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Scabies in Koranic schools in Dakar, Senegal: Prevalence and risk factors

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Abstract

The main clinical manifestation of scabies caused by the mite, *Sarcoptes scabiei*, is a pruritic skin eruption. Since 2017, WHO has recognised it as a Neglected Tropical Disease (NTD). In order to bring forward strategies relevant to the framework of NTDs in Senegal, we conducted a study. Our aims were to determine the prevalence of scabies and its risk factors among students attending Koranic schools in Dakar

Method: We were provided with a list of Koranic schools by the heads of health districts and the academic inspectorate. The Koranic schools participating in the study were randomly selected. A cross sectional study was performed, in the departments of Pikine and Dakar, located in the capital, Dakar. Diagnosis was based of clinical criteria with or without confirmation by parasitological examination. Statistical analysis was performed using Stata software version 12. The significance level was 5%.

Result: During the study period from January 9 to October 16, 2018, a total of fifteen koranic schools were included. Out of the 959 residents, 70 were diagnosed with scabies giving a prevalence of 7.29%. The prevalence according to school varies from 1.63-30.84% The main risk factors were the following: male gender, age group less than 10 years ($p<0.05$), number of residents ($p=0.0001$), number of showers per week ($p=0.048$), the possession of field and land ($p<0.0001$), the urban origin in Dakar ($p=0.03$).

Multivariate analysis showed that the number of residents in the koranic school, less than 2 showers per week, the possession of livestock were risk factors for scabies, while the presence of a housekeeper, and phone contact with parents are protective factors for scabies. In the logistic regression model, only the number of showers per week above two (OR=0.41, 95% CI 0.22- 0.77) and age group more than ten years (OR=0.52, 95% CI 0.30-0.91) was the protective factors for scabies among schoolchildren in Koranic schools.

Conclusion: Highly scabies prevalence rates were observed in Koranic schools. The main protective factors were the number of showers per week (greater than two) and age group of more than ten years were the only protective factors for scabies among schoolchildren. The study emphasizes the importance of maintaining high standards of hygiene especially in children under 10 years of age.

Keywords: scabies- koranic school, Dakar

Introduction

Scabies is an ectoparasitosis that may reach epidemic levels in some regions. In 2017, WHO recognized it as a Neglected Tropical Disease (NTD) [1]. The Global Burden of Diseases study has estimated that scabies affects 455 million persons worldwide each year leading to approximately 3.8 million Disability-Adjusted Life-Years (DALYs); making scabies one of the most common NTDs [2, 3].

The most common complication of scabies is the superinfection with Group A *Streptococcus* (GAS), which is a source of impetigo, and chronic renal disease due to post-streptococcal acute glomerulonephritis (GNA) [4]. Impetiginisation is common in areas with high scabies prevalence [5]. In a hospital study in Dakar, the frequency of post-streptococcal acute glomerulonephritis in children with scabies reached 56.6% [6].

Data on scabies prevalence and associated risk factors in Koranic schools are scarce in sub-Saharan Africa. In some communities such as the Koranic schools called "daara", in Senegal, hundreds of children reside together, in order to learn the Quran [7].

On holidays, when the schoolchildren rejoin their family, new transmissions occur leading to family outbreaks.

For all these reasons, it is necessary to propose relevant strategies to control scabies within the frame of Neglected Tropical Diseases control policies in Senegal; such strategies should be based on studies of local risk factors for scabies. Thus, we conducted a study in Koranic schools with the aim to determine the prevalence of scabies and risk factors among students of Koranic schools in Dakar.

Methods

Study design and population

We conducted a cross sectional study from January to October 2018.

Setting

Senegal population is 15.7 million (National Agency for Statistics and Demography, 2018). The population growth is 2.9 (World Bank, 2016), the life expectancy 66.7 years (World Bank, 2015), and the literacy rate (for 15 years and over) 55.6% (World Bank, 2015). The main religion is Islam (94%). The human development index is 162nd out of 188 countries (UNDP, 2016).

The capital of Senegal is Dakar (550 km²), with a population of 3 835 019 inhabitants. Dakar region has four departments: Dakar, Pikine Guediawaye and Rufisque. One thousand and six Koranic schools ("Daaras", Franco-Arab school and Arab school) have been listed in the Dakar region with a majority in the departments of Pikine and Dakar. The total number of residents in the "daara" has been estimated at 42,162^[8]. Koranic schools are generally housed in houses in good condition (44%), houses under construction (19%), mosques (13%), and houses abandoned by their owners (5%)^[8].

Patients and Methods

Definition of case of scabies

A case was defined by the following clinical characteristics: Itching that affected at least three distinct sites of the body and was accompanied by characteristic lesions (vesicles, papules, nodules or pustules) located in at least three sites of predilection for scabies (interdigital folds of the hands, elbows, wrists, buttocks, axillary folds, nipple areolae in girls and male external genitalia), as assessed by a trained health worker.

Parasitological examination

Material was obtained by scraping the skin with a scalpel blade. A drop of potash (10%) was placed on the collected material to facilitate reading of the slide, then the slide was covered with a coverslip.

The sites of harvest were the interdigital spaces, the anterior surfaces of the wrists and the buttocks. At least one positive parasitological sample was required whatever the number of sites in an attempt to confirm diagnosis.

Study population

We were provided with a list of Koranic schools established by the heads of health districts and the academic inspectorate. The Koranic schools in two-departments (Dakar and Pikine) were selected by random. The choice of schools was random, on the basis of a list drawn up by the academic authorities, according to the locality, and which included the telephone number of the Head of the school. The Head of school was contacted by telephone, to check whether the category was that of boarding or day school.

Then if the school was eligible, it was chosen.

If permission for the study was refused or the school closed, we moved to the next school on the list.

Questions asked included variables such as consumer goods and type of accommodation. The patients recognised the psychological impact of the disease. For each resident of a selected school at least five visits were carried out (day 1-7-14-21-28). Those who were diagnosed with scabies were followed until they had healed. The treatment was based on benzyl benzoate or ivermectin. A total of 4.795 visits were performed.

Inclusion criteria

Any resident living in the selected Koranic school (only residential schools) and diagnosed with scabies was included regardless of age and sex. Authorization was previously requested and obtained from the head of the koranic school. A consent form was submitted and signed by the Head teacher.

The teachers of Koranic school and the administrative and maintenance staff were not included in the study.

Study Variables

Dermatologist and students in specialization in dermatology collected data with a pre-established tested and validated questionnaire.

The socio-demographic characteristics of school children (age, sex, number of residents in the school, and in the neighborhood, the socioeconomic and education level) were recorded. We also collected the clinical variables: weight, size, BMI, blood pressure, brachial perimeter, type and localization of the lesions, the comorbidities, urine dipstick in case of oedema or hematuria, the results of biological exams (haemogram, skin and stool parasitological examination, mycology).

Data analysis

The data were entered and analyzed with the STATA software version 14.

For quantitative variables we determined, the mean, the median and the standard deviation. For qualitative variables the Chi-square test and Fisher test were used for the comparison of percentages and proportions with a level of significance of 5%. The data were entered using Epi-Info version 7 and analyzed using the SPSS statistical package for Windows, version 20.0. We checked the hypothesis for binary logistic regression and variables found at a p value <0.05 were included in the multivariate analysis. The risk factors were the variables for which p value was <0.05. The OR with 95% confidence interval were reported.

Ethical Approval and Consent for Participation

This study was conducted according to the declaration of Helsinki and existing national legal and regulatory requirements. The protocol was reviewed and approved by the Ethics committee of Dakar University. Approval number was 0258/2017/CER/UCAD. Informed signed consent of legal representative was required prior the participation to the study. To respect the confidentiality, an identification code was given to each participant.

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Results

During the study period from January 9 to October 16, 2018, fifteen koranic schools were included. Of the 959 residents, 70 were diagnosed with scabies giving a prevalence of 7.29%. Table 1 shows the distribution of number of cases according to the different Koranic schools.

Characteristics of the population study

The mean age of schoolchildren was 11(±3); the median was 10 [4-23], the sex ratio was 7.7 (841/108). The mean number of residents in the « daara » was 58.49 (13-328). The mode and median were 105 and 54, respectively. The distribution of school children according to the number of residents per sleeping room was the following: 1-5(n=58.8%), 5-10(n=128,17.75%), >10(n= 535, 74.20%). The number of residents per room varied from 2 to more than 90.

The distribution according to the possession of certain consumer goods in their homes was as follows: phone in 29.64% of cases (n=241), car in 47.84% of cases (n=410), livestock in 88.75% (n=426,), land and field in 82.68% (n=339).

Three hundred and sixty two had a housekeeper at home (41.18%).

The profession of parents was variable, see in tables 2 and 3; we represented the distribution by the mother’s and father’s occupation respectively.

The number of showers taken per week was as follows: one (n=168, 21.54%), two (n=120, 15.38%), more than two (n=492, 63%).

Patients with scabies

The prevalence of scabies varied from 1.63% to 30.84% according to the school (table 2). The mean number of cases per daara was 10 (1-33). The mean age was 9.98 (4-17); all patients except one were boys.

Distribution of patients with scabies according to the socio-demographic characteristic

The average number of residents per room was 9.52 (2-18). Students reported that their parents owned a home in 71.42% of cases while they were tenants in 20% of cases.

The distribution of school children according to the number of residents per room was the following: 1-5(n=6,8.57%), 5-10(n=48, 68.57%), >10(n= 16, 22.85%). The distribution of parents’ profession and socio-demographic characteristics of the students were variable (tables 3, 4, 5).

The clinical aspects of the scabies

Pruritus was present in 65 cases, with the following characteristics: nocturnal (n=41), sever (n = 40), increasing nocturnal severity (n = 31), collective (n= 25), permanent (n

= 23), diurnal (n=4) generalized (n=14). There was a history of familial nocturnal pruritus in six cases. The distribution of the pruritus was the following: buttocks (n = 9), hands (n = 8), feet (n=4), head and neck (n=5), external genitalia (n=4), trunk (n=4), lower limb (n= 3) and upper limb (n=2). We found morning facial puffiness in 21.7% (n=15) and hematuria in 7.14% (n=5) of the patients.

The pruritus was recorded to have had an adverse impact in 17 patients out of 56 responding to this question with a psychological impact in 8 cases; absenteeism was noted in 9 cases and self-isolation in 5 cases.

Specific diagnostic lesions of scabies were rare, found in only 10.90% of the total lesions (table 5). The most common involved area were buttocks, finger webspaces, hands, the volar surfaces of the wrists and genitalia area (table 5).

There was eczematization in 12.85% of cases (n = 9) and impetigo in 17.14% of cases (n=12). The main comorbidity was tinea capitis found in 45.71% (n=32).

The parasitology was positive in 18,57% (n=13) with eggs, *Sarcoptes scabiei* and faeces.

Risk factors

The distribution of schoolchildren according to the age group was as follows: in the scabies group, 42.85% were less than 10 years and 50% 10 years and more, while 7.15% didn’t know their age. .

In univariate analysis, the main factors associated with scabies were the following: male gender, running water (p=0,002), number of residents (p=0,0001), number of weekly showers (p=0.048), land ownership (parents) (p<0.0001), urban origin in Dakar (p=0.03). Age of more than 10 years (p=0.05) was at the limit of significance. Signs of nocturnal itching (p=0,0001), and itchy skin disease at night (p=0,0001) are both associated with scabies. Multivariate analysis (table 5) showed that for a higher number of residents in koranic schools, more than two showers per week, being aged more than 10 years, and possession of livestock were factors associated with scabies, while the presence of a housekeeper, and phone at parent’s house were not associated with scabies.

In the logistic regression model, having more than two showers per week (OR=0.41, 95% CI 0.22- 0.77) and being aged more than 10 years (OR=0.52, 95% CI 0.30-0.91) were the only factors associated with the lower risk of scabies.

Table 1: Distribution of treatment allocated according to the Koranic school

	Benzyl benzoate	Ivermectin	Total
Participated	35	35	70
Follow up until D28	35	28	63
Cured at D14	15	2	17
Cured at D28	20	6	26

Table 2: distribution of the patients according to the treatment and the follow-up

School	Number of cases	Number of residents	Frequency	Treatment allocated
Daara 2	01	13	7.69	Benzyl benzoate
Daara 3	01	23	4.34	Ivermectin
Daara 5	07	51	13.72	Ivermectin
Daara 6	33	107	30.84	Benzyl benzoate
Daara 7	01	47	2.12	Ivermectin
Daara 14	01	61	1.63	Benzyl benzoate
Daara 15	26	328	7.92	Ivermectin

Table 3: comparison of cure rates of patients with scabies by treatment

	Benzyl benzoate	Ivermectin	Total
Participated	35	35	70
Follow up until D28	35	28	63
Cured at D14	15	2	17
Cured at D28	20	6	26

	YES n (%)	NO n (%)	Total	P
Cured D14				p=0.0001
Benzyl Benzoate	15 (88.24)	20 (37.74)	35	
Ivermectin	2 (11.76)	33 (62.26)	35	
Total	17	53	70	
Cured D28				p = 0.004
Benzyl benzoate	20 (76.92)	15 (40.54)	35 (55.56)	
Ivermectin	6 (23.08)	22 (59.46)	28 (44.44)	

Table 4: factors associated with the cure rate at day 14

	Recovery Day 14		P-value
	Yes n (%)	No n (%)	
Age			0.017
<10 years	3/15 (20)	27/49 (55.1)	
≥10 years	12/15 (80)	22/49 (44.9)	
Number of showers per week			0.011
1	9/17 (52.9)	11/44 (25)	
2	4/17 (23.5)	4/44 (9.1)	
>2	4/17 (23.5)	29/44 (65.9)	
Number of people in the room			0.012
1-10	0/17 (0.0)	17/45 (37.8)	
>10	17/17 (100)	28/45 (62.2)	
Number of residents per Daara			0.163
≤30	1/17 (5.9)	1/27 (3.7)	
31-60	1/17 (5.9)	8/27 (29.6)	
61-328	15/17 (88.2)	18/27 (66.7)	

Table 5: factors associated with the cure rate at day 28

	Recovery Day 28		P-value
	Yes n (%)	No n (%)	
Age			0.081
<10 years	7/22 (31.8)	23/42 (54.8)	
≥10 years	15/22 (68.2)	19/42 (45.2)	
Number of showers per week			0.012
1	12/23 (52.2)	8/38 (21.1)	
2	4/23 (17.4)	4/38 (10.5)	
>2	7/23 (30.4)	26/38 (68.4)	
Number of people in the room			0.032
1-10	2/23 (8.7)	5/39 (12.8)	
>10	21/23 (91.3)	24/39 (61.5)	
Number of residents per Daara			0.076
≤30-60	4/22 (18.2)	7/22 (31.8)	
61-328	18/22 (81.8)	15/22 (68.2)	

Discussion

In Koranic Schools in Dakar, Senegal, the global prevalence of scabies was relatively high with some variability depending on the school. In multivariate analysis scabies was associated with having less than two showers per week and being less than 10 years old.

The overall prevalence of scabies among children in fifteen Koranic schools in Dakar was 7.29% with a high variability depending on the school and the number of residents. In a previous study conducted in four koranic school in Dakar the prevalence was 13.3% [7]. In Bamako, Mali in 2977 children the prevalence of scabies was 17.2% [11]. In Dhaka, Bangladesh, the authors found in the residential madrasas (Islamic education institutes) a prevalence of 98% of scabies

among a total of 492 children receiving clinical check-ups, 92.5% were boys [12]. In contrast we found similar prevalence rates between our study and a study conducted in Dabat district in Ethiopia where the prevalence was 9.3% [13]. Lower prevalences were found in Nigeria in two distinct studies with 2.9% in Katanga [14] and 3.3% in Ibadan [15]. In Egypt a prevalence of 4.4% [16] was found while in southern Ethiopia it was 5.5% [17].

In our study, the prevalence is also variable according to the Koranic school, varying from 1.63 to 30.84%. The high prevalence rates found in some koranic school was associated with high number of residents; the schools with more than hundred residents had the highest prevalence. Comparatively high prevalences were reported in studies

conducted in India in a slum of Kolkata with 39.42% [18] and in Ethiopia also with 22.5% [19]. These disparities are probably associated with the chronicity of scabies and the difference in the diagnostic criteria of the scabies that vary according to the studies. In fact in Daara number 6, where the prevalence was 30.84%, officials claimed that scabies had been waning for a year and they had almost closed the school because many parents were gradually withdrawing their children.

In our study, all patients were male except at school number 15 where residents of both sexes were found. Overall we found that the male gender was associated with scabies. The male predominance is found in many studies [20, 21]. All girls reported having at least one shower a day while the majority of boys showered once a week.

The most common complications of scabies were eczematization and superinfection. Superinfection especially by *Streptococcus pyogenes* is a source of cardiac and kidney disease [22]. All the children included in our study had a complete clinical exam and when signs pointing to a cardiac or renal attack were found, further examinations were carried out. We found high frequency of morning facial puffiness (11.51%) and hematuria (9.25%). However, long-term follow-up is necessary because of the risk of chronic renal failure. Indeed according to the Taiwan National Health Insurance Database, patients with scabies have an increased risk of chronic kidney disease in subsequent years [22].

Some clinical signs such as nocturnal itching are very suggestive of the presence of scabies. Thus, they could be used as a clinical diagnostic argument for scabies in some communities such as Koranic school. According to the IACS's criteria, the following history features were used as part of the diagnosis: itch, close contact with an individual who is itching or skin lesions in a typical distribution [24]. In some Koranic school, some women volunteer to take care of the residents' hygiene and food [25]. So for a pragmatic approach, the training of a « Daara mother » could be considered for early diagnosis after ruling out other causes of pruritus such as xerosis or atopic dermatitis.

In Ethiopia, the risk to develop scabies is associated with a low frequency of taking bath. Thus children taking rarely bath are more susceptible to scabies by 3.54 times (AOR = 3.54, 95% CI 1.36, 9.25). Moreover the sociodemographic characteristics of both the children and their parents, such as location of the school, father's educational status, and students' grade level, play a key role in the transmission of scabies [13]. We didn't collect data concerning father's educational status. In Pakistan, the risk factors reported in Koranic schools, known as madrasas were infrequent washing of clothes ($P < 0.001$) and bed linen ($P < 0.001$), overcrowded sleeping arrangements ($P < 0.001$) and infrequent bathing ($P < 0.001$) with soap ($P < 0.001$) [23]. Thus, improving hygienic conditions and reducing the number of residents per room would significantly reduce the number of cases of scabies.

One of the limitations of our study is the absence of dermoscopy but the lack of sufficient numbers of this device is one of the explanations. The study was also undertaken before the IACS diagnostic criteria for scabies had been published. Another limitation was the low rate of positive parasitological examinations. This could be linked to the limited experience of the detection of *Sarcoptes scabiei* by microscopy. In practice, in this area there is a low demand

for parasitological examinations because the diagnosis of scabies is mainly based on epidemiological and clinical criteria.

Conclusion

Strategies should be developed to improve the health of these economically disadvantaged populations. Moreover, medical monitoring of Koranic school residents focused on superinfection by *Streptococcus pyogenes* would be relevant for the prevention of kidney damage.

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