signature

Date.....

For further information, question, concern, issues, or clarification, you may contact:

Dr. Muriungi Gituma: 0727822580 / h58116562018@students.uonbi.ac.ke

Introduction:

Good morning/ good afternoon sir/madam, I would like to invite you to participate in a medical research that seeks to assess the rational use of eye medication using the WHO/INRUD guideline at the public primary healthcare facilities within Machakos town sub county.

Before you make a decision to participate, it is important for you to understand why the survey is being done and what it will involve.

Permission is required from you to enroll in this medical research. You should understand the following general principles which apply to all the participants in a medical research:

- a) Your agreement to participate in this study is voluntary
- b) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal
- c) After you have read the explanation, please feel free to ask any questions that will enable you to understand clearly the nature of the study

We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol no. _____

WHAT IS THIS STUDY ABOUT?

The purpose of the study is to find out what eye medications are given to patients with eye illnesses by Health Care Workers in public health care facilities in Machakos town Sub County. Information will be extracted from prescription forms in order to reach our objectives.

Risks and benefits: There are no known physical harm participating in this study. We will endeavor to ensure that this study causes minimal disruption to care delivery.

There are no immediate or direct benefits accrued from taking part in the study. However, this study will give us a better insight into how eye care guidelines can be operationalized. The study will also help us understand the possible gaps in the use of eye medications that may be attributable to Health Care Workers' skills and availability of the drugs. The identified challenges will potentially inform strategies to help develop better guidelines on management of eye conditions and approaches that might address the gaps to enhance rational use of eye medications and services offered in Public Health Care Facilities

Protection of confidentiality: All your responses will remain strictly confidential and anonymous. It will only be used for research purposes, no one can access it. Your name will not appear on your questionnaire, and your responses will not be linked to your identity at any time.

Voluntary Participation: Participation is completely voluntary and can withdraw after having agreed to participate without any problem. The information provided prior to your withdrawal will not be analyzed and shall be stored securely to protect your privacy. You are free to refuse to answer any question that is asked in the questionnaire.

Participant's statement of consent

I have been adequately explained about the study by the researcher. I understand that my rights will be respected and confidentiality maintained.

I also understand that participation is voluntary, and I can withdraw at any time, with no consequences. I, therefore, consent to be recruited into the study.

Signature

Date.....

Researcher's statement of consent

I the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name:..... Date:

Signature

For further information, question, concern, issues, or clarification, you may contact:

Dr. Muriungi Gituma: 0727822580 / h58116562018@students.uonbi.ac.ke

APPENDIX VI: PATIENT'S CONSENT FORM

Serial no:

PATIENT'S INFORMATION AND CONSENT FORM

Title of Study: Assessment of rational use of eye medication by health care workers in public health facilities in Machakos town sub - county.

Principal Investigator: Dr Muriungi Gituma MMED Ophthalmology Student University of Nairobi.

Supervisors: Dr Margaret Njuguna and Dr Millicent Kariuki, senior lecturers department of ophthalmology, University of Nairobi.

Introduction:

Good morning/ good afternoon sir/madam, I would like to invite you to participate in a medical research that seeks to assess the rational use of eye medication using the WHO/INRUD guideline at the public primary healthcare facilities within Machakos town sub county.

Before you make a decision to participate, it is important for you to understand why the survey is being done and what it will involve.

Permission is required from you to enroll in this medical research. You should understand the following general principles which apply to all the participants in a medical research:

- a) Your agreement to participate in this study is voluntary
- b) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal
- c) After you have read the explanation, please feel free to ask any questions that will enable you to understand clearly the nature of the study

We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol no. _____

WHAT IS THIS STUDY ABOUT?

The purpose of the study is to find out what medications are given for your eye problems by Health Care Workers and also ask about how you will use the medications given once you get home. Your participation will involve the principal researcher asking some questions and your responses will be used for completion of the attached questionnaire.

Risks and benefits: There are no known physical harm participating in this study. We will endeavor to ensure that this study causes minimal disruption to care delivery.

There are no immediate or direct benefits accrued from taking part in the study. However, this study will give us a better insight into how eye care guidelines can be operationalized. The study will also help us understand the possible gaps in the use of eye medications that may be attributable to Health Care Workers' skills and availability of the drugs. The identified challenges will potentially inform strategies to help develop better guidelines on management of eye conditions and approaches that might address the gaps to enhance rational use of eye medications and services offered in Public Health Care Facilities

Protection of confidentiality: All your responses will remain strictly confidential and anonymous. It will only be used for research purposes, no one can access it. Your name will not appear on your questionnaire, and your responses will not be linked to your identity at any time.

Voluntary Participation: Participation is completely voluntary and can withdraw after having agreed to participate without any problem. The information provided prior to your withdrawal will not be analyzed and shall be stored securely to protect your privacy. You are free to refuse to answer any question that is asked in the questionnaire.

Participant's statement of consent

I have been adequately explained about the study by the researcher. I understand that my rights will be respected and confidentiality maintained.

I also understand that participation is voluntary, and I can withdraw at any time, with no consequences. I, therefore, consent to be recruited into the study.

Signature

Date.....

Researcher’s statement of consent

I the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher’s Name:..... Date:

Signature

For further information, question, concern, issues, or clarification, you may contact:

Dr. Muriungi Gituma: 0727822580 / h58116562018@students.uonbi.ac.ke

APPENDIX VII: DISPENSERS INFORMATION AND CONSENT FORM

Title of Study: Assessment of rational use of eye medication by health care workers in public health facilities in Machakos town sub - county.

Principal Investigator: Dr Muriungi Gituma MMED Ophthalmology Student University of Nairobi.

Supervisors: Dr Margaret Njuguna and Dr Millicent Kariuki, senior lecturers department of ophthalmology, University of Nairobi.

Introduction:

Good morning/ good afternoon sir/madam, I would like to invite you to participate in a medical research that seeks to assess the rational use of eye medication using the WHO/INRUD guideline at the public primary healthcare facilities within Machakos town sub county.

Before you make a decision to participate, it is important for you to understand why the survey is being done and what it will involve.

Permission is required from you to enroll in this medical research. You should understand the following general principles which apply to all the participants in a medical research:

- a) Your agreement to participate in this study is voluntary
- b) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal
- c) After you have read the explanation, please feel free to ask any questions that will enable you to understand clearly the nature of the study

We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol no. _____

What is this study about?

The purpose of the study is to find out if you have a copy of Kenya essential medicines list, what eye medications are available in your facility and analyze information from archived prescription copies. Your participation will involve the principal researcher asking some questions and your responses will be used for completion of the attached questionnaire.

Risks and benefits: There are no known physical harm participating in this study. We will endeavor to ensure that this study causes minimal disruption to care delivery.

There are no immediate or direct benefits accrued from taking part in the study. However, this study will give us a better insight into how eye care guidelines can be operationalized. The study will also help us understand the possible gaps in the use of eye medications that may be attributable to Health Care Workers' skills and availability of the drugs. The identified challenges will potentially inform strategies to help develop better guidelines on management of eye conditions and approaches that might address the gaps to enhance rational use of eye medications and services offered in Public Health Care Facilities

Protection of confidentiality: All your responses will remain strictly confidential and anonymous. It will only be used for research purposes, no one can access it. Your name will not appear on your questionnaire, and your responses will not be linked to your identity at any time.

Voluntary Participation: Participation is completely voluntary and can withdraw after having agreed to participate without any problem. The information provided prior to your withdrawal will not be analyzed and shall be stored securely to protect your privacy. You are free to refuse to answer any question that is asked in the questionnaire.

Participant's statement of consent

I have been adequately explained about the study by the researcher. I understand that my rights will be respected and confidentiality maintained.

I also understand that participation is voluntary, and I can withdraw at any time, with no consequences. I, therefore, consent to be recruited into the study.

Signature

Date.....

Researcher’s statement of consent

I the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher’s Name:..... Date:

Signature

For further information, question, concern, issues, or clarification, you may contact:

Dr. Muriungi Gituma: 0727822580 / h58116562018@students.uonbi.ac.ke

APPENDIX VIII; LIST OF HEALTH FACILITIES

Serial no.	Code (KHMFL)	Facility name	KEPH Level	Administrative ward
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1	12438	Machakos level 5 hospital	Level 5	Machakos central
2	12602	Mutituni Health Centre	Level 3	Mutituni
3	12612	Muumandu Health Center	Level 3	Kola
4	12381	Kola Health Centre	Level 3	Kola
5	21675	Mutuyu Dispensary	Level 2	Kalama
6	21440	Ivutini Dispensary	Level 2	Kalama
7	12247	Katumani Dispensary	Level 2	Kalama
8	12144	Kalama Dispensary	Level 2	Kalama
9	12304	Kiitini Dispensary	Level 2	Kalama
10	12317	Kimutwa Dispensary	Level 2	Kalama
11	12411	Kyawalia Dispensary	Level 2	Kalama
12	21939	Kyanzasu Dispensary	Level 2	Kalama
13	21804	Konza Dispensary	Level 2	Kalama
14	17643	Kititu Dispensary	Level 2	Kola
15	12687	Nzaini Dispensary	Level 2	Kola

16	24062	Mbuani Dispensary	Level 2	Kola
17	11931	Apdk Dispensary (Machakos)	Level 2	Machakos Central
18	21253	Machakos County beyond zero Mobile Clinic	Level 2	Machakos Central
19	12548	Mua Hills Dispensary	Level 2	Mua
20	18397	Makyau Dispensary	Level 2	Mua
21	21938	Kitanga Dispensary	Level 2	Mua
22	21677	Mikuyu Dispensary	Level 2	Mua
23	24794	People's Park Dispensary (Machakos)	Level 2	Mumbuni North
24	12167	Kamuthanga Dispensary	Level 2	Mutituni
25	21672	Ikulu Dispensary	Level 2	Muvuti/Kiima-kimwe
26	18873	Wondeni Dispensary	Level 2	Muvuti/Kiima-kimwe
27	18586	Iluvya Dispensary	Level 2	Muvuti/Kiima-kimwe
28	12616	Muvuti Dispensary	Level 2	Muvuti/Kiima-kimwe

APPENDIX IX; ETHICAL APPROVALS.

a) **KNH - UON ethics and research committee approval.**



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Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: [@UONKNH_ERC](https://twitter.com/UONKNH_ERC) https://twitter.com/UONKNH_ERC

Ref: KNH-ERC/A/101

Dr. Kennedy Muriungi Gituma
Reg. No. H58/11656/2018
Dept. of Ophthalmology
Faculty of Health Sciences
University of Nairobi

Dear Dr. Gituma,



15th March, 2022

RESEARCH PROPOSAL: ASSESSMENT OF RATIONAL USE OF EYE MEDICATION BY HEALTHCARE WORKERS IN PUBLIC HEALTH FACILITIES IN MACHAKOS TOWN SUB-COUNTY (P959/12/2021)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P959/12/2021**. The approval period is 15th March 2022 – 14th March 2023.

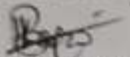
This approval is subject to compliance with the following requirements;

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affected 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.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. 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.
- vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Protect to discover

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke> and also obtain other clearances needed.


Yours sincerely,




DR. BEATRICE K.M. AMUGUNE
SECRETARY, KNH-UoN ERC

c.c. The Dean, Faculty of Health Sciences, UoN
The Senior Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Chair, Dept. of Ophthalmology, UoN
Supervisors: Dr. Margaret Njuguna, Dept. of Ophthalmology UoN
Dr. Millicent Kariuki, Dept. of Ophthalmology UoN


b) National Commission for Science and Technology license.


REPUBLIC OF KENYA


**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: **645777** Date of Issue: **09/April/2022**


RESEARCH LICENSE




This is to Certify that Dr., Kennedy gituma Muriungi of University of Nairobi, has been licensed to conduct research in Machakos on the topic: assessment of rational use of eye medication by healthcare workers in public health facilities in Machakos town sub-county for the period ending : 09/April/2023.

License No: **NACOSTI/P/22/16849**

645777
Applicant Identification Number


Director General
**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION**

Verification QR Code



**NOTE: This is a computer generated License. To verify the authenticity of this document,
Scan the QR Code using QR scanner application.**

c) Machakos county government authorization



