

Malassezia Folliculitis (MF) Patient Profile in Mycology Division of Dermatovenereology Outpatient Clinic General Academic Hospital Dr. Soetomo Surabaya Period of 2018-2020 Lintang Elin Massita^a, Yuri Widia^b, Agung Wahyu Widodo^c, Evy Ervianti^d

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Abstract

Malassezia folliculitis (MF) is a chronic infection of pilosebaceous follicles caused by *Malassezia* spp. Clinical features of MF may include perifollicular papules and itchy erythematous pustules. This study evaluating the profile of MF patients in the period 2018-2020 in the Mycology Division of Dermatovenereology Outpatient Clinic of Dr. Soetomo General Academic Hospital Surabaya. Retrospective descriptive study aimed at evaluating MF patients including the number of cases, patient baseline data, history taking, physical examination, supporting examinations, and therapy. Based on the tabulation of data obtained 154 new MF patients. The majority of patients were aged 17-25, were females, were students. The most clinical characteristics were red nodules accompanied by moderate itching, the longest duration of complaints were <1 months, the most endogenous predisposing factors were hyperhidrosis and exogenous was humidity and high temperature, the most localized status was in the thoracalis posterior, the most dermatological status was erythematous papules, the supporting examinations carried out were KOH 20% and showed blastospores with the predominance grade 4+, the most Wood's lamp examination revealed bright green yellow color, dermoscope examination showed erythema. Most systemic therapies was ketoconazole 2x200 mg and topical was ketoconazole shampoo 2%. There was an increase in the number of MF patients. The diagnosis of MF is based on anamnesis, physical examination and then matched with supporting examinations.

Keywords: Malassezia folliculitis, retrospective descriptive study, RSUD Dr. Sutomo Surabaya, Indonesia

1. Introduction

Malassezia folliculitis (MF) is a chronic fungal infection of pilosebacea follicle due to *Malassezia* spp., a normal flora of the skin (PERDOSKI, 2017). *Malassezia* spp. is a dysmorphic lipophilic fungus with 90% of the species habituates in the hair follicle and only a fraction of them sets in corneal layer of the skin. The overgrowth of this species would result as *Malassezia* folliculitis (Pravitasari, 2015). Clinical manifestations of MF are varied from perifollicular papules to erthematous pustules, which are often most accompanied with mild to moderate itch, and commonly predilected in the upper body. Due to its clinical resemblance with acne vulgaris, MF are frequently misdiagnosed while the prognoses are closely affected (Hald et al, 2015).

The colonization of *Malassezia* spp. begin right after birth. This colonization would not commonly progress to an infection until adolescence, when MF are predominantly occur. Race and gender have no influence in the incidence of MF. The age predomination of MF are varied in different studies. A turkish study with 49 patients revealed that MF mostly eventuated around the age of 26 (Durdu et al, 2013), while 5-year-american study with 110 patients argued that MF commonly occurred at around 15 years old (Prindaville et al, 2017). The MF prevalence in Indonesian general population has not been well-documented. However,

a previous 3-year-period Indonesian study, based on the data of 196 patients of the the Mycology Division of Dermatovenereology Outpatient Clinic of Dr. Soetomo General Academic Hospital Surabaya, suggested that most patients are classified similarly in the adolescence age group of 15 to 24 years-old (Putri and Evy, 2020).

As any other diseases, the diagnosis of MF is based on the clinical history and physical examination, illustrating the distinctive upper body distribution of MF, such as torso and forearms. A confirmatory microscopic examination of fungal culture, through specimens collection from the infective pustules fused with KOH 20% solution and parker blue-black ink, is as well necessary. Medications and treatments have been vastly varied from topical to systemic regiments which should be suited according to the clinical manifestation and severity of the occurring disease. Nonetheless, there has not been a standardized algorithm nor observational study regarding the MF treatments.

This retrospective study aimed to alleviate the success rate of MF treatments through evaluating the diagnosis accuracy and treatment outcomes of MF. We conducted the observation in the Micology Division of Dermatology and Venerology Outpatient Center in Soetomo General Hospital, which is a tertiary referral center in eastern Indonesia.

II. Method

2.1 Data Collecting

This is a descriptive restrospective study with a total sampling of patients receiving workups, medications, and treatments in the Mycology Division of Dermatovenereology Outpatient Clinic of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. Secondary data was obtained both from the electronic medical record (EMR) and the paper-based medical record. Demographic characteristics including age, gender, and occupation; clinical characteristics including duration of illness, dermatology manifestations, itch grading, predisposition factors, and other physical and supporting examinations; as well as medications and treatments of MF patients are observed in this study.

2.2 Data Analysis

We used descriptive data analysis through classifying corresponding variables and presenting the the analysis results in frequency distribution tables. Counts and percentages are presented.

III. Result and Discussion

Among 154 patients included in the analysis of this study, 33 patients (21.42%) are diagnosed in 2018, while 57 patients (37.01%) in 2019 and 64 patients (41.55%) in 2020.

3.1 Sociodemographic Data

Table 1. Demographic characteristics of MF patients.

| Demographic Characteristics | Year | | | n (%) |
|-----------------------------|-------------|-------------|-------------|-------------|
| | 2018 | 2019 | 2020 | |
| Gender | | | | |
| Men | 18 (11,68%) | 27 (17,53%) | 26 (16,88%) | 71 (46,10%) |
| Women | 15 (9,74%) | 30 (19,48%) | 38 (24,67%) | 83 (53,89%) |

| | | | | |
|---------------------|--------------------|--------------------|--------------------|----------------------|
| Age (years) | | | | |
| 0-5 | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| 5-11 | 1 (0,64%) | 5 (3,24%) | 0 (0,00%) | 6 (3,89%) |
| 12-16 | 5 (3,24%) | 12 (7,79%) | 6 (3,89%) | 23 (14,93%) |
| 17-25 | 11 (7,14%) | 24 (15,58%) | 40 (25,97%) | 75 (48,70%) |
| 26-35 | 13 (8,44%) | 10 (6,49%) | 17 (11,03%) | 40 (25,97%) |
| 36-45 | 0 (0,00%) | 5 (3,24%) | 1 (0,64%) | 6 (3,89%) |
| 46-55 | 3 (1,94%) | 0 (0,00%) | 0 (0,00%) | 3 (1,94%) |
| 56-65 | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| >65 | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| No data | 0 (0,00%) | 1 (0,64%) | 0 (0,00%) | 1 (0,64%) |
| Occupation | | | | |
| Student | 7 (4,54%) | 17 (11,03%) | 13 (8,44%) | 37 (24,02%) |
| Government employee | 1 (0,64%) | 0 (0,00%) | 1 (0,64%) | 2 (1,29%) |
| Private employee | 4 (2,59%) | 6 (3,89%) | 7 (4,54%) | 17 (11,03%) |
| Housewife | 2 (1,29%) | 1 (0,64%) | 2 (1,29%) | 5 (3,24%) |
| Not working | 1 (0,64%) | 2 (1,29%) | 1 (0,64%) | 4 (2,59%) |
| Others | 2 (1,29%) | 5 (3,24%) | 8 (5,19%) | 15 (9,74%) |
| No data | 17 (11,03%) | 25 (16,23%) | 32 (20,77%) | 74 (48,05%) |
| Total | 33 (21,42%) | 57 (37,01%) | 64 (41,55%) | 154 (100,00%) |

The study results showed that women suffer from MF more than men with 83 patients (53.89%) of our patients are women, compared to 71 men patients (41.06%). A study from Saudi Arabia revealed similar results with a 2:1 ratio of women and men, consecutively (Abdel et al, 1995). However, previous study in the same outpatient center at Soetomo General Hospital from 2014 to 2017 suggesting different results with men predominated the MF patients' population (63.8%). Men are more prone to suffer MF due to increased outdoor activities which trigger over-perspiration and over-moist skin. This discrepancy of hyperhidrosis risk due to outdoor activities were assumed to be drastically minimized during COVID-19 restrictions lockdowns (Anisa et al., 2021), thus the risk of MF was balanced between men and women (Ikfina, 2020).

The age of late adolescence at 17 to 25 years old predominated almost half of the MF population with 75 patients (48.70%). Previous study with the same settings in the Micology Division of Dermatology and Venerology Outpatient Center in Soetomo General Hospital reported similar results, with most of their patients were aged 15 to 24 years old. Miranda (2013) also found that the predomination of adulthood MF even extended from 18 to 39 years old. Levin (2011) argued that the majority of children, before adolescence and puberty, tend to produce less sebum compared to adolescents and adults, thus underlying the typical sebaceous skin characteristics in adolescents and adults. The colonization of *Malassezia* spp. begin immediately following the delivery of a newborn then progressively peaked during the adolescence and adulthood. The elevated androgen hormone activity in adolescents and adults, triggered by puberty and maturity of androgenic pathways, stimulates the sebaceous glands activity, thus increases the sebum production and created a relatively more oily skin. Despite the internal predisposition, an increased physical activity also gives rise to the liability of adolescents and adults to over-perspiration and over-moist skin, thus proliferate the MF risk in adolescents and adults.

Most MF patients were students with 37 patients (24.02%). Students tend to have a densed schedule and back-to-back activities, both for academical and non-academical necessities. Along with a typical high-stress environment of schools and colleges, these work-related stressors could disrupt the immune system and

provoke the recurrency of MF in students (Cantika, 2012).

3.2 Clinical Characteristics

Table 2. Clinical characteristics of MF patients.

| Clinical Characteristics | Year | | | n (%) |
|-------------------------------|-------------|-------------|-------------|---------------|
| | 2018 | 2019 | 2020 | |
| Lesion Types | | | | |
| Red lesion | 20 (12,98%) | 16 (10,38%) | 33 (21,42%) | 69 (44,80%) |
| Skin-colored lesion | 1 (0,64%) | 5 (3,24%) | 5 (3,24%) | 11 (7,14%) |
| Brown lesion | 2 (1,29%) | 0 (0,00%) | 0 (0,00%) | 2 (1,29%) |
| White lesion | 3 (1,94%) | 7 (4,54%) | 4 (2,59%) | 14 (9,09%) |
| Scalous lesion | 1 (0,64%) | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) |
| Total | 27 (17,53%) | 28 (18,18%) | 42 (27,27%) | 97 (62,98%) |
| Lesion Characteristics | | | | |
| Novel | 15 (9,74%) | 12 (7,79%) | 20 (12,98%) | 47 (30,51%) |
| Recurrent | 12 (7,79%) | 17 (11,03%) | 17 (11,03%) | 46 (29,87%) |
| Itchy | 19 (12,33%) | 40 (25,97%) | 43 (27,92%) | 102 (66,23%) |
| Painful | 0 (0,00%) | 4 (2,59%) | 1 (0,64%) | 5 (3,24%) |
| Burning | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| Stinging | 0 (0,00%) | 1 (0,64%) | 3 (1,94%) | 4 (2,59%) |
| No data | 0 (0,00%) | 0 (0,00%) | 12 (7,79%) | 12 (7,79%) |
| Total | 33 (21,42%) | 57 (37,01%) | 64 (41,55%) | 154 (100,00%) |
| Duration of Illness (months) | | | | |
| <1 | 17 (11,03%) | 19 (12,33%) | 22 (14,28%) | 58 (37,66%) |
| 1-6 | 8 (5,19%) | 16 (10,38%) | 22 (14,28%) | 46 (29,87%) |
| >6 | 3 (1,94%) | 13 (8,44%) | 11 (7,14%) | 27 (17,53%) |
| >12 | 3 (1,94%) | 8 (5,19%) | 9 (5,84%) | 20 (12,98%) |
| No data | 2 (1,29%) | 1 (0,64%) | 0 (0,00%) | 3 (1,94%) |
| Total | 46 (29,87%) | 74 (48,05%) | 96 (62,33%) | 216 (140,25%) |
| Itchiness | | | | |
| Mild | 3 (1,94%) | 14 (9,09%) | 19 (12,33%) | 36 (23,37%) |
| Moderate | 18 (11,68%) | 12 (7,79%) | 7 (4,54%) | 37 (24,02%) |
| Severe | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) | 2 (1,29%) |
| Total | 21 (13,63%) | 27 (17,53%) | 27 (17,53%) | 75 (48,70%) |
| Predisposition Factors | | | | |
| Endogen | | | | |
| Oily skin | 13 (8,44%) | 23 (14,93%) | 25 (16,23%) | 61 (39,61%) |
| Hyperhidrosis | 16 (10,38%) | 29 (18,83%) | 37 (24,02%) | 82 (53,24%) |
| Prolonged steroid use | 3 (1,94%) | 4 (2,59%) | 12 (7,79%) | 19 (12,33%) |
| Immunodeficiency | 2 (1,29%) | 1 (0,64%) | 2 (1,29%) | 5 (3,24%) |
| Cushing syndrome | 1 (0,64%) | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) |
| Prolonged antibiotic use | 1 (0,64%) | 1 (0,64%) | 1 (0,64%) | 3 (1,94%) |
| Other | 4 (2,59%) | 1 (0,64%) | 3 (1,94%) | 8 (5,19%) |
| Total | 40 (25,97%) | 59 (38,31%) | 80 (51,94%) | 179 (116,23%) |
| Exogen | | | | |
| Humidity and high temperature | 26 (16,88%) | 28 (18,18%) | 20 (12,98%) | 74 (48,05%) |
| Low hygiene | 12 (7,79%) | 13 (8,44%) | 12 (7,79%) | 37 (24,02%) |
| Garments occlusion | 5 (3,24%) | 14 (9,09%) | 4 (2,59%) | 23 (14,93%) |
| Oily emolients | 1 (0,64%) | 2 (1,29%) | 1 (0,64%) | 4 (2,59%) |
| Other | 0 (0,00%) | 10 (6,49%) | 9 (5,84%) | 19 (12,33%) |

| | | | | |
|--------------------|-------------|---------------|--------------|---------------|
| Total | 44 (28,57%) | 67 (43,50%) | 46 (29,87%) | 157 (101,94%) |
| Lesion Site | | | | |
| Anterior chest | 23 (14,93%) | 40 (25,97%) | 39 (25,32%) | 102 (66,23%) |
| Posterior chest | 33 (21,42%) | 53 (34,41%) | 55 (35,71%) | 141 (91,55%) |
| Face | 3 (1,94%) | 41 (26,62%) | 38 (24,67%) | 82 (53,24%) |
| Neck | 2 (1,29%) | 1 (0,64%) | 1 (0,64%) | 4 (2,59%) |
| Abdomen | 1 (0,64%) | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) |
| Forearm | 4 (2,59%) | 9 (5,84%) | 8 (5,19%) | 21 (13,63%) |
| Lower arm | 0 (0,00%) | 4 (2,59%) | 4 (2,59%) | 8 (5,19%) |
| Trunk | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) | 2 (1,29%) |
| Gluteal | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) | 2 (1,29%) |
| Upper extremity | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) | 2 (1,29%) |
| Axilla | 0 (0,00%) | 1 (0,64%) | 0 (0,00%) | 1 (0,64%) |
| Generalized | 0 (0,00%) | 2 (1,29%) | 2 (1,29%) | 4 (2,59%) |
| No data | 2 (1,29%) | 1 (0,64%) | 1 (0,64%) | 4 (2,59%) |
| Total | 68 (44,15%) | 155 (100,64%) | 151 (98,05%) | 374 (242,85%) |

We found that the most frequent chief complain from MF patients is red lesions in 69 patients (44.80%). This finding is in accordance with previous study by Putri and Evy (2020) who found that 100% of their patients were having itchy erythematous pustules.

The majority of MF patients, 58 patients (37.66%) suffered from the disease for less than a month. The Indonesian climate tends to be hot and humid which precipitates sebum secretion to the skin surface and generate an optimal environment for *Malassezia* spp. growth. Nevertheless, several studies also revealed a longer duration of illness from 1 to 10 months (Jacinto-Jamora et al., 1991).

Itchiness are the most common lesion characteristics in MF, which had been experienced by 102 patients (66.23%), and with moderate grading of itchiness in 37 patients (24.02%). These findings are similar to previous study that reported 93% patients experienced moderate itchiness (Putri and Evy, 2020). In general, the itchiness most felt with moderate grading. The itch would occur in frequent episodes and could be manifested as a stinging pain. Patients would oftentimes scratch the affected areas to reduce the itchiness. The stinging sensation is commonly endured during increased activities and direct sun exposures which stimulates perspiration (Durdu et al, 2013).

Predisposition factors could appear as endogen or exogen factors. The most typical endogen predisposition is hyperhidrosis in 61 patients (39.61%), while humidity and high temperatures comprising most of the exogen predispositors, 74 patients (48.05%). Hyperhidrosis is a hyperperspiration condition which drive the sweat production surpassing the physiological thermoregulation requirements. With this overproduction of sweats, an optimal skin humidity could be created for *Malassezia* spp. growth. On the other hand, high humidity and temperatures could additionally accelerates sebum production on the skin surface, thus also promote the growth of *Malassezia* spp. (Miranda, 2013).

The posterior trunk are the most predilected area to be affected by *Malassezia* spp., 141 patients (91,55%), while the abdomen and axilla are the least affected area, with only 1 patients (0.64%) on each area. A South Korean study by Yu et al. (1998) corresponded with these results with the chest and back are the most affected area in MF. These predilections are associated with garments occlusion, thus increasing the humidity and temperature which increase the risk for MF.

3.3 Dermatology Manifestation

Table 3. Physical examination characteristics of MF patients.

| Dermatologic status | Year | | | n (%) |
|------------------------|---------------------|---------------------|----------------------|----------------------|
| | 2018 | 2019 | 2020 | |
| Erythematous papule | 29 (18,83%) | 49 (31,81%) | 67 (43,50%) | 145 (94,15%) |
| Perifollicular pustule | 21 (13,63%) | 23 (14,93%) | 42 (27,27%) | 86 (55,84%) |
| Delle | 17 (11,03%) | 24 (15,58%) | 20 (12,98%) | 61 (39,61%) |
| Extended | 7 (4,54%) | 8 (5,19%) | 7 (4,54%) | 22 (14,28%) |
| Monomorph | 16 (10,38%) | 8 (5,19%) | 12 (7,79%) | 36 (23,37%) |
| Dispersed | | | | |
| Peripheral | 14 (9,09%) | 6 (3,89%) | 4 (2,59%) | 24 (15,58%) |
| Central | 3 (1,94%) | 14 (9,09%) | 7 (4,54%) | 24 (15,58%) |
| No data | 0 (0,00%) | 6 (3,89%) | 16 (10,38%) | 22 (14,28%) |
| Other | 0 (0,00%) | 7 (4,54%) | 8 (5,19%) | 15 (9,74%) |
| Total | 107 (69,48%) | 145 (94,15%) | 183 (118,83%) | 435 (282,46%) |

Erythematous papules are the most observed dermatologic lesion in MF patients, 145 patients (94.15%), although several patients also manifested more than 1 dermatological lesion types. This is corresponded with previous literature study which stated that erythematous papules and perifollicular pustules in the upper body area including upper trunk, neck, and forearm are the most frequent dermatological status in MF patients (Miranda, 2013).

3.4 Supporting Examinations

Table 4. Supporting examinations results in MF patients.

| Supporting Examination | Year | | | n (%) |
|------------------------------|--------------------|--------------------|--------------------|---------------------|
| | 2018 | 2019 | 2020 | |
| Wood Lamp | | | | |
| Negatif | 11 (7,14%) | 11 (7,14%) | 13 (8,44%) | 35 (22,72%) |
| Positif | | | | |
| Kuning hijau terang | 10 (6,49%) | 14 (9,09%) | 18 (11,68%) | 42 (27,27%) |
| Kuning keemasan | 1 (0,64%) | 2 (1,29%) | 4 (2,59%) | 7 (4,54%) |
| Biru terang | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) |
| Orange kekuningan | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) | 1 (0,64%) |
| Putih | 2 (1,29%) | 1 (0,64%) | 0 (0,00%) | 3 (1,94%) |
| Tidak ada keterangan | 4 (2,59%) | 5 (3,24%) | 2 (1,29%) | 11 (7,14%) |
| Total | 28 (18,18%) | 33 (21,42%) | 39 (25,32%) | 100 (64,93%) |
| KOH | | | | |
| Negatif | 1 (0,64%) | 1 (0,64%) | 2 (1,29%) | 4 (2,59%) |
| Positif | | | | |
| Blastospora | 29 (18,83%) | 52 (33,76%) | 57 (37,01%) | 138 (89,61%) |
| Budding yeast | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| Pseudohifa | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| Spaghetti and meatball | 1 (0,64%) | 2 (1,29%) | 0 (0,00%) | 3 (1,94%) |
| Lain-lain (M. Furfur gr. II) | 0 (0,00%) | 1 (0,64%) | 0 (0,00%) | 1 (0,64%) |
| Total | 31 (20,12%) | 56 (36,36%) | 59 (38,31%) | 146 (94,80%) |
| KOH Grading | | | | |
| Grade 1+ | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) | 0 (0,00%) |
| Grade 2+ | 2 (1,29%) | 1 (0,64%) | 3 (1,94%) | 6 (3,89%) |

| | | | | |
|--|--------------------|--------------------|--------------------|---------------------|
| Grade 3+ | 5 (3,24%) | 13 (8,44%) | 7 (4,54%) | 25 (16,23%) |
| Grade 4+ | 20 (12,98%) | 34 (22,07%) | 45 (29,22%) | 99 (64,28%) |
| Tidak ada data | 1 (0,64%) | 3 (1,94%) | 2 (1,29%) | 6 (3,89%) |
| Lain-lain | 0 (0,00%) | 2 (1,29%) | 0 (0,00%) | 2 (1,29%) |
| Total | 28 (18,18%) | 53 (34,41%) | 57 (37,01%) | 138 (89,61%) |
| Dermoscopy | | | | |
| Negatif | 0 (0,00%) | 7 (4,54%) | 0 (0,00%) | 7 (4,54%) |
| Positif | | | | |
| Net-like distribution of pigmented skin lesion | 0 (0,00%) | 4 (2,59%) | 5 (3,24%) | 9 (5,84%) |
| Papula hipopigmentasi/putih | 0 (0,00%) | 0 (0,00%) | 3 (1,94%) | 3 (1,94%) |
| Skuama perilesional berwarna putih | 0 (0,00%) | 0 (0,00%) | 12 (7,79%) | 12 (7,79%) |
| Papula folikulosentris | 0 (0,00%) | 0 (0,00%) | 16 (10,38%) | 16 (10,38%) |
| Pustula folikulosentris | 0 (0,00%) | 4 (2,59%) | 8 (5,19%) | 12 (7,79%) |
| Eritema | 0 (0,00%) | 1 (0,64%) | 18 (11,68%) | 19 (12,33%) |
| Rambut bergulung | 0 (0,00%) | 0 (0,00%) | 4 (2,59%) | 4 (2,59%) |
| Scaling | 0 (0,00%) | 2 (1,29%) | 0 (0,00%) | 0 (0,00%) |
| Total | 0 (0,00%) | 18 (11,68%) | 66 (42,8%) | 82 (53,24%) |

100 patients (64.93%) were examined for Wood's lamp examination with 35 patients (22.72%) showed a negative result and 65 patients (42.20%) came up with positive results. Bright greenish yellow KOH staining was found in 42 patients (22.72%). Studies by Sharquie (2012) in Baghdad and Durdu (2013) in Turkey suggested that a positive KOH examination is commonly indicated with greenish yellow staining, although a white or bright blue staining could also indicate a positive result. The Wood's lamp could be utilized to detect a subclinical infection or even an extended infection, thus could objectively differ an MF with other etiologies of folliculitis. The Wood's lamp examination is based on the theory that *Malassezia* spp. synthesizes particular compounds, pityriacitrin and pityrialactone, that could absorb light and fluorescence under a 365 nm UV light (Layton, 2010).

The most documented supporting examination used to confirm the diagnosis of MF is KOH 20% in 146 patients (94.80%), while the least examination conducted is Sabourraud Dextrose Agar (SDA) culture with olive oil in only 1 patient (0.64%) with no report on the culture result. Among the patients examined for KOH 20%, only 4 patients (2.59%) were tested negative and the majority of MF patients, 138 patients (89.61%) are KOH-positive, with blastospore as the most found form of the fungus. The KOH grading were predominated with 4+ grade patients, 99 patients (64.28%), and no patients resulted in KOH grade 1. These findings are in accordance with Durdu (2013) study which resulted in 81.6% of the patients were KOH-positive.

The KOH grading, originated by Jacinto-Jamora et al. (1991), is based on the spore load per view field, which could be determined as KOH-positive with minimal grading of more than 2+. KOH examination sample could be obtained from skin-fat scraping, which then fused with 10 to 20% of KOH and colored with blue parker ink on the preparation slide. The slide then read under a light microscope with 400x enlargement. KOH solution works by dissolving the protein, lipid, and epithelial cells from the specimen. The fungal elements would not be dissipated with KOH due to its chitin and glycoprotein in its walls (Ayers et al., 2005). Results of this study had proven the high-positivity rate of KOH examination in the MF diagnosis. This examination could confirm the MF diagnosis in a shorter time compared to skin biopsy or skin culture. During the culture process, *Malassezia* spp. would only grow on a fatty acid-rich media or an olive-oil augmented media.

Among the 82 patients undergo dermoscopy, 75 patients were positive with erythema (12.33%) and papulofolliculocentris (10.38%) are the most found dermatological lesions. Deepak et al. Had been previously observe these similar findings with erythema and papulofolliculocentris lesions was found in all of the patients.

3.5 Medication and treatments

Table 5. Medication and treatments of MF patients.

| Medications and Treatments | Year | | | n (%) |
|--------------------------------|-------------|-------------|-------------|---------------|
| | 2018 | 2019 | 2020 | |
| Systemic | | | | |
| Ketoconazole 2 x 200mg | 29 (18,83%) | 49 (31,81%) | 62 (40,25%) | 140 (90,90%) |
| Cetirizine | 1 (0,64%) | 1 (0,64%) | 8 (5,19%) | 10 (6,49%) |
| Topical | | | | |
| Ketoconazole 2% Cream | 0 (0,00%) | 6 (3,89%) | 2 (1,29%) | 8 (5,19%) |
| Ketoconazole shampoo 2% | 10 (6,49%) | 11 (7,14%) | 12 (7,79%) | 33 (21,42%) |
| Ketoconazole 2% scalp solution | 0 (0,00%) | 11 (7,14%) | 4 (2,59%) | 15 (9,74%) |
| Tretinoin 0,025% Cream | 1 (0,64%) | 0 (0,00%) | 0 (0,00%) | 1 (0,64%) |
| Tretinoin 0,05% Cream | 0 (0,00%) | 0 (0,00%) | 2 (1,29%) | 2 (1,29%) |
| Urea cream 10% | 0 (0,00%) | 5 (3,24%) | 0 (0,00%) | 5 (3,24%) |
| Total | 41 (26,62%) | 83 (53,89%) | 90 (58,44%) | 214 (138,96%) |

200 mg oral ketoconazole twice a day is remain the medication of choice in treating fungal infections in Indonesia, as proven in 140 patients (90.90%) of the study, while 2% shampoo ketoconazole was prescribed in 33 patients (21.42%). 10% urea cream was frequently prescribed in patients with comorbidities including psoriasis vulgaris, tinea cruris, and pityriasis versicolor. Multiple medications are also observed in several patients. Overall, ketoconazole, both systemic and topical, is remain the most chosen treatment.

According to both the clinical guidelines applied in Soetomo General Hospital and the recommendation of the National Dermatology and Venerology Committee, ketoconazole is the first-line systemic treatment for MF patients with 4-weeks-interval evaluation. Antifungal medications have been proven satisfactory in MF treatments. Yu et al. (1998) stated that the use of antifungal treatment could diminish the spore load to less than 2+ only after 2 weeks of treatment. Ketoconazole also decrease the sebum production and prevent follicle ostium blockage.

4. Conclusion

There was an increase in the number of MF patients. The MF profile and characteristics in Soetomo General Hospital are similar to previous findings in various study from different counterparts of the world. However, during this time of vast medical advancements, the medication and treatment of choice for MF has not been significantly explored. We hope that future studies could emulate a more advanced treatment regimens for MF, thus alleviate the MF population quality of life.

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