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Research Article

A study on the Prescription Pattern of Antifungal Drugs in Aden-Yemen

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Abstract

Background: Fungal infections are more common in tropical zones; they can be simple, complicated, or even fatal. Studying the prescribing pattern can help physicians provide rational medical care and appropriate patient compliance. The current study aimed to determine the prescription patterns of antifungals in three departments and the distribution of fungal disease to help in developing policies and stewardship in using antifungal medications.

Method: This cross-sectional study was conducted over 6 months from March to October 2023. Potential participants were approached in Governorate and private pharmacies, and dermatologic, gynaecologic, and dental clinics.

Results: The total number of collected prescriptions was 250. The analysis of the demographic characteristics of the involved patients showed that about 166 (66.4%) of the patients were females and 84 (33.65%) were males. Most of the patients are in the age group (19-35 years). Most of the fungal infection was vulvovaginal candidiasis 64(25.6%), Tinea versicolor 38(15.2), Tinea cruris 30(12%), oral candidiasis 21 (8.4 %), Tinea corporis (8.4%) then Tinea pedis and skin candidiasis had equal number 19 (7.6%), followed by tinea capitis 12 (4.8%) and onychomycosis 12 (4.8%). The most prescribed oral medicines were Itraconazole 66 (26.4%), followed by Fluconazole 56 (22.4%), Terbinafine 28 (11.2%), Ketoconazole 29 (11.6%) and Griseofulvin 13 (5.2%). The topical medicines prescribed were as follows: Ketoconazole 98 (39.28%), Clotrimazole 46 (18.4 %), Terbinafine 36 (14.4%), and Miconazole 33 (16.4%). The majority of patients (75%) received a combination of topical and systemic oral therapy. While (25 %) were treated by only topical agents.

Conclusion: The current report will aid in understanding antifungal prescription practices and form a basis for future research and formulation guidelines for the rational use of these drugs.

1. Introduction

Fungal infections are common dermatological conditions that become a curse to life if they are not treated with a rational prescription. It is estimated that almost 1 billion people suffer from fungal infections of the skin, nails, and hair, and more than 150 million people have serious fungal diseases, which have a significant impact on their lives and are sometimes fatal [1]. Antimicrobial drug resistance is a major health concern worldwide. It has been classified by the World Health Organization (WHO) as one of the main global threats to public health [2]. The excessive use and misuse of antimicrobials have been considered one of the main causes of drug resistance; as a result, emphasis has been placed on appropriately prescribed medications [3-6]. According to WHO the rational use of drugs helps in evolving standard treatment guidelines, preventing inappropriate drug use, adopting the essential list of drugs, and determining irrational prescriptions. A prescription is a written instruction given by a qualified medical practitioner with the intent to provide medicine or treatment for the benefit of the patient [7]. Thus, the prescription in other words reflect the doctor's knowledge and his/her attitude to

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treat the patient with due consideration of the patient's condition physically as well as financially [8]. In recent years, economic evaluation has become an integral part of health service research and soon it will become more influential. The study of prescription patterns is a component of medical audit that helps prescribers provide rational and cost-effective medical care that will be beneficial to patients [9]. Tropical countries have a high prevalence of fungal infections some of which may be fatal [10]. Aden is a coastal city with hot and humid weather. Also, as a result of the civil war, the city has recently witnessed the displacement of several families from conflict areas. These families live in IDP camps that suffer from overcrowding, poverty, low hygiene, and improper sanitization, which are the main factors for the spreading of fungal infections. Rational use of antifungals can minimize drug resistance. Therefore, the optimal selection of antifungal, dose, route of administration, and duration of therapy are key to preserving the efficacy of antimicrobials [3]. Thus, this study will help in understanding antifungal prescription practices and also in developing local policies for the appropriate use of antifungal drugs.

2. Materials and methods:

This questionnaire-based cross-sectional study was conducted over 6 months from March to October 2023. No formal sample size was calculated, and patients were engaged based on period-specific convenience sampling. The participants were included in dermatologic, gynecologic, obstetrician, dental clinics (governorate and private), and pharmacies. The survey was self-developed to assess the prescription pattern of antifungal drugs in Aden – Yemen.

➢ **Inclusion criteria**

The patients who visited dermatologic, gynaecologic, obstetricians, dental, and pharmacies (public or private clinics or hospitals) were included in the study.

- Patients who were using antifungal treatment.

➢ **Exclusion criteria**

- Prescriptions with incomplete data.
- Patients with other skin diseases will be excluded.

➢ **Data collection**

The data were filled in the Performa prepared which was approved by the Ethics Committee. The factors analyzed were:

- Socio demographic characters (age, sex).
- The disease diagnosed and the number of patients in each group.
- Number of patients who were prescribed combination antifungal therapy (oral + topical) and mono therapy either oral or topical agents.
- The number of topical agents and oral agents prescribed per encounter.

➢ **Statistical data analysis:** To analyse the data, SPSS version 24 software was used. Descriptive statistics were used to show averages, percentages, and frequencies.

3. Results

In the present study, the demographic characteristics of the participants were as represented in Table 1; out of a total of 250 patients, 166 (66.4%) were females and 84 (33.65) were males, more than half of the patient's age group of the patients were fall in 19-35 years (56%), followed by 36-55 years of age (26%).

Table 1: Demographic Characteristics of the Involved Patients (n=250)

Demographic **factors**	Categories	N	%
Age in years	0-18 years	41	16.4
	19-35 years	140	56
	36-55 years	65	26
	56-75 years	4	1.6
Gender	Males	84	33.65
	Females	166	66.4

Several departments prescribed antifungal drugs for different diagnoses. Most of the collected data in our study were from the dermatology department 173 (69.2%), followed by the gynecological department 67 (26.8%). The lowest value was from dentist clinics 10 (4%) as represented in Table 2.

Table 2: Distribution of patients received Antifungal drugs according to the departments.

Department	N	%
Dermatology	173	69.2
Gynecology& obstetric	67	26.8
Dentist	10	4

In the present study, the most common fungal infection observed was vulvovaginal candidiasis 64 (25.6%), followed by candidiasis (oral and skin), 40 (16%) tinea versicolor 38 (15.2%), tinea cruris 30(12.0%). Tinea pedis

and skin candidiasis had equal numbers 19 (7.6%), tinea capititis 12 (4.8%), and onychomycosis 12 (4.8%). Other cases for which antifungals were prescribed are shown in Table 3. In our study, some patients had more than one fungal infection, two cases (0.8%) had two fungal diseases, the combination were (tenia versicolor & tinea cruris), and the other combinations were three (tinea cruris, tinea corporis, and onychomycosis) which constituted (0.12 %) and only one case (0.4 %) with four fungal infections (oral candidiasis, cutaneous candidiasis, vulva vaginitis and tenia pedis).

Table 3: Distribution of the Fungal Diseases

Diseases	N	%
Oral candidiasis	21	8.4
Skin candidiasis	19	7.6
Vulvovaginal candidiasis	64	25.6
Tinea versicolor	38	15.2
Tinea capitis	12	4.8
Tinea facei	6	2.4
Tinea barbae	3	1.2
Tinea corporis	21	8.4
Tinea cruris	30	12.0
Tinea pedis	19	7.6
Onychomycosis	12	4.8
Tinea manum	2	0.8
Intertrigo	3	1.2
Total	250	100

Regarding treatment patterns, the majority of patients (75.0%) received a combination of topical and systemic oral therapy. While, (25.0 %.) were treated by only topical agents, as shown in Figure 1, in some prescriptions, more than one topical was prescribed. The percentage of oral and topical agents prescribed in our study is illustrated in Figure 2.

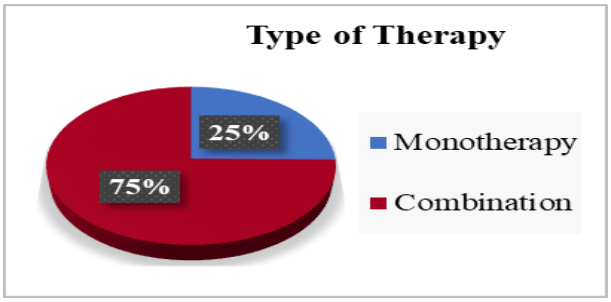

Figure 1. Treatment modalities

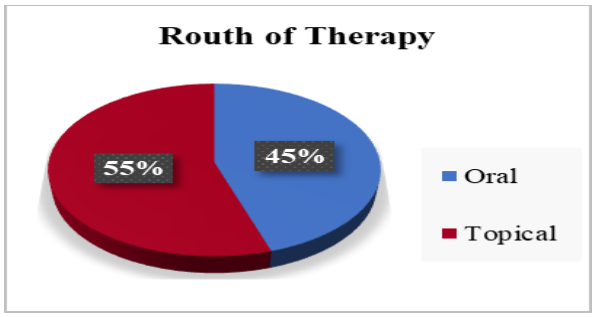

Figure 2. Route of therapy

Table 4: Oral anti-fungal drugs

Oral antifungal drugs	N	%
Itraconazole	66	26.4
Fluconazole	56	22.4
Terbinafine	28	11.2
Ketoconazole	29	11.6
Griseofulvin	13	5.2
Nystatin suspension	12	4.8

In this study, the most commonly prescribed oral antifungal drug was Itraconazole 66 (26.4%), followed by Fluconazole 56 (22.4%), Terbinafine 28 (11.2%), Ketoconazole 29 (11.6%), Griseofulvin 13 (5.2%), and Nystatin 12 (4.8%) as represented in Table 4, and the most commonly prescribed topical antifungal agent was Ketoconazole 98 (39.2 %) followed by Clotrimazole 46 (18.4%), Terbinafine 42 (16.8%) and Miconazole 41 (16.4%) as shown in Table 5, some prescription recorded more than one topical agents.
Our study documented that creams (61.2%) were the most common dosage form compared to other dosage forms, followed by soaps (12%). This was similar to the results of a study done in West India by Patel et al. 2023[12]. The average number of drugs per prescription in this study was 2.12.

4. Discussions

Fungal infections are more common in tropical zones; they can be simple, complicated, or even fatal. The irrational use of antifungals leads to increasing microbial resistance, and little is known about prescription patterns in Aden, Yemen. So, the findings from this study can help reinforce medical practices about the use of antifungals as a strategy to prevent antifungal resistance and can be helpful to healthcare, academic, and scientific workers in making judgments

regarding the dangers encountered by their patients. The results of this study can help in developing antifungal dispensing policies. The result of the demographic character showed that there were more female patients than males. The current result is similar to the studies in Western India [11], South India [12], the United States [13], and Colombia [14], while other studies revealed that male percentages were higher than females [15-19]. The higher number of females may be due to our study involving the gynecological department while others only restricted to the dermatological department.

Concerning age of patients in this study, our finding related to the age of the patients was similar to the studies conducted in Colombia [14], Southern Kerala [15], and Western India [11]. This shows that the majority of the patients represent the most active population in the society

Table 5: Topical anti-fungal drugs.

Topical anti-fungal drugs	N	%
Ketaconazol	98	39.2
Clotrimazole	46	18.4
Miconazole	33	16.4
Terbiniafine	36	14.4
Ticonazole	31	12.4
Isoconazole	13	5.2
Sertaconazole	8	3.2
Nystatin	5	2
Antifungal wash	8	3.2
Sulfur	1	0.4
Topizol	20	8

The data was collected from different departments, most of them from the dermatological department, followed by the gynecologist and then the dentist. Contrary to the study by Valladles-Restrepo et al. in Colombia, which showed that the majority was data from the gynecologic and obstetric department [14]. As per findings of a previous study done in Yemen, the authors reported the highest number of vulvovaginitis, candidiasis, and intertigo in Sana'a and Aden cities, respectively, as well as a study in Oman [20-22]. In the Nepal study, Saud et al. 2020, revealed that fungal growth was higher in oral followed by toe, urine, hair, and nail samples [23].

As regards our finding about fungal infection in this study, Tenia cruris was reported in (12%) followed by Tenia corporis (8.4%). Similarly to the study done by Bansal P et al. 2021 who reported tinea cruris in 41.50 % of patients, followed by tinea corporis in 38.20% [24]. Patel et al.2023 in Western India, also reported tinea cruris as the most common infection, followed by tinea corporis in their study [11]. In a study conducted by Shetty et al., tinea corporis constituted the highest number of cases, 50.27%, followed by a combination of tinea corporis and tinea cruris [25]. In another study conducted by Kalola et al., tinea corporis and tinea cruris were the most common fungal, followed by tinea corporis in their study [18]. Other fungal infections observed such as tinea facei, tenia pedis, tenia barbae, tinea manum, capitis and, intertrigo, were relatively less detected. These results are parallel to another study which was conducted by Naaz et al. in India [19]. Some patients had more than one fungal infection. The results is similar, to a study conducted by Kalola et al., and Shetty et al. found a combination of many types of skin infections [18,25]. The presence of more than one fungal infection may be due to low immunity, poor nutrition, hot climate, overcrowding etc. Most of the fungal infections can be managed with topical therapy alone. However, topical and systemic drugs were frequently combined to boost the cure rate. As per studies by Gopimohan et al. and Kalola et al. reported that 79.6% and 99.44% of patients, respectively, were treated with a combination of oral as well as topical antifungal drugs [15,18]. In a study in Western India, the authors showed that topical antifungal drugs were prescribed more than oral medications which may be because topical drugs have the minimum side effects and easy application [11]. Also in another study in South India, the topical route represents 61.75% followed by oral and parental administration [12].

The result of the current study can be compared with the previous study in the following manner, in Indian studies, Subashree et al. reported that Clotrimazole was the most frequently prescribed topical antifungal drug followed by Fluconazole and Kalola et al. 2023 reported Clotrimazole (34.59%) also as the most prescribed antifungal, followed by Fluconazole (31.61%) and Luliconazole [12,18]. In a study done by Gopimohan et al. 2019, Clotrimazole and Terbinafine were reported to be prescribed in (29%) and ketoconazole in (23.3%) [15]. Clotrimazole considered as oldest medicine used for oral and vaginal candidiasis [10]. The result was parallel with a study in Saudi Arabia [26]. In a study carried out by Benedict et al. 2021, systemic Fluconazole was reported to be prescribed in 70.0% of women with vulvovaginitis [13]. Similarly, a study conducted by Al Balushi et al. in Oman revealed that Fluconazole was the most commonly prescribed antifungal drug, followed by Nystatin as well as, Rajathilagam

represented in his study that Fluconazole was the most commonly used oral antifungal agent respectively [17,27]. Fluconazole was the drug most commonly prescribed among antifungal agents because it's once-in-a-month dose schedule results in cost-effective treatment and a lower propensity for adverse effects [28]. Drug use patterns vary due to a variety of factors, including the prescriber's preferences, compliance with management guidelines, drug availability in national health systems, patterns of resistance, and the sensitivity of drug microorganisms in each area, among others [29,30]. The Food and Drug Administration (FDA) warns that the use of ketoconazole is associated with multiple severe adverse effects, including liver failure, and recommends that it be used for critical fungal infections for which no other treatment is available [31]. It is noticed that its prescription rate is relatively low in the current study.

Prescriptions for generic drugs are thought to be the most cost-effective and logical way to prescribe [32]. Here, though, the prescription was overshadowed by the branded medication. Some patients prefer to buy branded medicines due to the low per capita standard in Aden. The dose and duration of these medicines varied according to the severity of the infection and the type of drugs. The pharmaceutical dosage forms of oral were varied between capsules, tablets, oral gel, and suspension. The pharmaceutical dosage forms for topical were also varied between creams, soaps, shampoo, vaginal suppositories, and washes.

Regarding the average number of drugs per prescription, the result of the current study indicated that the physicians had reasonable knowledge and good practices in prescribing medicines. The low percentage of drugs per prescription indicated no sign of polypharmacy. Polypharmacy increases the risk of drug interactions, ADRs, medication errors, patients, poor compliance, underuse of effective treatment, and increased cost of therapy[10]. In a study in India, the average number of antifungal drugs per prescription was 2.83 ± 0.57, which is near to our results [18]. While in another study, the average number of antifungal drugs prescribed per prescription was 1.63 [11].

Conclusion

Medicine prescribing has a crucial role in the health care system. The most common fungal infections observed during this study were vulvovaginal candidiasis, followed by tinea versicolor, and tinea cruris. The most common oral antifungal drugs and topical antifungal drugs were Itraconazole and Ketoconazole, respectively. Combination antifungal therapy was more commonly used than mono therapy. The strength of the study was that it represents the first study carried out in Aden City. The limitations of the study were low sample size, short duration of the study, seasonal differences that may affect the prescription pattern, as well as, variation of treatment approach by the physicians.

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بحث علمي

دراسة نمط الوصفات الطبية لمضادات الفطريات في عدن / اليمن

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الملخص

تعد العدوى الفطرية أكثر شيوعاً في المناطق الاستوائية ويمكن أن تكون بسيطة أو معقدة ومميتة. ودراسة الوصفة الطبية يمكن أن تساعد الأطباء على توفير الرعاية الطبية العقلانية والامتثال المناسب للمريض. تهدف الدراسة الحالية لتحديد نمط الوصفة الطبية لمضادات الفطريات في ثلاثة أقسام وتوزيع الأمراض الفطرية للمساعدة في تطوير السياسات والإشراف في إستخدام الأدوية المضادة للفطريات. تم إجراء دراسة مقطعية عرضية على مدى أكثر من سبعة أشهر من مارس إلى أكتوبر 2022م. وشملت الدراسة كل الوصفات المتعلقة بمضادات الفطريات لكل الأعمار ولكلا الجنسين في عيادات الجلدية وأمراض النساء والأسنان والصيدليات الحكومي والخاص.

النتائج : إجمالي الوصفة الطبية كان 250، تحليل الخصائص الديموغرافية للمرضى أظهر أنه حوالي 166 التي شكلت نسبة (66.4%) كانوا من النساء، بينما 84 (63.65%) كانوا من الرجال، غالبية المرضى البالغ عددهم 140 (56%) كانوا من الفئة العمرية من 19- 39 سنة. معظم العدوى الفطرية كانت داء المبيضات المهبلي 64 (25,6%), تينا فرسي كلر (السعفة المبرقشة) 38 (15.2%), سعفة الساق 30 (12%)، داء المبيضات الفموي 21 (8.4%)، تينا الجسم 21 (8.4 %)، سعفة القدم وداء المبيضات الجلدي كان متساويا 19 (6 . 7 %) يتبعهم تينا الراس 12 (.8 .4%) و فطار الأظافر 12 (.8 .4%). وكان الدواء الأكثر وصفاً عن طريق الفم هو اتركونازول 66 (4 . 26.%) يتبعه فلوكونازول 56 (4, 22%) وتيربينفين 28 (11.2%) و كيتوكونازول 29 (6 .11. %) جرسيوفو لفين 13 (5.2%). الدواء الموضعي اللذي يوصف كان كيتوكونازول 98 (28 .39%) , كلتروكونازول 46 (18.4%) , تيربينفين 42 بنسبة (.8 . 16 %). وميكونازول 41 (4 .16%). كان الغالبية من المرضى ممن تلقوا مزيج من العلاج الفموي والموضعي (75 %) بينما شكل نسبة (25 %) ممن يتعاطوا علاج أحادي.

الاستنتاج: سيساعد التقرير الحالي في فهم ممارسات الوصفات الطبية المضادة للفطريات وسيشكل هذا ايضاً اساساً للأبحاث المستقبلية وصياغة دليل للاستخدام الرشيد لهذه الأدوية.

مفاتيح البحث

التسليم : 20 مارس 2024

القبول : 20 مايو 2024

كلمات مفتاحية :

تلوث فطري ، نمط وصفة طبية ، الدواء الموضعي .