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Prescribing trend of treating malaria patients by public and private healthcare facilities in Lahore

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Abstract

Malaria is an infectious disease caused by parasites of the Plasmodium genus. It is one of the major causes of morbidity and mortality worldwide. The World Health Organization (WHO) has recommended artemisinin combination therapy (ACT) to manage malaria among children and adults. However, chloroquine as monotherapy and ACT are commonly prescribed in treating malaria in Pakistan's healthcare delivery system. Therefore, this study assessed the prescribing trends for treating malaria patients in public and private healthcare facilities. Moreover, the study also determined the number of drugs prescribed per prescription by physicians and consultants. This descriptive study was conducted for six months in Lahore's major public and private healthcare facilities. A purposive sampling technique was employed to review 300 malaria patients' prescriptions accessed from the hospital records. Descriptive statistics and the chi-square test were used to achieve the study's objectives. The study showed that most malaria prescriptions were from both public (64.67%) and private healthcare facilities (42.67%) and comprised a dual-drug regimen involving antimalarials, antibiotics, antipyretics, or their combinations. There was a significant difference ($p = 0.002$) in the prescription trend between public and private healthcare facilities regarding the number of drugs prescribed for treating malaria. Moreover, prescriptions from private healthcare facilities mainly contained antimalarial drugs (58.59%) and antibiotics (17.60%), while most prescriptions from public healthcare facilities contained antipyretics and other drugs (60.67%) ($p = 0.001$). Most of the consultants prescribed two (66.67%) or three drugs (33.33%), while the prescribing trends of physicians ranged between one and four, which was also statistically significantly different ($p = 0.001$). In addition, most prescriptions from public healthcare facilities were rationally prescribed (68%). On the other hand, most prescriptions from private healthcare facilities were rational (54%) and semirational (42%). The rationality of prescriptions by public and private healthcare facilities was also significantly different ($p = 0.001$). Public healthcare facilities were found to exhibit more rational prescribing trends for managing malaria compared to private healthcare facilities, with a focus on prescribing an optimal number of drugs per prescription and a lower usage of antimalarial and antibiotic medications.

Keywords

Malaria management; Prescribing trends; Prescription analysis; Rational drug use

1. Introduction

Malaria is an infectious disease caused by parasites of the Plasmodium genus and acquired through the bite of female Anopheles mosquitoes [1]. Four types of species of plasmodium, including P. falciparum, P. vivax, P. ovale, and P. malariae, are common causes of human infections [2]. Symptoms of malaria include fever, chills, rigors, cough,

headache, sweating, lethargy, and myalgia. In addition, gastrointestinal symptoms may be prominently observed among patients, including nausea, vomiting, diarrhea, and abdominal pain [3, 4]. The standard for diagnosing malaria is the microscopy of blood smears. However, rapid diagnostic kits are available and employed in regions where microscopy cannot be performed or is unavailable [5].

Malaria cases are common among African and some Asian countries, contributing to up to one million deaths annually [6, 7]. According to the World Health Organization (WHO), in 2017, half of the world's population was at risk because of endemic malaria in 90 counties. In the same year, 219 million cases occurred across the globe, which resulted in 400,000 deaths [8]. However, in 2018, the infection resulted in 228 million cases and 405,000 deaths worldwide [9]. Efforts at international and national levels have been made to control and prevent malaria infections. However, studies have reported increased hospital admissions among malaria-endemic countries [10, 11].

Earlier, the WHO recommended treating malaria using a single pharmacological agent, i.e., monotherapy, but later recommended artemisinin combination therapy (ACT) for managing malaria among children and adults due to drug resistance [12, 13]. Furthermore, injectable artesunate, followed by oral doses of ACT, is recommended by the WHO for treating severe malaria [14]. In addition, it is also recommended not to delay malaria treatment after confirmation through the laboratory [15].

Studies have reported that prescribing trends from most public sector healthcare facilities adhere to the WHO guidelines and qualify most of the national prescribing indicators. However, polypharmacy and irrational use of antibiotics are generally observed and reflected in prescriptions from public and private healthcare facilities [16, 17, 18]. Moreover, it is common for the healthcare service provider to prescribe antibiotics for managing suspected malaria to patients before receiving malaria diagnosis through the laboratory [19].

It is evident from the literature that prescriptions from public healthcare facilities contain fewer drugs than those from private healthcare facilities. For instance, an African study reported that prescriptions from public healthcare facilities contained 3.7 drugs. In contrast, prescriptions from private healthcare facilities contained 5.4 drugs. Moreover, most of the prescriptions from public healthcare facilities (54%) contained proper doses of drugs when compared with prescriptions from private healthcare facilities (9.8%) [20]. In some African countries, malaria symptoms are treated with different species of medicinal plants [21].

In the healthcare delivery system of Pakistan, chloroquine is used as monotherapy, and ACT is most commonly prescribed in treating malaria [22]. In addition, antimalarials are irrationally prescribed to nonpatients for malaria prophylaxis [23]. Furthermore, prescriptions from different healthcare facilities contain a major proportion of antibiotics and injectables [24]. Therefore, it is crucial to recognize the importance of rational drug use in the treatment of infectious diseases. Prescriptions that include inappropriate drug types, doses, frequency, dosage forms, or duration significantly contribute to irrational drug use and antimicrobial resistance. However, it is noteworthy that prescribing trends may differ between public and private healthcare facilities, and there is a local need to explore these trends.

By assessing adherence to malaria standard treatment guidelines, it can be determined which type of healthcare facilities demonstrate better adherence. Therefore, this study assessed the prescribing trends for treating malaria patients in public and private healthcare facilities. Moreover, the study also determined the number of drugs prescribed per prescription by physicians and consultants.

2. Materials and methods

2.1. Study design

This prospective descriptive study was conducted for six months, from March 2021 to August 2021.

2.2. Ethics approval

Ethical approval was obtained from the Ethics Review Committee, Hussain College of Health Sciences, Lahore (No. HCHS/18/ERC/102).

2.3. Study setting

This study was conducted in Lahore's public and private healthcare facilities, i.e., Shaikh Zaid Medical Complex and Hussain Memorial Hospital. The targeted healthcare facilities provide round-the-clock emergency services, diagnostic facilities, and indoor and outdoor patient care [25, 26].

2.4. Inclusion and exclusion criteria

The researcher accessed the hospital records of outpatients aged between 20 and 40 years who visited the targeted healthcare facility on the same day and were diagnosed with malaria, confirmed by a laboratory report. The study specifically included patients with no specified medical conditions, comorbidities, allergies, or diseases that could potentially affect the prescription analysis. However, patient records of those who revisited the hospital during their malaria incubation period were excluded from the study.

2.5. Sample size and sampling technique

The sample size was calculated using the Raosoft calculator by keeping a 5% margin of error, 95% confidence interval, and 11% response distribution [27]. Finally, 150 prescriptions from public and 150 prescriptions from private healthcare facilities were accessed and reviewed using a purposive sampling technique.

2.6. Study instrument development

The questionnaire was developed in line with the WHO's prescribing indicators and Pakistan's National Malaria Case Management Guideline, focusing on the number of drugs per prescription, the type of drugs prescribed in the prescriptions, and the type of healthcare practitioner [28, 29]. Additionally, the study employed the Index of Rational Drug Prescribing (IRDP) to determine the rationality of prescriptions by physicians and consultants [30]. Finally, the field experts reviewed the data collection tool before its final use.

2.7. Data collection

The researcher accessed and reviewed the prescriptions fulfilling the inclusion criteria in the record-keeping section of the outdoor department of the targeted healthcare facilities.

2.8. Study measures

The study instrument collected information regarding the types of healthcare facilities (public, private), the types of healthcare providers (physician, consultant), the number of drugs prescribed, and the types of drugs prescribed (antimalarial, antibiotics, antipyretics, and other drugs). The rationality of prescriptions was determined by assigning

a maximum score of 30 to drugs comprising 20 scores to main drugs, i.e., antimalarial, and ten scores to complementary drugs, i.e., antipyretics with iron or vitamin supplements. If more than two drugs were prescribed, then five scores were deducted for prescribing unnecessary drugs, i.e., antiallergy with other drugs; five scores were deducted for irrational drugs, i.e., antibiotics with antiallergy; ten scores were deducted for hazardous drugs; and five scores were deducted for unnecessary injections. Finally, the type of prescription was determined using the obtained score, including irrational prescriptions (0 to 14 scores), semirational prescriptions (15 to 24 scores), and rational prescriptions (25 to 30 scores).

2.9. Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) [version 25.00 (IBM Corp., Armonk, NY, USA)]. Descriptive statistics were calculated for the collected data. Moreover, the chi-square test was employed to determine the association between the number of drugs per prescription, the types of drugs prescribed for managing malaria, and the rationality of prescriptions by healthcare facilities. In addition, the study also determined the association between the number of drugs prescribed per prescription by physicians and consultants using the chi-square test.

3. Results

Table 1 depicts that most of the malaria prescriptions from public healthcare facilities contained two drugs (64.67%), followed by three drugs (28.67%), four drugs (4.00%), and a single drug (2.67%). On the other hand, prescriptions from private healthcare facilities showed that the majority of the prescriptions had two drugs (42.67%), followed by one drug (28.00%), three drugs (23.33%), and four drugs (6.00%). Public and private healthcare facilities had significantly different prescription trends for managing malaria regarding the number of prescribed drugs ($p = 0.002$). Furthermore, Table 2 shows that private healthcare facilities mostly prescribed antimalarial drugs (58.59%) and antibiotics (17.60%). In contrast, most prescriptions from public healthcare facilities contained antipyretics and other drugs (60.67%). The prescribing trend of various drugs for managing malaria by healthcare facilities was significantly different ($p = 0.001$).

Table 1. Number of drugs prescribed by public and private healthcare facilities.

Number of Drugs per Prescription	Public Healthcare Facility n = 150		Private Healthcare Facility n = 150		*p* value **
	N	%	N	%	
One	4	2.67	42	28.00	0.002 **
Two	97	64.67	64	42.67	
Three	43	28.67	35	23.33	
Four	6	4.00	9	6.00	

* Variables are compared using the chi-square test. ** Significant at ($p < 0.05$).

Table 2. Type of drugs prescribed for managing malaria by public and private healthcare facilities.

Health Facility	Antimalarial Drugs n = 256		Antibiotics n = 55		Antipyretics and Other Drugs n = 178		*p* value **
	N	%	N	%	N	%	
Public	106	41.41	23	12.65	108	60.67	0.001 **
Private	150	58.59	32	17.60	70	39.33	

* Variables are compared using the chi-square test. ** Significant at ($p < 0.05$).

Table 3 shows that consultants prescribed two (66.67%) or three drugs (33.33%), while the prescribing trend of physicians significantly varied, as most were prescribed one (17.04%), two (52.22%), three (25.19%) and four (5.56%) drugs ($p = 0.001$).

Table 3. Number of drugs prescribed by different healthcare providers.

Number of Drugs per Prescription	Consultants n = 30		Physicians n = 270		*p* value **
	N	%	N	%	
One	0	0.00	46	17.04	0.001 **
Two	20	66.67	141	52.22	
Three	10	33.33	68	25.19	
Four	0	0.00	15	5.56	

* Variables are compared using the chi-square test. ** Significant at ($p < 0.05$).

Table 4 highlights that most prescriptions from public healthcare facilities were rationally prescribed (68%), followed by semirational (19.33%) and irrational prescriptions (12.67%). On the other hand, most prescriptions from private healthcare facilities were either rational (54%) or semirational (42%), while a meager number of prescriptions were irrational (4%). The rationality of prescriptions was significantly different by healthcare facilities ($p = 0.001$).

Table 4. The rationality of prescriptions by public and private healthcare facilities.

Parameter	Public Healthcare Facility n = 150		Private Healthcare Facility n = 150		*p* value **
	N	%	N	%	
Rational prescriptions	102	68.00	81	54.00	0.001 **
Semi rational prescriptions	29	19.33	63	42.00	
Irrational prescriptions	19	12.67	6	4.00	

* Variables are compared using the chi-square test. ** Significant at ($p < 0.05$).

4. Discussion

Our study showed that most malaria prescriptions from public and private healthcare facilities contained two drugs. The prescription trend of public and private healthcare facilities for treating malaria by the number of prescribed drugs was significantly different. Moreover, prescriptions from private healthcare facilities mainly contained antimalarial drugs and antibiotics, while most prescriptions from public healthcare facilities contained antipyretics and other drugs. Most of the consultants prescribed two or three drugs, while the prescribing trends of physicians ranged between one and four, which was also statistically significantly different. In addition, most prescriptions from public healthcare facilities were rationally prescribed. On the other hand, most prescriptions from private healthcare facilities were rational and semirational. The rationality of prescriptions by public and private healthcare facilities was also significantly different.

Our study's results are supported by a Nigerian study that analyzed 500 prescriptions to determine prescribing trends and highlighted that the average number of drugs recorded per prescription was 3.04. Moreover, 34.4% of prescriptions contained antibiotics, followed by antimalarials (19.1%) and vitamins (9.7%) [31]. Another Nigerian study reported 3.2 drugs per prescription [32]. Of 1,000 prescriptions, most drugs were antima-

larials (61.3%) and antibiotics (43.8%), while a meager number of drugs were vitamins (30.2%) [32]. A study compared prescribing practices among military and civil healthcare facilities and highlighted that prescriptions from both healthcare facilities contain a limited number of drugs. Furthermore, both types of facilities prescribe monotherapy for malaria as well as antibiotics [33]. Another Pakistani-based study reported that private healthcare facilities do not comply with the standard treatment guidelines for managing malaria and irrationally prescribe antibiotics, which contributes to increasing antimicrobial drug resistance [34].

A Pakistan-based study assessed physicians' prescribing patterns and found 3.32 drugs per prescription, with a high proportion of antimicrobial drugs (57.2%) and comparatively low vitamins (37.8%) [35]. Another Pakistani study found 4.51 drugs per prescription containing a high proportion of antimicrobial drugs, vitamins, and minerals. Moreover, nearly half of the drugs were prescribed from Pakistan's National Essential Drug List [36]. An Indian study highlighted that the average number of drugs prescribed for malaria was 3.96, and 84.5% of the drugs were prescribed from the national Essential Drug List [37]. The most frequently prescribed drugs, including antibiotics for treating malaria, can be attributed to various factors but are not limited to the lack of knowledge of the prescriber, false belief, peer influence, and misunderstanding of normal findings of malaria (i.e., most of the prescribers relate malaria symptoms with typhoid fever due to similar symptoms) [38, 39, 40]. Irrational prescribing trends can also be attributed to limited pharmacists' role in healthcare facilities, which is regarded more as managing and dispensing drugs rather than advising in clinical prescribing for managing diseases [41, 42].

Our study's results are inconsistent with a study performed in Pakistan that assessed prescriptions from public and private healthcare facilities using the WHO prescribing indicators. The study reported that the average number of drugs per prescription among public and private healthcare facilities were 7.14 and 5.4, respectively, and 67.94% of public setups and 51.59% of private setups prescriptions contained antibiotics [43]. A Nigerian study compared prescribing trends for managing malaria among public and private healthcare facilities by analyzing 665 prescriptions and found that 77% of prescriptions had monotherapy, while 20.8% had combination therapies [44]. The study found no significant difference in prescribing trends between public and private healthcare facilities for treating malaria patients. Another Nigerian study reported that 57.6% of inpatient prescriptions contained monotherapy, and 42.8% of outpatient prescriptions contained combination therapies [45]. Another study performed in Gimbi highlighted the use of monotherapy prescribed at an appropriate dosage, frequency, and duration for the treatment of malaria [46]. A study performed in Western Kenya highlighted that only among 3.7% of the cases was ACT prescribed [47].

Our study analyzed malaria prescriptions to determine prescribing trends and the rationality of prescriptions from public and private healthcare facilities in light of the WHO's prescribing indicators and Pakistan's National Malaria Case Management Guidelines. Therefore, it provides baseline data for researchers to conduct future studies in the local context, which is the potential strength of the study. However, the study did not investigate healthcare providers' perspectives on the drug of choice and active agents prescribed but rather focused on providing a broader overview of prescribing trends based on the number of drugs per prescription and the number of drugs prescribed by different healthcare providers. This limitation prevents insight into the rationale behind the number of drugs prescribed for malaria management. Future research is necessary to explore the factors influencing drug selection in the management of malaria from the viewpoint of healthcare providers. Furthermore, the study did not analyze the patients'

perspectives or consider sociodemographic factors in relation to malaria treatment. This aspect remains unexplored and represents an avenue for future research.

5. Conclusions

Public healthcare facilities were found to exhibit more rational prescribing trends for managing malaria compared to private healthcare facilities, with a focus on prescribing an optimal number of drugs per prescription and a lower usage of antimalarial and antibiotic medications.

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