A descriptive study of factors associated with anti-fungal medication adherence among patients with dermatophytosis

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ABSTRACT

The prevalence of superficial Mycotic infection worldwide is 20–25%. Medication non-adherence in patients leads to worsening of the disease, death and increased health care costs. More than 30% of medicine-related hospital admissions occur due to medication non-adherence. The aim of the study is assessing the factors associated with medication adherence in patients with dermatophytosis. Data were analyzed by using descriptive analysis of 305 patients attending the dermatology department. The period of study was three months. Medication adherence was determined using Morisky Green Levine Scale for dermatophytosis patients who are undergoing treatment. KAP (knowledge, attitude, practice) was used to determine the knowledge gaps, general health practice, and beliefs of the patient towards fungal infection. It was found that 47.86% of the subjects in the study are non-adherent and 49.50% are moderate adherents, and only 2.62% are highly adherent to medications prescribed. In KAP study, it was found that (14.4%) strongly agree that fungal infection does not create hindrance in normal life, while (28.85%) strongly disagree. Practice where analyzed in 305 subjects, (52.13%) share clothing with family members or friends, (50.16%) do not take medication as prescribed. The patient affected with fungal infections had poor adherence to the medicines prescribed. The risk factors affecting medication adherence are poor hygiene, sharing of clothes of friends or family, dosing schedule, complex regimens, access barriers, and cost of the drug.

INTRODUCTION

Fungal infections (or) mycotic diseases are globally distributed, 800 million people in the world suffer from one or other fungal infection (Meinhof, 1984). Majority of mycotic disease cases are seen in tropical and subtropical countries like India (Pal, 2018). The risk factors of cutaneous fungal infections are environmental factors like hot, humid climate, contact with infected animals, like cats, could lead to a skin infection (Arshah et al., 2015).

The prevalence of superficial mycotic infection
worldwide is 20–25% of which dermatophytes are the most common agents (Mahajan and Sahoo, 2016). Dermatophytosis is a fungal infection of hair, nail and stratum corneum of the skin (Narasimhalu and M, 2015). There are different types of dermatophyte strains, and for diagnosing and identifying of different strains, several new techniques such as polymerase chain reaction (PCR) and mass spectroscopy are used (Mahajan and Sahoo, 2016).

Based upon the affected site, dermatophytes have been classified clinically into Tinea capitis (head), Tinea faciei (face), Tinea barbae (beard), Tinea corporis (body), Tinea manus (hand), Tinea cruris (groin), Tinea pedis (foot), and Tinea unguium (nail) (Jimmy and Jose, 2011). Among all types of superficial infection, Tinea pedis and Tinea corporis have highest prevalence rate (Ruhnke et al., 2015).

In effective treatment in tinea pedis, tinea corporis, and tinea cruris commonly occur (Panackal et al., 2009). Improper use of anti-fungal agents such as inadequate dosage or indication is seen in anti-fungal prescribing, which can lead to treatment failure in dermatophytosis patients (Nivoix et al., 2012).

World Health Organization defines medication adherence as "the degree to which the person's behaviour corresponds with the agreed recommendations from a health care provider. In case of treatment success, adherence to therapy was found to be a primary determinant failure to adherence, affects both patients and the health care system. Medication non-adherence in patients leads to worsening of disease, increased health care costs and even death.

Patients with dermatophytosis had poor compliance in anti-fungal treatment which greatly influenced the therapeutic outcome. Therefore, non-compliance to medication affects patient, physician, provider, and the medical researcher. Hence, helping patients to take their medicine appropriately by providing the right information and creating awareness could be a more significant achievement in today’s scenario which may help to prevent hospitalizations and a higher risk of severe relapse. In recent days' poor adherence was found to be "a fundamental principle of dermatology (Zhou, 2011)."

Factors that influence medication adherence

Social/economic

Patients who have social support from family, friends, or caregivers to assist with medication regimens are found to have better adherence to treatment. Whereas, patients who have limited access to the health care system, lack of financial resources, and busy work schedules are associated with decreased adherence to treatment.

Provider-patient/health care system

The most important health care system-related factors affecting adherence was found to be the relationship between doctor and patient. Lack of communication regarding, instructions for the use of medicine, and side effects of medications can also contribute to non-adherence, especially in elderly patients with memory problems (Muñoz and Bouza, 2016). Therapies that are inconvenient or interfere with a person’s lifestyle lead to decreased patients’ adherence. By improving patients’ adherence, the safety of the patients will also increase (Kalogianni, 2011).

Condition-related

Patients who have few symptoms or no symptoms, and the absence of them, acts as a barrier for patients to take their medication. Thus, the patient needs to understand the illness and importance of treatment to obtain a better therapeutic outcome.

Therapy-related

Complex treatment regimen, longer duration of therapy, increased number of daily doses required, medication therapies that are inconvenient or those that interfere with a patient’s lifestyle and side effects are associated with decreased adherence to medication by the patient.

Patient-related factors

There is an increased risk for non-adherence in elderly patients with cognitive limitations and physical impairment. Patients who lack knowledge about the disease and importance of medication in the cure of illness, those who have low self-efficacy, who require motivation and substance abuse are some of the important parameters that are associated with poor medication adherence (Muñoz and Bouza, 2016).

We can improve patient adherence to treatment regimen by choosing active anti-fungal agents and encouraging patients to visit their doctor properly and enhancing knowledge about disease and treatment aspects (Tsunemi et al., 2015). Long term treatment cause decreases medication adherence while short-term treatment improves it with simple interventions and by follow-up patients through telephone or e-mail, reminders and psychological therapy (Weinberg, 2009).

Knowledge, attitude, and the practices among patients with dermatophytosis

A KAP survey can be designed specifically to gather information about dermatophytosis, but it may also
include questions about general health practices and beliefs. KAP survey data are essential to help plan, implement and evaluate patient behaviour. KAP surveys can identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate understanding and action, as well as pose problems or create barriers for control efforts.

They can identify information that is commonly known, and attitudes that are widely present. To some extent, they can identify factors influencing behaviour that are not known to most people, reasons for their views, and how and why people practice certain health behaviours.

KAP surveys may be used to identify needs, problems and barriers in program delivery, as well as solutions for improving quality and accessibility of services. Identifying the risk factors will aid in developing preventive strategies, drug selection and improve medication compliance (Cailler and Yang, 2008).

MATERIALS AND METHODS

Study site

The study was conducted at ESI MC-PGIMSR & Model Hospital, Rajajinagar, which is a 500 bedded Hospital with state of the art facilities for patients.

Study design and duration

This was an observational study over six months.

Sample size

A total of 305 patients attending the OP clinic of the Department of Dermatology, venereology & leprosy, satisfying the inclusion and exclusion criteria during the data collection were included in the study.

Inclusion criteria

1. Subjects who were attending the OP clinic with dermatophytosis.
2. Subjects who are willing to participate in the study signed written informed consent.

Exclusion criteria

1. Subjects who are critically ill.

Source of data

1. Case Report Form
2. Prescriptions of patients
3. Personal interview

Study tools

The following tools were used to obtain information pertaining to the study:

Case Report Form

Data was collected by using a self-designed data collection form which consists of demographic details, diagnosis and response to the self-designed questions.

Morisky Green Levine Scale

This self-reported scale comprises of four questions with yes/no response that assesses the patient’s medication taking behavior. A yes response to a question is given one score and no response is given zero. The scoring ranges from 0-4 and the three levels of medication non-adherence based on this score is high, moderate and low adherence with 0, 1-2 and
### Table 1: Distribution of Subjects Based on Types of Tinea Infections

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Types of Tinea infections</th>
<th>Number of subjects</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tinea Cruris</td>
<td>132</td>
<td>43.27</td>
</tr>
<tr>
<td>2.</td>
<td>Tinea Corporis</td>
<td>65</td>
<td>21.31</td>
</tr>
<tr>
<td>3.</td>
<td>Tinea Corporis + Tinea Cruris</td>
<td>63</td>
<td>20.65</td>
</tr>
<tr>
<td>4.</td>
<td>Tinea Incognito</td>
<td>17</td>
<td>5.57</td>
</tr>
<tr>
<td>5.</td>
<td>Tinea Axillaris</td>
<td>3</td>
<td>0.98</td>
</tr>
<tr>
<td>6.</td>
<td>Tinea Facei</td>
<td>3</td>
<td>0.98</td>
</tr>
<tr>
<td>7.</td>
<td>Tinea Mannum</td>
<td>3</td>
<td>0.98</td>
</tr>
<tr>
<td>8.</td>
<td>Onychomycosis</td>
<td>2</td>
<td>0.65</td>
</tr>
<tr>
<td>9.</td>
<td>Tinea Corporis + Onychomycosis</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>10.</td>
<td>Tinea Barbae</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>11.</td>
<td>Tinea Capitis</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>12.</td>
<td>Tinea Corporis + Tinea Axillaris</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>13.</td>
<td>Tinea Pedis</td>
<td>7</td>
<td>2.29</td>
</tr>
<tr>
<td>14.</td>
<td>Tinea Cruris + Tinea Mannum</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>15.</td>
<td>Tinea Cruris + Tinea Corporis + Tinea Pedis</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>16.</td>
<td>Tinea Cruris + Tinea Incognito</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>17.</td>
<td>Tinea Corporis + Tinea Incognito</td>
<td>1</td>
<td>0.32</td>
</tr>
</tbody>
</table>

### Table 2: Distribution based on Medication Adherence

<table>
<thead>
<tr>
<th>Medication adherence scale</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low medication adherence</td>
<td>146</td>
<td>47.86</td>
</tr>
<tr>
<td>Medium medication adherence</td>
<td>151</td>
<td>49.5</td>
</tr>
<tr>
<td>High medication adherence</td>
<td>8</td>
<td>2.62</td>
</tr>
</tbody>
</table>

### Table 3: knowledge-based question

<table>
<thead>
<tr>
<th>S.No</th>
<th>Knowledge questions</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Do you think fungal infections are contagious diseases?</td>
<td>70%</td>
<td>39%</td>
</tr>
<tr>
<td>2</td>
<td>Do you know that moisture can lead to fungal infection?</td>
<td>47.5%</td>
<td>52.4%</td>
</tr>
<tr>
<td>3</td>
<td>Do you know that excessive sweating can cause fungal infection?</td>
<td>52.1%</td>
<td>48%</td>
</tr>
<tr>
<td>4</td>
<td>Do you know that good personal hygiene can prevent fungal infections?</td>
<td>78.36%</td>
<td>22%</td>
</tr>
<tr>
<td>5</td>
<td>Do you know pets can cause fungal infections?</td>
<td>44.59%</td>
<td>55.4%</td>
</tr>
</tbody>
</table>

### Table 4: Attitude-based questions

<table>
<thead>
<tr>
<th>S. No</th>
<th>Attitude questions</th>
<th>Strongly disagree</th>
<th>disagree</th>
<th>neutral</th>
<th>agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fungal infection does not create hindrance in normal life.</td>
<td>8.19%</td>
<td>43%</td>
<td>5.57%</td>
<td>29%</td>
<td>14.42%</td>
</tr>
<tr>
<td>2</td>
<td>Superficial fungal infections are caused by luck.</td>
<td>27%</td>
<td>40.32%</td>
<td>22.29%</td>
<td>7.21%</td>
<td>3.27%</td>
</tr>
<tr>
<td>3</td>
<td>Fungal infections are unavoidable, and it is a normal condition.</td>
<td>8.52%</td>
<td>61%</td>
<td>9.18%</td>
<td>16.39%</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>I feel downhearted and depressed after getting a fungal infection.</td>
<td>8.19%</td>
<td>16.72%</td>
<td>3%</td>
<td>25.5%</td>
<td>46.5%</td>
</tr>
<tr>
<td>5</td>
<td>I always keep my body clean and moisture-free.</td>
<td>0.65%</td>
<td>6.88%</td>
<td>13%</td>
<td>71.47%</td>
<td>8.19%</td>
</tr>
</tbody>
</table>
3-4 points respectively.

**KAP questionnaire**

It is a practical health status instrument which is used to assess the knowledge, attitude and practice among patients with dermatophytosis. It is self-administered questionnaire, which contains 15 questions, 5 knowledge questions, 6 attitude questions and 4 practice questions. Binary questions were used for knowledge and practice while, Likert scale was used in attitude.

**Ethical clearance**

The Institutional Ethics Committee approved this study of ESIC-MC PGIMSR & Model Hospital with the approval number 532/L/11/12/Ethics/ESICMC&PGIMSR/Estt. Vol. III, dated 04/12/2018.

**Study procedure**

The study was conducted as per the inclusion and exclusion criteria which states that the subjects will be identified from the OP clinic of the department of dermatology, venereology & leprosy. The subjects were explained, the purpose of the study and consent was obtained.

Relevant data (demographic data, response to the self-designed questions) was recorded on the case report form, and the subjects were administered the other study tools to obtain relevant information. The data thus got were entered in a Microsoft Excel sheet, and appropriate analysis was performed.

**Statistical analysis**

Appropriate descriptive and inferential statistical analysis was performed. The mean percentage was calculated to estimate the relative scores with other domain of the study.

Pearson’s correlation was done between domains of knowledge, attitude and practice using Microsoft Excel 2010. Pearson’s correlation was performed to understand statistical significance.

**RESULTS AND DISCUSSION**

**Gender distribution of patients**

Prevalence of dermatophytosis based on gender presented in Figure 1.

**Age Distribution of Patients**

Prevalence of dermatophytosis showed that 63% belonged to 19-45 years of age group followed by 24% in 46-60 years and 7% in 7-18 years of age groups as presented in Figure 2.

**Distribution of patients based on the type of tinea infections**

Different types of tinea infections were documented in which most common clinical type of dermatophytosis observed in this study was 43% of tinea cruris, detailed information illustrated in Table 1.

**Distribution of patients based on medication adherence**

Morisky Green Levine scale was used to assess the medication adherence of the subjects. It was found that 49% of subjects were found to have medium medication adherence, 3% of subjects were found to have highest medication adherence, and 48% of subjects had low medication adherence as presented in Table 2.

**Distribution of patients based on knowledge, attitude and practice**

Responses of knowledge questionnaire showed that 78.36% of subjects knew that good personal hygiene could prevent fungal infection, and 55.4% of subjects did not know that pets can cause fungal infection as presented in Table 3. Attitude assessment responses presented in Table 4. Practice assessments showed that 52.13% of subjects with dermatophytosis shared their clothing between friends and family members, 50.16% of subjects did not take their medication as prescribed by the physician, 44.91% of subjects preferred OTC medication and 51.47% of subjects did not wash their hands before and after applying topical agents.

**Distribution of subjects based on the number of medicines prescribed**

Subjects were categorized based on the number of medicines prescribed, which eventually results in poor medication adherence. It was found that 10.49% of subjects were prescribed with only one dose, 29.18% of subjects were prescribed with two drugs, 24.6% of subjects with three medicines, 26.22% of subjects with four medications and 9.83% of subjects with more than four medications.

**Distribution of responses obtained from a self-designed questionnaire**

Responses showed that 83.60% of subjects replied that their duration of treatment was not explained to them, 51.47% of subjects replied that their response of therapy was not explained. Only 4.91% of subjects were discussed with the occurrence of side effects, 63.60% had out of stock problems at the pharmacy, 14.42% was found to be alcoholic. Distribution of responses obtained from a self-designed questionnaire is depicted in Figure 3.

This study indicates that the prevalence of fungal infection in men is 55% and in women is 44.91%, its mean prevalence of fungal infection in men is more
than women. Most affected age group belonged to 34-38 (40%), second-most affected age groups were 19-33 (27.86%) and 49-64 (20.65%), and least affected were age groups of 65-78 (4.26%).

Various types of tinea infections were collected in which the most commonly occurring tinea in this study were Tinea cruris (43.27%), in which similar findings were observed in the study conducted by (Olutoyin et al., 2017).

The present study shows that 47.86% of the population took part are non-adherent, and 49.50% are moderate adherent and only 2.6% are highly adherent to medications prescribed by the physician, as supported by many kinds of literature, (Jimmy and Jose, 2011; Zhou, 2011).

Results imply that poor adherence in patients on anti-fungal treatment is due to influencing factors such as age, sex, level of awareness, occupation, course of the disease, personal income, inconvenience in access to the treatment, being impatient, lack of confidence. Reports show that over 60% of patients interviewed immediately after visiting their doctors misunderstood the directions to use the prescribed medications.

The practice of subjects suggest that 52.13% of subjects shared clothing’s with their friends and family members, 50.16% did not take medication as prescribed by the physician, 49.91% preferred OTC medications, and 51.4% of subjects did not wash hands before and after applying topical agents.

Pearson correlation test was conducted, and there was a weak positive correlation between knowledge and practice, knowledge and attitude, and attitude and practice. In contrast, Som (2016) conducted an observational study to examine risk factors and the epidemiological profile of superficial fungal infections in patients of rural area. Among which 37% gave a history of fomite sharing, 65% use of OTC medication (uneducated patients, farmers, labourers) appeared late to the hospital had a longer duration of fungal infection. Thus, understanding about the knowledge and practice of subjects with a superficial fungal infection will help in formulating a new strategy for prevention, treatment and methods to improve compliance to anti-fungal medication (Som, 2016).

Results imply that 63.6% of subjects had out of stock problems at the pharmacy. Thus, these factors influence patient compliance with treatment prescribed (Jimmy and Jose, 2011).

In the present study, it was found that lack of knowledge regarding the disease may worsen the health condition and which will directly reflect in the health care cost. There was a positive attitude observed among the few numbers of the respondents, while the remaining had a negative attitude towards the disease. About half of the subjects followed good practice towards the SFI. Systematically assessing the patient’s adherence to the drug regimen will improve the therapeutic outcome.

**CONCLUSION**

Different factors determine subjects Knowledge, Attitude and Practice towards the disease. In the present study by adopting KAP assessment and Morisky green Levine scale. It was found that most of the subjects were not adherent to the prescribed medication, even though considerable respondents had adequate knowledge, attitude and practice regarding superficial fungal infection. Due to the poor knowledge about the diseases, most of them do not adopt an appropriate preventive or corrective measures. Lack of knowledge regarding the disease may worsen the health condition and which will directly reflect in the health care cost. Among the responses received from subjects, it was found that the majority of the subjects affected with SFI was male subjects. Tinea cruris was the most common type of SFI observed in the study. The knowledge of the respondents was assessed and found that the majority of them believed that SFI is contagious; there are only a few respondents who believe SFI are caused due to luck. There was a positive attitude observed among a few numbers of the respondents, where few tried to adhere to their medication. At the same time, the remaining had a negative attitude towards the disease and half of the subjects followed good practice towards the SFI. There is a need for providing patient counselling on the use of drugs and adherence, which will play a major role in achieving the required therapeutic outcome. Among the respondents, adherence to medicines using MGLS shows that most of the subjects were having low adherence while few respondents had very high adherence as well. Efficient education programs should be implemented in-order to impart knowledge and awareness to improve health status. Systematically assessing the patient’s adherence to the drug regimen will improve the therapeutic outcome.

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**Conflict of Interest**
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