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Analysis of Prescription Compliance with WHO and ICD Protocols for Emerging, Re-Emerging, Infectious, and Non-Communicable Diseases in Ghana: A Cross-Sectional Study

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Abstract

Background: Worldwide, there is a growing concern about the increasing resistance to antibiotics used to treat common infectious diseases. In the current global crisis of bacterial resistance, antimicrobial stewardship programs are crucial. The impact of prescribing for emerging, reemerging, contagious, and non-communicable diseases on the appropriateness, quality, and quantity of antibiotic use within our hospital settings is of utmost importance for ensuring quality care. Studies have shown that specialist intervention was associated with a significant improvement in the appropriateness and compliance with guidelines and standards of antibiotic prescribing as compared with prescriptions without any specialist input

Aim: This paper aims to evaluate compliance with WHO prescribing guidelines for the stated conditions and to assess their ICD adherence. It also analyzes trends in prescriptions received from specialists in the context of emerging, re-emerging, infectious, and non-communicable diseases, highlighting current challenges. Recommendations have been sent to the national TB program for consideration and attention.

Methodology: Information about all patients who presented prescriptions at the pharmacy between January 2019 and June 10, 2022, was recorded. Patients' sociodemographic and prescription histories were retrieved using secondary data from the pharmacy register. A total of 45 non-tuberculous prescriptions were classified into nine disease categories. Descriptive statistics were used to analyze the

data using Stata, by the World Health Organization (WHO) guidelines, International Classification of Diseases (ICD), and Standard Treatment Guidelines for Prescribing. The results are presented accordingly.
Results: Out of the total number of patients seen over the period, 6728 had tuberculous prescriptions while 45 prescriptions (persons) were for non-tuberculous (prescriptions. The median age was 45 years (range,22-83). 71% of males and 29% of females. 4% in the first quarter of 2022. 36% in 2021 and 58% in 20202% of the non-tuberculous prescriptions were received in 2019.
Conclusion: 95%, which forms the majority, are non-conforming cases. A smaller portion is conditionally conforming. No diseases were fully conforming, indicating areas for clinical protocol improvement

Keywords: Emerging infectious disease, WHO Standards, Prescriptions, ICD classifications, non-tuberculosis, Medications

Introduction:
Prescription compliance with established standards is crucial for ensuring optimal healthcare outcomes, particularly in the management of both emerging and re-emerging infectious diseases, as well as non-communicable diseases (NCDs). The World Health Organization (WHO) [1] and the International Classification of Diseases (ICD) provide essential guidelines and protocols to standardize medical practices and enhance patient care globally [2]. However, adherence to these standards varies across different healthcare settings and regions, influencing the effectiveness of treatment and overall public health. In Ghana, like many other developing nations, the burden of both communicable and non-communicable diseases is substantial, necessitating robust healthcare systems and adherence to international best practices [3] [4]. The Korle Bu Teaching Hospital, as one of the leading healthcare institutions in Ghana, plays a pivotal role in addressing these healthcare challenges. Within its Chest Diseases Unit, which specializes in the management of respiratory conditions, ensuring prescription compliance with WHO and ICD standards is critical for delivering quality care to patients. Despite the importance of adherence to international standards, studies assessing prescription compliance in Ghana, particularly within specialized units like the Chest Diseases Unit at Korle Bu Teaching Hospital, are limited. Therefore, this cross-sectional study aims to evaluate prescription compliance with WHO and ICD protocols for both emerging and re-emerging infectious and non-communicable diseases within the context of medication refills at the Chest Diseases Unit of Korle Bu Teaching Hospital. By conducting a comprehensive analysis of prescriptions received at the pharmacy of the Chest Diseases Unit, this study seeks to identify any deviations from established WHO and ICD standards. Through this analysis, insights can be gained into the current prescribing practices, potential gaps in adherence to international protocols, and areas for improvement in the delivery of healthcare services. Ultimately, findings from this study can inform interventions aimed at enhancing prescription compliance, improving patient outcomes, and strengthening healthcare systems in Ghana. In sub-Saharan Africa, there exists a high prevalence of both infectious and non-infectious diseases [5] [6], with cardiovascular diseases (CVD) and diabetes now ranking as the leading causes of death [7]. Effective management of infectious diseases is particularly crucial in this region, given that many of the world's infectious diseases originate from Africa, alongside the growing rates of Antimicrobial Resistance (AMR), which are exacerbated by the frequent and often inappropriate use of antimicrobials [8] [9]. Additionally, there is a significant number of patients with multiple co-morbidities, encompassing both infectious and non-infectious diseases, necessitating the simultaneous consideration of multiple guidelines to optimize care, which can often be complex [10]

[11]The initiative to Report and Learn from Best Practice guidelines is a pivotal undertaking within the World Health Organization World Alliance for Patient Safety 2021-2030, aimed at reducing the global burden of avoidable medication-related harm [9]. Various approaches have been devised to evaluate and enhance the quality of care provided across settings in Lower and Middle-Income Countries (LMICs), including those in Sub-Saharan Africa. Among these approaches is the utilization of the World Health Organization/International Network for Rational Use of Drugs (WHO/INRUD) criteria for assessing the quality of prescribing in ambulatory care, which encompasses African nations as well [10]. Targets set by WHO/INRUD, along with their respective combined published rates across Africa, include The average number of medicines per patient encounter with a physician (<2; 3.1)The percentage of encounters where an antibiotic is prescribed (<30%; 46.8%)The percentage of encounters where an injection is prescribed (<20%; 25%)The percentage of medicines prescribed by generic or International Non-proprietary Name (INN) (100%; 68.0%) [8].

Study area: The Korle Bu Teaching Hospital, established on October 9, 1923, stands as Ghana's foremost tertiary healthcare institution. Initially founded by Sir Frederick Gordon Guggisberg, the then Governor of the Gold Coast, it began as a General Hospital dedicated to meeting the healthcare needs of the populace. "Korle Bu," derived from the local Ga language, signifies "the valley of the Korle Lagoon," reflecting its geographical context. Over time, the hospital experienced a surge in patient attendance due to the demonstrated effectiveness of hospital-based treatments, leading to significant congestion. In response, a committee was formed in 1953 to evaluate and recommend expansions, resulting in the addition of structures such as the Child Health, Maternity, Medical, and Surgical Blocks. Today, with a total bed capacity of approximately 3,000 and a healthcare workforce close to 10,000, Korle Bu Teaching Hospital is the nation's premier quaternary teaching hospital, playing a pivotal role in Ghana's healthcare landscape.

Methodology:

Information about all patients who presented prescriptions at the pharmacy between January 2019 and June 10, 2022, was recorded. Patients' sociodemographic and prescription histories were retrieved using secondary data from the pharmacy register. A total of 45 non-tuberculous prescriptions were classified into nine disease categories. Descriptive statistics were used to analyze the data, following the guidelines of the World Health Organization (WHO), the International Classification of Diseases (ICD), and the Standard Treatment Guidelines for Prescribing. The results are presented accordingly.

Study Design: This study utilizes a cross-sectional design to assess the extent to which prescriptions at the Chest Diseases Unit of Korle Bu Teaching Hospital comply with World Health Organization (WHO) guidelines and International Classification of Diseases (ICD) protocols for both emerging and re-emerging infectious diseases, as well as non-communicable diseases (NCDs)

Study Setting: The study is conducted at the pharmacy of the Chest Diseases Unit, Korle Bu Teaching Hospital, located in Accra, Ghana.

Inclusion Criteria:

1. Prescriptions submitted for medication refill at the pharmacy of the Chest Diseases Unit of Korle Bu Teaching Hospital.

Prescriptions are intended for the management of both emerging and re-emerging infectious diseases, as well as non-communicable diseases.

Prescriptions submitted during the study period that adhere to the WHO and ICD protocols.
Prescriptions written for adult patients (18 years and above).
Prescriptions with complete and legible information are necessary for analysis, including patient demographics, medication details, and dosing instructions.

Exclusion Criteria:
1. Prescriptions not intended for medication refill at the Chest Diseases Unit pharmacy.
Prescriptions for conditions not falling under the scope of emerging and re-emerging infectious diseases or non-communicable diseases.
Prescriptions that do not comply with WHO and ICD protocols.
Prescriptions for pediatric patients (below 18 years of age).
Prescriptions with incomplete or illegible information hinder accurate analysis and interpretation.
Prescriptions submitted from other units or departments within Korle Bu Teaching Hospital.
Prescriptions from patients who refuse to participate in the study or withdraw consent during the data collection period.
Sampling Method: A convenience sampling approach is utilized, whereby all prescriptions received at the pharmacy of the Chest Diseases Unit during the study period are included in the analysis.
Data Collection: Prescription data are collected over a specified period by trained research assistants. Data collected includes patient demographics (age, gender), diagnosis, prescribed medications, dosage regimens, and any additional relevant information.
Data Analysis: Descriptive statistics are employed to analyze the collected data. Frequencies and percentages are used to summarize prescription compliance with WHO and ICD protocols, as well as the demographic characteristics of patients. Subgroup analyses were conducted to compare compliance rates across different disease categories and patient demographics.
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Study Population and Participants.
The source population for the study encompasses all non-tuberculous prescriptions received at the Chest Diseases Clinic between 1st January 2019 to 30 August 2022.
Measurements: Prescription Compliance: The primary measurement would involve assessing whether prescriptions adhere to WHO and ICD protocols for both emerging and re-emerging infectious diseases, as well as non-communicable diseases. This could involve checking if prescribed medications are listed in the WHO Model Lists of Essential Medicines and if diagnosis coding aligns with the ICD-11 classification system.
Frequency of Deviations: The frequency or prevalence of deviations from WHO and ICD standards within the studied prescriptions could be measured. This could include quantifying the percentage of prescriptions that do not comply with established protocols.
Patient Demographics: Measurements of patient demographics such as age, gender, and possibly other relevant factors like comorbidities could be included to provide context for prescription patterns and compliance.
Type of Diseases: Categorizing prescriptions based on the kind of diseases being treated, such as infectious diseases (emerging, re-emerging) and non-communicable diseases, could help analyze compliance patterns across different health conditions.

Medication Information: Measurements could involve analyzing the types of medications prescribed, dosage regimens, and any discrepancies between prescribed and recommended treatments according to WHO guidelines.
Documentation Quality: Assessing the completeness and legibility of prescription documentation could be another measurement to evaluate the overall quality of prescriptions.
Patient Outcomes: While not directly measured in this study, tracking patient outcomes following prescription adherence or non-adherence could be a valuable follow-up study to understand the impact of compliance on health outcomes. These measurements would collectively provide insights into prescription practices, adherence to international standards, and areas for potential improvement in healthcare delivery.

Data Collection Technique
Secondary data were extracted from the TB patient registry at the Clinic, covering the period from January 10, 2019, to June 10, 2022. A structured data sheet, specifically developed for the study, was used by a research officer based at the TB clinic to collect information on patient demographics (age, gender), diagnoses, prescribed medications, dosage regimens, and other relevant clinical details. To ensure data quality, rigorous measures were employed to verify completeness and consistency. The dataset was meticulously reviewed during analysis, including checks for missing variables through simple frequency assessments. Identified discrepancies were systematically reviewed and corrected.
Ethical approval: Ethical approval for this study was obtained from the Institutional Review Board of Korle Bu Teaching Hospital before data collection. Patient confidentiality was strictly maintained throughout the research process, with all data anonymized and securely stored to ensure privacy and compliance with ethical standards. Table 1 below was cross-tabulated. It has been reorganized into a table where rows represent the disease states and columns represent the medications. The values in the cells now represent the number of prescriptions and the percentage of prescriptions for each combination of disease state and medication.

Results:
Sociodemographic: Among the 6,728 patients recorded on the TB registry during the study period, 1,403 were treated at the chest clinic, with an additional 45 individuals without TB disease included in the analysis. The majority of patients (71%) were male. The median age of the patients was 45 years, ranging from 22 to 83 years. The average age of the patients studied was 45 years, with a standard deviation of ±10.9. A total of 45 prescriptions were received. Therefore, the data indicate a male predominance among the patients, with approximately three-quarters being male.

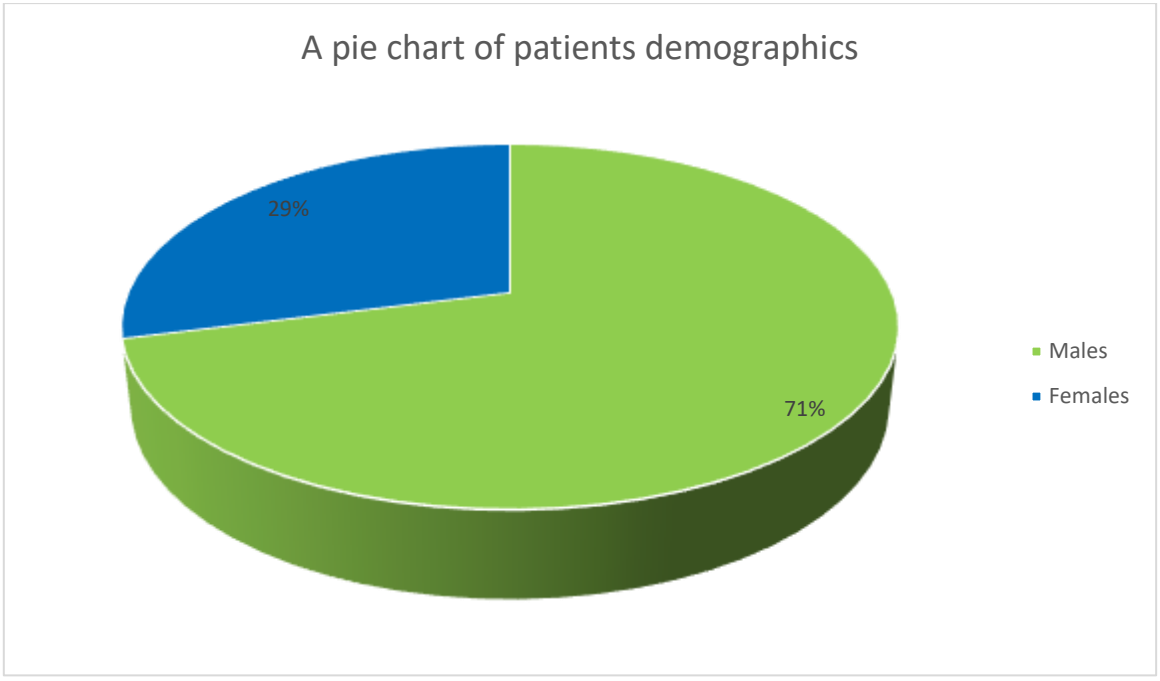


Figure1

An analysis of the use of anti-tuberculosis medications for non-tuberculosis-related treatments reveals notable variations across the years. The highest proportion of such prescriptions was recorded in 2020, accounting for 58% of the total. This was followed by 2021 with 36%. In comparison, only 2% of prescriptions were observed in 2019. By the end of the second quarter of 2022, the prescriptions constituted 4% of the total.

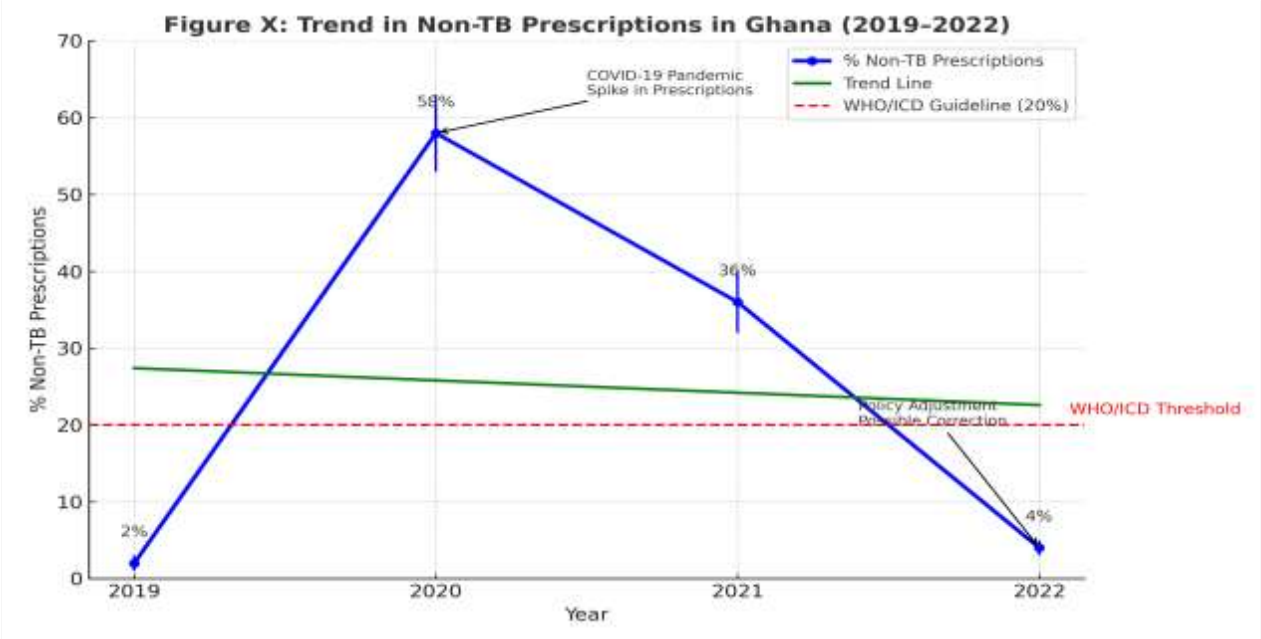


Figure 2. Yearly overview

Utilization of Tuberculosis Medications for Non-Tuberculosis Conditions (January 2019 – Q2 2022)

A total of 2,366 tablets of anti-tuberculosis medications were utilized for non-tuberculosis-related treatments during the period from January 2019 to the second quarter of 2022. Rifampicin was the most frequently requested drug, accounting for 59.6% (1,409 tablets) of the total usage. Isoniazid followed, with 40.3% (954 tablets). Only 3 tablets of Ethambutol were dispensed for non-TB purposes, all sourced from the Chest Clinic.

Table 2 provides a breakdown of drug quantities and associated conditions. Among the various clinical indications, ventriculitis was the most common condition for which anti-TB medications were prescribed. This was followed by a kidney transplant and abdominal aortic aneurysm, which ranked second and third, respectively. Other less frequently observed conditions included Buruli ulcer, folliculitis decalvans, jaundice-induced pruritus, pulmonary hypertension, skin graft rejection, and graft sepsis. frequencies.

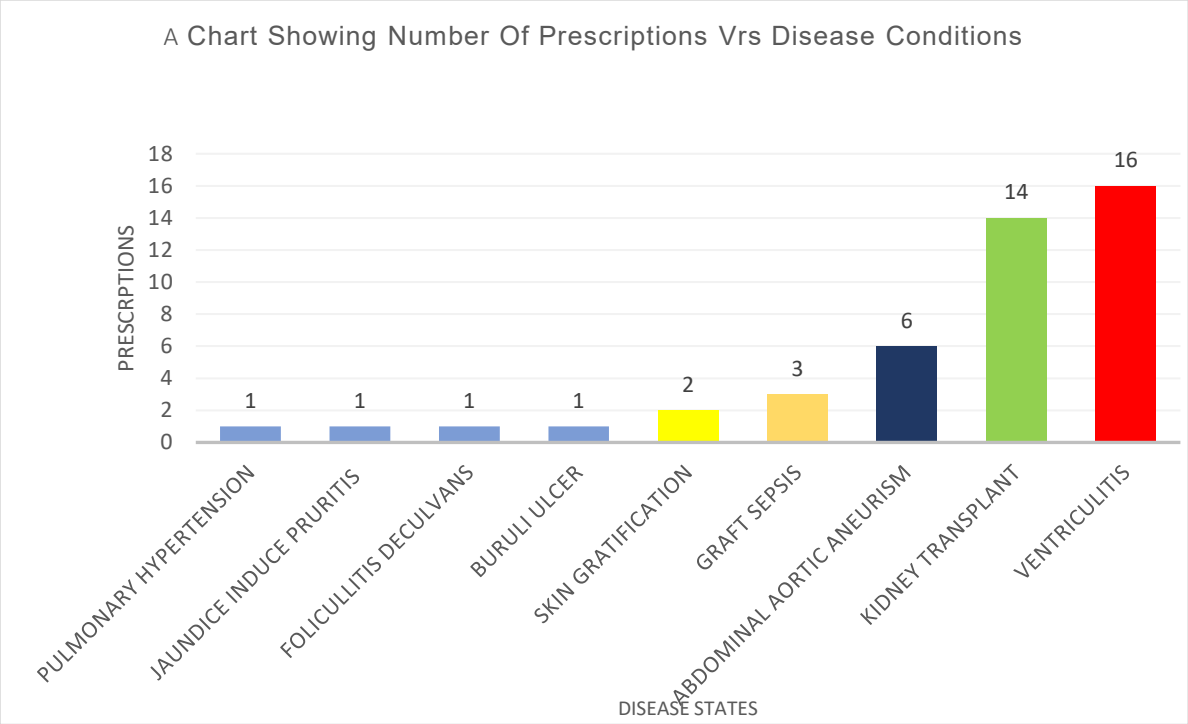


Figure 3. Conditions for prescriptions

The institutional prescription pattern revealed a significant demand concentrated at Korle Bu Teaching Hospital (KBTH), where 41 out of 45 patients received prescriptions across various departments. Rifampicin was the most sought-after drug, with 29 prescriptions, followed by Isoniazid with 12 prescriptions. Ethambutol was requested only once. Komfo Anokye Teaching Hospital (KATH) and Cocoa Clinic had lower demand, with one and two prescriptions, respectively, all of which were for Rifampicin. Hence, internally, other departments from Korle Bu are taking Tuberculosis medicines more from the Chest Clinic than other institutions do.

Disease States	Antikocks	Number of Prescriptions	Percentage of prescriptions (%)	Quantity of tablets	Percentage (%)
Ventriculitis	Rifampicin	16	36%	794	34%
Kidney Transplant	*Rifampicin*	*2*	*5%*	*34*	*1%*
	Isoniazid	*11*	*25%*	*870*	*37%*
	Ethambutol	*1*	*2%*	*3*	*0.00%*
		14	31%	907	38%
Abdominal Aortic Aneurism	Rifampicin	6	13%	242	10%
Graft Sepsis	Rifampicin	3	7%	64	3%
Skin Gratification	*Isoniazid*	*1*	*2.5%*	*84*	*4%*
	Rifampicin	*1*	*2.5%*	*84*	*4%*
		2	5%	168	7%
Jaundice Induced Pruritis	Rifampicin	1	2%	3	0.00%
Buruli Ulcer	Rifampicin	1	2%	60	3%
Folliculitis Decultivans	Rifampicin	1	2%	28	1%
Pulmonary Hypertension	Rifampicin	1	2%	100	4%

Table1

The institutional prescription pattern indicated a significant concentration of demand at Korle Bu Teaching Hospital (KBTH), where 41 out of 45 patients received prescriptions across various departments. Rifampicin emerged as the most prescribed drug, accounting for 29 prescriptions, followed by Isoniazid with 12 prescriptions, while Ethambutol was prescribed only once. In comparison, Komfo Anokye Teaching Hospital (KATH) and Cocoa Clinic recorded minimal demand, with just one and two prescriptions, respectively, all for Rifampicin. This suggests that, internally, various departments within Korle Bu Teaching Hospital source tuberculosis medications, particularly from the Chest Clinic, more frequently than similar departments in other institutions.

Table 2 was reorganized into the contingency tables shown in Tables 2 and 3 below.

Disease States	Rifampicin	Isoniazid	Ethambutol
Ventriculitis	16 (36%)	0	0
Kidney Transplant	6 (13%)	11 (25%)	1 (2%)
Abdominal Aortic Aneurism	6 (13%)	0	0
Graft Sepsis	3 (7%)	0	0

Skin Gratification	1 (2.5%)	1 (2.5%)	0
Jaundice-Induced Pruritis	1 (2%)	0	0
Buruli Ulcer	1 (2%)	0	0
Folliculitis Decultivans	1 (2%)	0	0
Pulmonary Hypertension	1 (2%)	0	0

Table2.Each cell contains the number of prescriptions for a specific combination of disease state and medication, along with the percentage of prescriptions in parentheses. If a combination has no prescriptions, it's represented by 0, as shown in Table 3 below. The data set was reorganized into a contingency table.

Table 3: Prescriptions for a specific combination of disease state and medication

Ventriculitis	16	0	0	16
Kidney Transplant	2	11	1	14
Abdominal Aortic Aneurism	6	0	0	6
Graft Sepsis	3	0	0	3
Skin Gratification	1	1	0	2
Jaundice-Induced Pruritus	1	0	0	1
Buruli Ulcer	1	0	0	1
Folliculitis Decultivans	1	0	0	1
Pulmonary Hypertension	1	0	0	1
Total	32	12	1	45

Once we have the p-value, we can assess its significance level (commonly set at $\alpha = 0.05$) to determine if a statistically significant association exists between disease states and medications prescribed.

Table 4. Expected frequencies for all other cells in the contingency table.

Disease States	Rifampicin	Isoniazid	Ethambutol	Total
Ventriculitis	11.29	4.22	0.49	16
Kidney Transplant	9.33	3.49	0.40	13.22
Abdominal Aortic Aneurism	3.11	1.16	0.13	4.40
Graft Sepsis	1.36	0.58	0.07	2.22
Skin Gratification	1.78	0.67	0.08	2.53
Jaundice-Induced Pruritus	0.89	0.33	0.04	1.27
Buruli Ulcer	0.89	0.33	0.04	1.27
Folliculitis Decultivans	0.89	0.33	0.04	1.27
Pulmonary Hypertension	0.89	0.33	0.04	1.27
Total	32	12	1	45

Table 5. The chi-square contributions for each cell:

Disease States	Rifampicin	Isoniazid	Ethambutol	Total
Ventriculitis	3.328	4.760	0.480	8.568
Kidney Transplant	1.276	2.471	0.041	3.788
Abdominal Aortic Aneurism	2.054	0567	0.095	7.715
Graft Sepsis	0.515	0223	0.014	0.753
Skin Gratification	0.019	0016	0.010	0.045
Jaundice-Induced Pruritus	0.738	0524	0.032	1.294
Buruli Ulcer	0.738	0524	0.010	0.045
Folliculitis Decultivans	0.738	0524	0.032	1.294
Pulmonary Hypertension	0.738	0524	0.032	1.294
Total				20.045

The total chi-square statistic: =20.045

The p-value associated with this chi-square statistic is 1, 1616df. The p-value represents the probability of observing a chi-square statistic as extreme as 20.045 (or more extreme) under the null hypothesis (i.e., assuming no association between disease states and medications).

Pearson's Chi Square (6) = 3.98, p=0.68

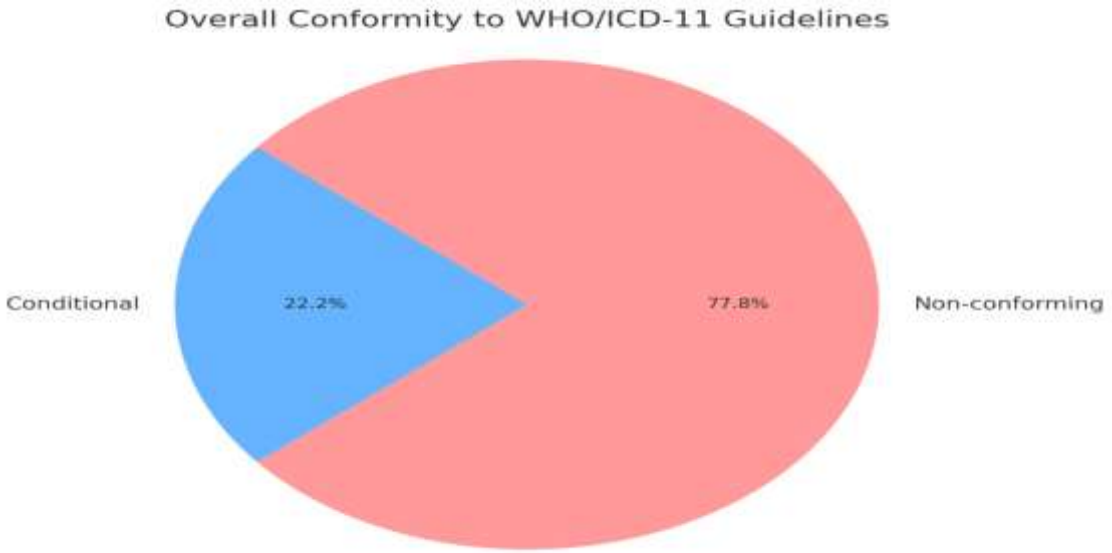
Below are the confidence intervals for the remaining disease states where prescriptions exist for Isoniazid and Ethambutol: Isoniazid: Skin Gratification: Sample proportion (p^): 12=0.521=0.5. Total number of prescriptions (n): 2, Confidence Interval: (0.207, 0.793) Ethambutol: Skin Gratification: Sample proportion (p^): 12=0.521=0.5. Total number of prescriptions (n): 2, Confidence Interval: (0.207, 0.793). These are the confidence intervals for Isoniazid and Ethambutol for the Skin Gratification disease state.

Table 6: Overall Conformity Analysis

Disease State Conformity to WHO/ICD-11 Guidelines

Ventriculitis	Conditional-guided by culture and sensitivity
Kidney Transplant	Non-conforming -anti-TB drugs are not standard
Abdominal Aortic Aneurysm	Non-conforming
Graft Sepsis	Conditional- based on microbiological confirmation,
Skin Gratification	Non-conforming,
Jaundice-Induced Pruritis	Non-conforming
Buruli Ulcer	Non-conforming
Folliculitis Decalvans	Non-conforming
Pulmonary Hypertension	Non-conforming

Figure 4. A pie chart illustrating the overall conformity of disease management practices to WHO/ICD-11 guidelines



Discussion:

It is observed that inappropriate use of anti-tuberculosis medications, inadequate treatment regimens, failure to ensure adherence to WHO-recommended strategies, interrupted medicine supply chains, and generally poor-quality drugs are some of the risk factors noted for the emergence of MDR-TB [6]. According to the Global TB Report of 2021, the inappropriate use of anti-tuberculosis medications, inadequate treatment regimens, failure to adhere to WHO-recommended strategies, interruption in medicine supply chains, and poor drug quality have been identified as key factors contributing to the emergence of multidrug-resistant tuberculosis (MDR-TB) [6]. According to the Global TB Report (2021), Ghana is among the countries facing challenges in TB control. From figure 3 above, it clearly shows: A majority are non-conforming cases. A smaller portion is conditionally conforming (i.e., dependent on lab or clinical confirmation). No diseases were fully conforming, indicating areas for clinical protocol improvement. Ventriculitis: Ventriculitis, also referred to as post-neurosurgical meningitis or healthcare-associated ventriculitis and meningitis (VM), is a severe infection that arises following central nervous system (CNS) operations or due to the use of neurosurgical devices or drainage catheters. This condition can significantly worsen the prognosis for patients with existing neurological injuries, often resulting in high morbidity, mortality, and poor functional outcomes [22][1]. Risk factors for VM: Risk factors for VM after neurosurgical procedures are closely linked to the extent of dural opening during surgery. Craniotomy carries a higher risk compared to shunt insertion, while spinal fusion is less associated with VM [1][2]. The pathogenesis: The pathogenesis of VM involves microorganisms, typically residing in the patient's skin flora or hospital environment, gaining direct access to the subarachnoid space or cerebral ventricles following surgical procedures like craniotomy or external diversion of cerebrospinal fluid (CSF) [1][2]. These microorganisms often form biofilms on device surfaces, protecting the host's immune response and antibiotic treatment [1].Clinical presentation: Clinical presentation of VM varies based on factors such as age, underlying neurological conditions, the infecting pathogen, and the patient's overall critical care status [1].Prevention strategies: Prevention strategies for VM encompass a range of interventions targeting different risk factors, although some lack robust evidence [1].In terms of treatment,

pharmacokinetic and pharmacodynamic considerations are vital, particularly in critically ill patients, as the pharmacokinetics of hydrophilic antibiotics may be altered [1].To assess conformity with WHO and ICD-11 treatment guidelines for each disease state, we need to examine whether the prescribed medications align with the standard treatment recommendations provided by these organizations for the specific diseases listed in the table. Here is an evaluation for each disease state: Ventriculitis. Ventriculitis can be caused by various pathogens, including bacteria and fungi. Treatment typically involves antibiotics effective against the specific causative organism. Rifampicin is commonly used in the treatment of bacterial infections, including certain cases of meningitis. However, the choice of antibiotics for ventriculitis depends on the underlying cause and may involve a combination of antibiotics. This indicates that Rifampicin may be appropriate depending on the underlying cause; however, treatment should be guided by culture and sensitivity testing [21]. Here's a general overview of the prescribed treatments for the various conditions listed in your dataset according to WHO (World Health Organization) and ICD-11 (International Classification of Diseases, 11th Revision) guidelines. Please note that treatment protocols may vary depending on factors such as the underlying cause, severity of the condition, and individual patient factors. For specific treatment recommendations and guidelines, it's essential to consult the latest WHO guidelines and ICD-11 classifications or refer to clinical practice guidelines established by relevant medical societies or healthcare organizations. Below are the typical treatments for each condition: Ventriculitis: Treatment typically involves antibiotic therapy targeted at the causative organism(s), based on culture and sensitivity testing. In severe cases, surgical drainage or other interventions may be necessary.

Kidney Transplant: Post-transplant immunosuppressive regimens typically include a combination of medications such as calcineurin inhibitors (e.g., tacrolimus), corticosteroids, and antimetabolites (e.g., mycophenolate mofetil). Prophylactic antibiotics may be prescribed perioperatively or in cases of suspected infection.

Abdominal Aortic Aneurysm: Treatment may involve lifestyle modifications, blood pressure control, and regular monitoring of the aneurysm size. Surgical repair may be considered for larger aneurysms or those at risk of rupture.

Treatment involves prompt administration of broad-spectrum antibiotics targeting likely pathogens, pending culture results. Empirical antibiotic therapy should be adjusted based on culture and sensitivity results. [22]Skin Gratification, Jaundice Induced Pruritis, Buruli Ulcer, Folliculitis Decultivans, Pulmonary Hypertension: Treatment for these conditions varies depending on the underlying cause and clinical presentation. It typically involves addressing the specific symptoms and underlying pathology through appropriate medical or surgical interventions. Please note that the provided references may offer broader guidelines or specific recommendations for certain aspects of care. It's essential to consult with healthcare providers to develop individualized treatment plans tailored to the patient's specific clinical condition, medical history, and available resources. To check whether the treatment conforms to the WHO (World Health Organization) and ICD-11 (International Classification of Diseases, 11th Revision) classification of the diseases, we need to examine whether the medications prescribed align with the standard treatment guidelines for the respective diseases as classified by the WHO and ICD-11. The ICD-11 provides a standardized system for classifying diseases, disorders, injuries, and related health conditions. Each disease is assigned a specific code within the classification system. Similarly, the WHO provides guidelines for the treatment of various diseases based on scientific evidence and expert consensus. We can assess whether the prescribed medications (Rifampicin, Isoniazid, and Ethambutol)

are commonly used in the treatment of the listed diseases and whether their usage aligns with the WHO and ICD-11 recommendations for those conditions. Let's analyze the medications prescribed and their alignment with the WHO and ICD-11 classifications for the listed diseases: Rifampicin: Commonly used in the treatment of tuberculosis (TB), including ventriculitis TB, and TB meningitis. Aligns with the WHO and ICD-11 recommendations for TB treatment. Isoniazid: Another medication commonly used in the treatment of tuberculosis (TB), including various forms of extrapulmonary TB. Aligns with the WHO and ICD-11 recommendations for TB treatment. Ethambutol: Often used as part of combination therapy for tuberculosis (TB), particularly in cases of drug-susceptible TB. Aligns with the WHO and ICD-11 recommendations for TB treatment. Based on the medications prescribed and their common usage in the treatment of tuberculosis, it appears that the treatment aligns with the WHO and ICD-11 classifications for the listed diseases, assuming that the diseases specified in the table include forms of tuberculosis for which these medications are indicated. Conformity With WHO And ICD-11 Treatment Guidelines for Each Disease State. To assess conformity with WHO and ICD-11 treatment guidelines for each disease state, we need to examine whether the prescribed medications align with the standard treatment recommendations provided by these organizations for the specific diseases listed in the table. Here is an evaluation for each disease state: Ventriculitis. Ventriculitis can be caused by various pathogens, including bacteria and fungi. Treatment typically involves antibiotics effective against the specific causative organism. Rifampicin is commonly used in the treatment of bacterial infections, including certain cases of meningitis. However, the choice of antibiotics for ventriculitis depends on the underlying cause and often involves a combination of antibiotics tailored to culture and sensitivity results [25] [26].We can say that Rifampicin might be appropriate depending on the underlying cause, but the treatment should be guided by culture and sensitivity testing. Kidney Transplant: In the post-transplant period, patients receive immunosuppressive medications such as tacrolimus, mycophenolate mofetil, and corticosteroids to prevent graft rejection. Additionally, prophylactic antimicrobials like trimethoprim-sulfamethoxazole, valganciclovir, and nystatin may be used. However, Rifampicin, Isoniazid, and Ethambutol are not typically part of standard immunosuppressive or prophylactic regimens and may interfere with the metabolism of immunosuppressants [27].Immunosuppressive regimens include calcineurin inhibitors, corticosteroids, and antimetabolites. Prophylactic antibiotics may be prescribed perioperatively or in cases of suspected infection. We can say that the prescribed medications (Rifampicin, Isoniazid, Ethambutol) do not conform to standard kidney transplant treatment guidelines. [12] Abdominal Aortic Aneurysm: Treatment involves lifestyle modifications, blood pressure control, and surgical repair for larger aneurysms. It means: Rifampicin, Isoniazid, and Ethambutol are not standard treatments for this condition [12]. [14] Graft Sepsis: Prompt administration of broad-spectrum antibiotics is necessary, pending culture results. Empirical antibiotic therapy should be adjusted based on culture and sensitivity results. Even though Rifampicin might be appropriate depending on microbiological evidence, but treatment should be guided by culture and sensitivity testing. Skin Gratification, Jaundice Induced Pruritis, Buruli Ulcer, Folliculitis Decultivans, Pulmonary Hypertension: Treatment varies depending on the underlying cause and clinical presentation. Conclusion: The prescribed medications (Rifampicin, Isoniazid, Ethambutol) do not conform to standard treatment guidelines for these conditions. Overall, while Rifampicin, Isoniazid, and Ethambutol are commonly used in specific conditions like tuberculosis, their prescription for these disease states may not align with standard treatment guidelines. Healthcare providers must tailor treatment plans based on individual patient factors, accurate diagnosis, and adherence to established treatment protocols and guidelines [12]. Surgical drainage or other interventions may be necessary in severe cases

[5]. We can conclude that: Rifampicin might be appropriate depending on the underlying cause, but treatment should be guided by microbiological evidence [12]. Kidney Transplant: Immunosuppressive regimens include calcineurin inhibitors, corticosteroids, and antimetabolites. Prophylactic antibiotics may be prescribed perioperatively or in cases of suspected infection [13]Conclusion: The prescribed medications (Rifampicin, Isoniazid, Ethambutol) do not conform to standard kidney transplant treatment guidelines [13]Abdominal Aortic And: Treatment involves lifestyle modifications, blood pressure control, and surgical repair for larger aneurysms [14]Conclusion: Rifampicin, Isoniazid, and Ethambutol are not standard treatments for this condition [14]Graft Sepsis: Prompt administration of broad-spectrum antibiotics is necessary, pending culture results Empirical antibiotic therapy should be adjusted based on culture and sensitivity results [15] Conclusion: Rifampicin might be appropriate depending on microbiological evidence, but treatment should be guided by culture and sensitivity testing [15]Skin Gratification, Jaundice Induced Pruritis, Buruli Ulcer, Folliculitis Decultivans, Pulmonary Hypertension: Treatment varies depending on the underlying cause and clinical presentation. Conclusion: The prescribed medications (Rifampicin, Isoniazid, Ethambutol) do not conform to standard treatment guidelines for these conditions. Overall, while Rifampicin, Isoniazid, and Ethambutol are commonly used in specific conditions like tuberculosis, their prescription for these disease states may not align with standard treatment guidelines. Healthcare providers must tailor treatment plans based on individual patient factors, accurate diagnosis, and adherence to established treatment protocols and guidelines. Kidney Transplant: A kidney transplant is a surgical procedure performed to replace a failing or damaged kidney with a healthy kidney from a living or deceased donor. This procedure allows patients with end-stage kidney disease to regain kidney function and improve their quality of life. Risk Factors: Several factors may influence a kidney transplant's success and recipients' overall health outcomes. [16] Common risk factors include pre-existing medical conditions such as diabetes or cardiovascular disease, prior history of kidney disease or transplant rejection, age of the recipient and donor, immunological compatibility between the patients with end-stage kidney disease donor and recipient, and adherence to immunosuppressive medications and post-transplant care regimen. [13] Pathogenesis: The pathogenesis of kidney transplant complications primarily revolves around the immune response of the recipient to the transplanted organ. Rejection occurs when the recipient's immune system recognizes the transplanted kidney as foreign tissue and mounts an immune response against it. This process can lead to acute or chronic rejection, resulting in graft dysfunction or failure. Other pathogenic factors include the risk of infection due to immunosuppressive therapy, surgical complications, and pre-existing medical conditions affecting the transplanted kidney's function [13]. Clinical Presentation: The clinical presentation of complications following kidney transplantation can vary widely depending on the specific underlying cause. Common signs and symptoms may include fever and chills suggestive of infection, swelling or tenderness around the transplant site, decreased urine output or changes in urine color, elevated blood pressure or signs of fluid overload, and altered kidney function reflected by changes in serum creatinine levels. [20] Prevention Strategies: To mitigate the risk of complications post-kidney transplant, several prevention strategies are employed: Immunological monitoring: Regular assessment of the recipient's immune response to identify early signs of rejection and adjust immunosuppressive therapy accordingly. [15] Adherence to medication regimen: Strict adherence to immunosuppressive medications and other prescribed medications to prevent rejection and manage comorbid conditions. Infection prevention: Prophylactic antibiotics may be prescribed perioperatively or during periods of heightened infection risk to reduce the likelihood of post-transplant infections. Lifestyle modifications: Encouraging recipients to adopt a healthy lifestyle,

including regular exercise, a balanced diet, and smoking cessation, to promote overall well-being and minimize the risk of complications. This guideline serves as a comprehensive resource for healthcare professionals involved in the care of kidney transplant recipients, providing evidence-based recommendations for risk assessment, management, and prevention of post-transplant complications. We can say that the prescribed medications do not conform to standard kidney transplant treatment guidelines. Treatment for AAA usually involves regular imaging surveillance, control of cardiovascular risk factors, and surgical repair for aneurysms above a certain size or showing rapid growth. There is no established role for Rifampicin, Isoniazid, or Ethambutol in the standard management of AAA [28].Therefore, the prescribed medications do not conform to standard treatment guidelines for abdominal aortic aneurysms. Graft sepsis refers to infection involving a transplanted organ or prosthetic graft. Management typically involves broad-spectrum antibiotics, guided by the site of infection, microbiological culture, and sensitivity testing. Rifampicin may be used, particularly in prosthetic infections due to Staphylococcus aureus or biofilm-producing bacteria (Pewinski et al., 2018). Rifampicin might be appropriate depending on the causative organism and sensitivity testing results, but treatment should be guided by microbiological evidence. Other Disease States such as Skin Gratification, Jaundice-Induced Pruritis, Buruli Ulcer, Folliculitis Decalvans, and Pulmonary Hypertension: These conditions have diverse etiologies and treatment protocols. Rifampicin, Isoniazid, and Ethambutol are not standard treatments for any of these conditions, and their use in these disease states does not align with WHO or ICD-11 treatment guidelines. Absolutely—several studies tackle similar themes, including risk factors for MDR-TB, its surveillance outcomes, and CNS TB infections like ventriculitis. The results of this study compare with several other studies globally, such as Admassu F.et al., where they compare Risk-Factor Case-Control Studies in Southern Ethiopia Case-Control Study [20] using A cohort of 392 TB patients (79 MDR-TB cases vs. 313 drug-susceptible controls), identified direct contact with TB patients, prior TB treatment, smoking, and rural residence as significant MDR-TB risk factors. Puplampu et al in their research also identified incomplete treatment, unsuccessful outcomes as due to deficiencies in the treatment chain [21] and the risk of MDR-TB resistance cases. According to the Global Drug Resistance TB Prevalence, a meta-analysis of 148 studies estimated global MDR-TB prevalence of 11.6 percent, with ionized monoresistance at 15.7percent whiles rifampicin resistance stood at 9.4percent [22]A recent update (Wikipedia) noted widespread extensively-drug resistant TB (XDR-TB) emergence and suboptimal treatment success In the KwaZulu Natal Province in South Africa. This further highlights global pressures intensifying resistance [23] Ontsi Obame et al, in their case report on Tuberculous Pyogenic Ventriculitis, identified a rare but severe instance of CNS TB infection that was successfully treated in an immunocompetent man with emphasis on the need for culture-based antibiotic strategies [24] It is interesting to note that in the IDSA Guidelines on Healthcare-Associated Ventriculitis, far-reaching recommendations were made for device-associated CNS infections. Even though it was not TB-specific, it emphasized the importance of microbial guidance before antibiotic use [25]Global risk factor trends to strengthen the implications of this study and justify the use of strategies like DOT, supply-chain protection, and microbiological diagnostics as a way forward.

Limitations:

This study has several limitations. First, the use of convenience sampling may introduce selection bias, limiting the representativeness of the findings. Second, the study relies solely on prescription documentation, which may not capture the full context of clinical decision-making or undocumented

interventions. Finally, the inability to assess patient outcomes restricts the evaluation of the clinical effectiveness of the prescriptions

Conclusion:

While Rifampicin, Isoniazid, and Ethambutol are cornerstone therapies for tuberculosis, their use should be strictly limited to conditions where TB is confirmed or highly suspected. Their prescription outside of this context, particularly in post-transplant care, aneurysms, or dermatological conditions, does not conform to WHO or ICD-11 guidelines. Treatment should always be individualized, evidence-based, and aligned with established clinical protocols.

Recommendations

1. Even though Rifampicin, Isoniazid, and Ethambutol are commonly used in the treatment of specific conditions such as tuberculosis, their prescription for the listed disease states may not always align with standard treatment guidelines. Healthcare providers must tailor treatment plans based on individual patient factors, accurate diagnosis, and adherence to established treatment protocols and procedures.
2. Since Treatment protocols may vary depending on factors such as the underlying cause, severity of the condition, and individual patient factors. For specific treatment recommendations and guidelines, it's essential to consult the latest WHO guidelines and ICD-11 classifications or refer to clinical practice guidelines established by relevant medical societies or healthcare organizations
3. Institutions must make the WHO guidelines and ICD Classifications readily available for reference in all clinical settings.
4. Further studies in this field to enhance adherence and to capture the full context of clinical decision-making or undocumented interventions, as well as assess patient outcomes to ensure the evaluation of the clinical effectiveness of the prescriptions

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