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Characteristics of Scabietic Lesions as Predictors of Microscopy Outcome in the Diagnosis of Scabies

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Abstract

Background: In resource limited settings, microscopic isolation of the scabies mite or its products is a cheap method to confirm clinical diagnosis of scabies, however this method is sometimes problematic as the mite or its products are not often found. *Objectives*: This study was conducted to determine the correlation between clinical characteristics of scabies lesions and outcome of microscopy. *Methods*: In a hospital-based cross sectional study, 210 consecutive patients with a clinical diagnosis of scabies were recruited. Questionnaires were used to obtain their demographic and clinical data, and skin scrapings were taken for microscopic diagnosis of scabies. Data was analyzed using Epi Info version 7 statistical software package. *Results*: Of 210 patients with a clinical diagnosis of scabies, 52.9% were females and 47.1% were males with a mean age of 14.8 (±11.7). Microscopy of skin scrapings confirmed the diagnosis of scabies in 111 patients (52.9%) while 99 patients (47.1%) had a negative microscopy result. A significant correlation was found between the distribution of scabies lesions to the buttocks and a positive microscopy result. *Conclusion*: For microscopic diagnosis of scabies, distribution of scabies lesions to the buttocks seems to be a significant predictor of a positive result.

Keywords

Scabies, Lesions, Diagnosis, Microscopy

1. Introduction

Human scabies is caused by the parasitic mite *Sarcoptes scabiei hominis*, an intensely pruritic, highly contagious parasitic skin infestation reported to affect an estimated 300 million people worldwide each year. [1] Scabies affects all age groups, races, sexes and socioeconomic groups, but it is more common in children and conditions of poverty and overcrowding. [2]-[7] In Nigeria, scabies has been noted to be among the commonest skin conditions. [8]-[10] It is endemic in underdeveloped countries, and apart from the intense discomfort it causes, it is also associated with severe complications such as cellulitis, pyoderma, impetigo, bacteraemia, post-streptococcal glomerulonephritis and rheumatic heart disease thus constituting a public health problem. [3], [11], [12] In developed countries, scabies is more commonly seen in institutionalized settings such as nursing homes, prisons, long-term care facilities. [1] The World Health Organization (WHO) has recently added scabies to the list of neglected tropical diseases. [13]

The infective agent is the adult female mite which measures about 0·3 mm by 0·4 mm in size so it is not visible to the naked eye. It burrows through the skin depositing faeces and laying eggs in its path. The burrow formed by the mite along its way is pathognomonic for scabies. [14] It is a short, about 5 – 10mm, S-shaped, wavy, scaly, grey line on the skin surface with a vesicle at the distal end containing the mite.

Scabies presents with various clinical manifestations. [13], [14] Knowing the various forms of clinical presentation is important for diagnosing scabies. The primary symptom is widespread itching which is usually worse at night. The rash presents with burrows and pruritic papules that classically occur in the webs of the fingers, the flexor aspects of the wrists, the extensor aspects of the elbows, the peri-umbilical skin, the buttocks, the ankles, the penis and scrotum in males, and the peri-areolar region in females. In immunocompetent adults, the head and neck are rarely involved, but in infants and young children, all skin surfaces are susceptible. Excoriation and secondary infection can result in distortion of the typical

burrows and vesicles giving rise to secondary lesions such as crusted papules, excoriations, pustules, nodules, impetigo and folliculitis. All these make it difficult to detect the characteristic burrows. Another form of scabies presentation is the more severe crusted scabies or Norwegian scabies commonly seen in immunocompromised patients. Depending on the severity of scabies infestation, a scabies patient may have an average of 12 mites in classical scabies to thousands of mites in crusted scabies. [14]

Because scabies presents in different clinical forms, combined with the fact that it resembles many clinical dermatoses, diagnosing scabies can be a challenge. [2], [15] In developing countries, clinical diagnosis remains the main method of diagnosis and is based on a typical history of pruritus which is worse at night, presenting along with characteristic lesions distributed at typical sites and a history of contact with a case of scabies or itching in another household member. [1], [16], [17] Clinical diagnosis is non-specific due to the extensive number of skin conditions that resemble scabies.

Microscopy of skin scrapings is the traditional method for identifying the scabies mite, its eggs or faeces, but experience has shown that the sensitivity of this traditional method is less than 50%, [17] so even when a person is infested with scabies, examination of skin scrapings does not always yield a positive result even in the hands of experienced scientists. [17], [18], [19] The method is cheap, and continues to be used in resource limited settings like Nigeria. Various other options exist for scabies diagnosis; they include burrow ink test, adhesive tape test, dermatoscopy, and nucleic acid detection methods. [16], [17], [18] Some challenges associated with these methods are: the burrow ink and adhesive tape tests are often impracticable and not commonly used, dermatoscopy and nucleic acid detection tests have not been accessed in tropical environments and have the disadvantages of high equipment cost, and technical difficulties.

Literature describes certain features of scabies infestation that tend to influence the presence and number of mites within the lesions. [14], [17]. Since a positive microscopy result is dependent on detection of the mite or its products, patients who have lesions that influence the presence of a high number of mites are more likely to have a positive result for microscopy. Scrapings taken from typical burrows, unscratched lesions or lesions associated with severe infestation are more likely to contain mites than scrapings taken from lesions of less severe disease, distorted by scratching, secondarily infected or obscured by eczema and impetigo. [17] These are factors to be considered when taking skin scrapings.

Although clinical judgement is still practical in diagnosing scabies, the need to confirm clinical diagnosis may often arise when scabies needs to be distinguished from other common dermatoses particularly in cases that are difficult to treat. Successful treatment of scabies depends on accurate diagnosis. Only few studies involving microscopic diagnosis of scabies in resource limited settings are available, and they have reported low sensitivity. [21], [22] One study comparing methods for diagnosing scabies unexpectedly found that the sensitivity of the method used to diagnose scabies seemed to depend on the clinical characteristics of the patient. [21] This current study aimed to examine the correlation between clinical characteristics of scabietic lesions and the outcome of microscopy in 210 patients with a clinical diagnosis of scabies. Determination of such a correlation can become useful knowledge that will guide the selection of the most ideal lesions to collect skin scrapings from in order to enhance positive outcome of microscopy.

2. Materials and Methods

It was a cross-sectional study conducted in the General Outpatient Department (GOPD) of Jos University Teaching Hospital (JUTH). All consecutive patients aged 5 years or more, presenting at the clinic, who were clinically diagnosed to have scabies and had not received scabies treatment within the previous one month, and who were not very sick, pregnant or lactating met the inclusion criteria and were recruited for the study. A clinical diagnosis of scabies was made in each patient by an experienced family physician using the following criteria: history of contact with a person(s) infested with scabies; pruritus worse at night; presence of burrows and vesicles; presence of secondary lesions (papules, nodules, excoriations, crusts or folliculitis) in characteristic sites; and gross scaling, hyperkeratotic plaques, and fissuring. Three or more of any of these findings in a patient were accepted as diagnostic of scabies. Using a questionnaire, demographic and clinical data were also recorded by an experienced family physician that viewed the skin lesions with a hand lens and defined their characteristics based on (i) type (ii) distribution and (iii) severity. Lesions were grouped into 3 different types as follows: Primary lesions (burrows and vesicles); secondary lesions (papules, nodules and excoriations); and Crusts (gross scaling, hyperkeratotic plaques and fissuring). The lesions were plotted on a body map and grouped according to the following 6 distribution sites: head, trunk, hands/arms, buttocks, thigh/legs, and genital. Severity of the lesions was graded into mild ($\leq$ 10 lesions) =1, moderate (11-49 lesions) =2, severe ($\geq$ 50 lesions) =3 or crusted=4. Microscopy of skin scrapings was performed according to standard technique, [23] by an experienced laboratory technician. Skin scrapings were taken following careful examination of the patients to identify areas of skin where burrows were present or any other suspicious sites containing papules and vesicles. Identified areas were cleaned with alcohol swabs and mineral oil was applied to the lesions; the enlarged distal end of the burrow or papule and/or vesicle was then opened by scraping with a sterile blade. The entire scraping was then immediately transferred to a glass slide. A drop of 10% potassium hydroxide solution was placed on the scrapings and covered with a cover slip gently to avoid air bubbles. Every field throughout the entire wet slide was then examined microscopically for the mites and its products using X10 power of the light microscope. Identification of the mite, mite eggs or faecal material (scybala) was considered a positive microscopy result.

Statistical analysis

Analysis of data was performed using Epi info version 7 statistical software package (CDC, Atlanta, GA). Variables were presented as means ± standard deviations (SD) or frequencies and percentages. Differences in microscopy outcome were evaluated using Chi square analysis. Logistic regression was also performed to evaluate any correlations between characteristics of scabies lesions and outcome of microscopy. Confidence interval of 95% was applied and a P-value of ≤ 0.05 was considered to be significant.

3. Results

3.1. Characteristics of Patients

The study population comprised of 210 scabies patients of which 111(52.9%) were female and 99(47.1%) were male. Their ages ranged from 5 – 65 years with a mean age (± SD) of 14.8 (± 11.7) years. The largest number of patients was found in the age group of children between 5 – 14 years, and they formed 66.2% of the total population, while the least number of patients was in the age group ≥ 45 years forming 2.9% of patients. All of the patients (100%) had a history of pruritus as well as a history of contact with a case of scabies, and slightly more than half of the population (52.9%) had a positive microscopy result. There was no statistically significant difference in the outcome of microscopy related to the age and sex of the patients. See Table 1.

3.2. Characteristics of Lesions

Secondary lesions (papules, nodules, excoriations) were the most common type of lesions, occurring in 205 (97.6%) of the patients, followed by primary lesions (burrows/vesicles) in 92 (43.8%) of the patients. Crusts (gross scaling, hyperkeratotic plaques and fissuring) were the least common type of lesions and occurred only in 5 (2.4%) patients. The most frequent site of distribution of lesions was hand/arm – 195(92.8%); while the least frequent site was the head - 7(3.3%); distribution to other sites was as follows: trunk - 67 (32.0%); buttocks - 175(83.3%); thigh/legs - 126 (60.0%); Genital - 96(45.7%). In patients who had scabies lesions distributed to the buttocks, there was a statistically significant difference in the outcome of microscopy result, where more patients with buttock lesions had a positive result. In grading severity of lesions, a majority of the patients, 137 (65.2%) had moderate lesions, 70 (33.3%) had severe lesions and 3(1.4%) had crusted lesions. No patient had mild lesions at presentation. See Table 1.

Table 1. *Patient characteristics and outcome of microscopy*

Variable	Total (n = 210) Frequency (%)	Microscopy outcome		P-value
		Positive (n = 111) Frequency (%)	Negative (n = 99) Frequency (%)	
Age years				
5 – 14	139 (66.2)	70 (63.0)	69 (69.7)	0.0994
15 – 24	28 (13.3)	21 (19.0)	7 (7.1)	
25 – 34	22 (10.5)	12 (10.8)	10 (10.1)	
35 - 44	15 (7.1)	6 (5.4)	9 (9.1)	
≥45	6 (2.9)	2 (1.8)	4 (4.0)	
Sex				
Female	111(52.9)	64 (57.7)	47 (47.5)	0.1400
Male	99 (47.1)	47 (42.3)	52 (52.5)	
Symptoms				
History of contact/ pruritus	210 (100)	111 (100)	99 (100)	1.000
Types of lesions**				
Burrows/vesicles	92 (43.8)	50 (45.0)	42 (42.4)	0.7024
Papules/nodules/excoriations	205 (97.6)	109 (98.1)	96 (96.9)	0.5599
Crusts	5 (2.4)	2 (1.8)	1 (1.0)	0.6294
Distribution of lesions***				
Head	7 (3.3)	4 (3.6)	3 (3.0)	0.8172
Trunk	67 (32.0)	38 (34.2)	29 (29.3)	0.4431
Hands/arm	195(92.8)	101 (91.0)	94 (94.9)	0.2661
Buttocks	175(83.3)	98 (88.3)	77 (77.8)	0.0413*
Thigh/legs	126(60.0)	68 (61.3)	58 (58.6)	0.6928
Genital	96(45.7)	50 (45.0)	46 (46.5)	0.8366
Severity of lesions				
Mild	-	-	-	-
Moderate	137 (65.2)	76 (68.5)	61 (61.6)	0.2979
Severe	70 (33.3)	33 (29.7)	37 (37.4)	0.2407
Crusted	3 (1.4)	2 (1.8)	1 (1.0)	0.6294

*Statistically significant

**Patients had more than one type of lesion

***Lesions were distributed to more than one site

3.3. Correlation of Scabies Lesions and Outcome of Microscopy

There was no statistically significant association between characteristics of scabies lesions and microscopy outcome except for the lesions distributed to the buttocks which showed a statistically significant association with positive microscopy result. With the buttock lesions, there was a three times increased likelihood of having a positive result (odds ratio = 3.1642, P-value = 0.0102). The age group 5 – 14 years also showed a significant association with microscopy outcome (odds ratio = 2.9571, P- value = 0.0206). See Table 2.

Table 2. *Determinants of microscopy outcome in the study population (Logistic regression analysis)*

Variable	Odds ratio	95% Confidence interval	P-value
Age group years			
5 – 14	Reference	-	-
15 – 24	2.9571	1.1811–7.4036	0.0206*
25 – 35	1.1829	0.4796–2.9171	0.7154
35 – 44	0.6571	0.2220-1.9451	0.4483
≥45	0.4929	0.0874–27790	0.4227
Sex			
Female	Reference	-	-
Male	1.5066	0.8733–2.5990	0.1407
Type of lesions			
Yes/no	Reference	-	-
Burrows/vesicles	1.8244	0.2900–11.4774	0.5217
Papules/nodules/excoriations	1.1416	0.6541 – 1.9924	0.6413
Crusts	1.7197	0.1528–19.3582	0.6607
Distribution of lesions			
Yes/no	Reference	-	-
Head	0.9405	0.1920–4.6078	0.9397
Trunk	1.8470	0.6135–0.3713	0.0985
Hands/arm	0.4262	0.1322–1.3740	0.1533
Buttocks	3.1642	1.3147–7.6156	0.0102*
Thigh/legs	0.7001	0.3606–1.3592	0.2922
Genital	0.6204	0.3248–1.1851	0.1482
Severity of lesions			
Moderate	Reference	-	-
Severe	0.7159	0.4017–1.2756	0.2568
Crusted	1.6053	0.1422–18.1240	0.7019

*Statistically significant

4. Discussion

Scabies, recently added to the World Health Organisation list of neglected tropical diseases is an under-acknowledged public health problem. [13] A crucial step in managing this problem involves the accurate diagnosis of scabies, to ensure not only treatment and cure, but also prevention of complications and control of spread. [24] However diagnosis and ultimately treatment is not always easy particularly in resource limited settings where prevailing conditions favour missed diagnosis and an un-ending transmission of the mite. [16], [17], [24] Though there are newer and more efficient methods of diagnosing scabies in the developed world, microscopy for skin scrapings is still one of the easily available and affordable methods in developing world. This current study conducted in Nigeria, located in a resource limited setting set out to determine probable factors that when taken into consideration in the collection of skin scrapings, might enhance the efficiency of microscopy as a diagnostic method for scabies. In our literature search, we did not come across any such similar study evaluating characteristics of lesions for microscopic diagnosis of scabies.

Clinical diagnosis was the method used to diagnose scabies patients for recruitment into this study, and this is a common and acceptable method that has been used in many studies and in clinical practice. [13], [25]-[27] The 210 patients each had at least 3 of the 5 criteria which was a requirement to qualify for a clinical diagnosis. Indeed, all the patients (100%) had a history of pruritus and contact with a case of similar scabies rash, though in reality, it is still possible to contact the infestation without being aware of the source; moreover the source might be animals or fomites. [13], [17] In this study, a majority of the patients with scabies were children and this is in concordance with the well-known fact that scabies occurs more commonly in children. [14] It is also similar to reports of other studies where scabies was reported to occur most commonly in children. [8], [9] Other criteria used in this study for the clinical diagnosis of scabies included the type and distribution of the scabies lesions. The various types of scabies lesions primary, secondary and crusts, distributed at the typical sites were seen in the study population. The least frequent site was the head and this may be because scabies does not commonly occur on the head except in infants and young children, [3] and this group (infants and children less than 5 years) were not included in this study. The most frequent type of lesions seen in the patients (97.6%) was the secondary lesions, which usually result from excoriation, secondary infection and hypersensitivity reactions, while primary lesions with undistorted burrows which are expected to be easier to detect and more likely to contain mites were found in less than half of the population (43.8%). A probable reason for secondary lesions being commoner may be because of the itchy nature of scabies with resultant scratching which favours the development of secondary lesions. Because this type of secondary lesions have been associated with negative microscopy result due to distortion of burrows, it was surprisingly that the ratio of positive microscopy result to number of patients was similar for patients with secondary lesions (distorted burrows) compared to that of patients with primary lesions (undistorted burrows) i.e. [109:205 and 50:92 respectively], this ratio should be expected to be higher for the patients with primary lesions (undistorted lesion). However, it should be considered that both types of lesions co-existed in

many of the patients. Also in this study, crusts which occur in the most severe form of scabies and are known to harbour a high mite load, occurred only in 5 patients, and of these, only three had a positive microscopy. The percentage of patients with crust (1.43%) was too small to make a significant difference.

Based on distribution of lesions, the hand/arm site distribution had the highest number of patients followed by the buttocks, but only the buttocks showed a statistically significant association with the outcome of microscopy. According to statistical analysis, patients with lesions at this site were 3 times more likely to have a positive microscopy result. See table 1 and 2. Putting together this finding and the similar ratios found for positive microscopy with primary lesions and secondary lesions, there is a possibility that site of lesion rather than type of lesion may play a more significant role in microscopy outcome. Unfortunately, the sites from which scrapings were taken was not documented in the study, perhaps this may have added credence to the possibility.

In spite of a 100% clinical diagnosis of scabies in the patients, only 52.8% of them had a microscopic diagnosis of scabies, and this is not an unusual finding. [17], [19] Absence of microscopic confirmation does not rule out the diagnosis of scabies. [16] Factors such as distorted burrows, atypical scabies with low mite load, poor sensitivity of the method and inefficient technique have been put forward as possible reasons for a negative result, but even in the hands of experienced dermatologists, only a mite or egg is recovered in about 50% of cases. [19].

Logistic regression analysis revealed a significant correlation between scabies lesions distributed to the buttocks and positive microscopy result. None of the other characteristics of scabies lesions showed any significant relationship. Patients with lesions on the buttocks did not necessarily have their skin scrapings taken from the buttock lesions to end up with a positive result. For this reason, further studies along these lines are required where the source site of skin scrapings would be documented for evaluation. There was also a significant correlation between the age group 5 – 14 years and positive microscopy outcome. This implies that children of that age group are move likely to have a positive microscopy result. However in view of the fact that this age group formed the largest proportion of the study population, this apparently significant association may be as a result of their high number rather than a true correlation. In this aspect also, further investigation is needed.

Though some experts have suggested that clinical diagnosis is sufficient to make a diagnosis of scabies and microscopic diagnosis is unnecessary, however, due to the fact that many skin conditions mimic or/and coexist with scabies and the problems associated with treatment difficulties, sometimes it becomes very essential to confirm the diagnosis by detecting the mite. Some researchers do not recommend microscopy of skin scraping as a diagnostic tool [20] but Detecting the mite by microscopy has been found practicable even with large numbers of patients. [18]

The population size in this study was small; however the findings are worth forming the basis of larger studies that may contribute lasting solutions to the menace of this neglected tropical disease, scabies.

5. Conclusion

The presence of scabies lesions on the buttocks of scabies patients seems to have a positive correlation with the outcome of microscopy; however, further studies involving larger populations are required to shed more light on this finding.

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