Eur J Dermatol 2005; 15 (5): 382-6

**Sékéné BADIAGA**[1,2]
**Amélie MENARD**[3,4]
**Hervé TISSOT DUPONT**[1,5]
**Isabelle RAVAUX**[5]
**Didier CHOUQUET**[4]
**Céline GRAVERIAU**[1]
**Didier RAOULT**[1]
**Philippe BROUQUI**[1,3]

[1] Unité des rickettsies, CNRS UMR 6020, IFR 48, Faculté de médecine, 27 bd J Moulin 13385 Marseille cedex 5 France
[2] Service des Urgences, CHU Nord, Marseille
[3] Service des maladies infectieuses et tropicales, CHU Nord, Marseille
[4] Service de dermatologie, CHU Nord, Marseille
[5] Service des maladies infectieuses, CHU Conception, Marseille

**Reprints:** P. Brouqui <philippe.brouqui@medecine.univ-mrs.fr>

Article accepted on 20/4/2005

Financial support: PHRC SDF 2000 N°3547 and Conseil Général des Bouches du Rhône

# Prevalence of skin infections in sheltered homeless

In an attempt to determine the prevalence of various skin infections in the homeless population in Marseilles, France, we undertook a case control study. Cases were recruited among institutionalized homeless subjects during two snapshot investigations conducted in January 2002 and 2003 respectively. The control subjects were recruited from among those who presented at a clinic for pre-travel advice. We recruited 498 cases and 200 control subjects. Compared to control subjects, a significantly higher proportion of cases had skin diseases (38% *versus* 0.5%; $p < 0.0001$). Pruritus, body-lice infestation, scratching lesions, folliculitis, tinea pedis, scabies and impetigo (ecthyma) were strongly significantly associated with homelessness. The higher prevalence of skin infections in the homeless people mainly results from the body-louse infestation, scabies, bacterial super-infection of skin surfaces that have been breached by frequent scratching and tinea pedis due to poor foot hygiene.

**Key words:** body louse, ecthyma, homelessness, impetigo, scabies, skin infections

Homelessness, defined as the absence of customary and regular access to a conventional dwelling or residence [1], is a growing social and public health problem in wealthy western countries. The number of homeless living in the United States, the United Kingdom and France has been estimated at at least 500,000, 120,000, and 400,000, respectively [1-3]. Due to poor living conditions, homeless people are affected by many infectious diseases [4]. Of the various infections affecting homeless people, cutaneous infections probably rank the top, presumably due to inattention to personal hygiene and promiscuity [5-7]. However, to our knowledge, the prevalence of skin diseases in this population has never been investigated properly in a case-control study. This prevents us from assessing accurately the prevalence of various infectious diseases, including skin infections in the homeless. Such information is necessary for planning appropriate intervention measures for the identification, treatment and prevention of various skin infections in homeless people. This is important, considering the fact that the homeless have poor access to health care systems [8]. It has been suggested that snapshot interventions are an efficient way to manage problems of homelessness [9, 10].

It is estimated that there are about 1,500 homeless persons in Marseilles. Of these, about 800 sleep on the streets and another 600 live in two town shelters. The remaining homeless persons sleep in different university hospitals in and around Marseilles. Since 1993, we have been studying various aspects of louse-borne diseases in the homeless population of Marseilles [11-13]. As part of the study, each year we send a medical team to each of the two town shelters designated for accommodating homeless people [10]. In 2002 and 2003, we included dermatologists in the medical team to investigate the prevalence of various dermatological diseases in the homeless people accommodated in those designated shelters.

We report here the prevalence of skin infections in this population as compared to that observed in healthy control subjects resident in Marseilles during the same period.

## Patients and methods

The study protocol was reviewed and approved by the Institutional Review Board and Ethic Committee of Marseilles (CCPPCRB99/76). As a part of an ongoing study, a snapshot evaluation was conducted in two shelters in Marseilles in January 2002 and 2003 [10]. Each of the two shelters, designated herein respectively A and B, offers 300 beds. They both provide showers, clothes, food and a washing service free of charges. A general practitioner is available two or three times in a week to provide medical care. A registered nurse is available daily in each shelter.

On one particular day in January, a medical team visited each of the residential facilities referred to above. The medical team comprised 7 nurses, 6 infectious disease residents or fellows, 4 dermatologists, and 10 other health professionals. This latter group comprised microbiologists and infectious disease specialists.

The residents of shelters were informed as soon as the medical team arrived at their facility and briefed about the purposes of the medical team's visit. The residents were advised that a medical team would examine them and if necessary, they would get appropriate medical care and treatment free of charge. All cases studied signed an informed consent form. A registered medical practitioner interviewed and examined them and the data were recorded

on a standardized data collection sheet. Whenever indicated, the cases were referred to a specialized center for further evaluation and care. Scotch-tape swabs were taken when skin lesions suggestive of scabies had been identified. The control subjects were recruited from among individuals seeking pre-travel advice at the clinic of Travel Medicine, Department of Tropical and Infectious Diseases, North hospital, University of the Mediterranean, Marseilles, France over a 4-month period ending in September 2004. They were interviewed and examined by the same dermatologists who later examined the cases.

### Data collection and statistical analysis

Standard software was used for the storage (Entry Builder 3.0, Microsoft® 2003, SPSS Inc. Chicago IL), retrieval and analyses (SPSS 10.0, Microsoft®) of the data. Two tailed tests were used for all comparisons. Differences in proportions were tested using chi-square test or Fisher's exact test as appropriate. Contrasts of dimensional variables were tested using the Student's t test and Levene test as appropriate. Statistical significance was defined as $p < 0.05$.

## Results

There were 498 cases and 200 control subjects. Of the cases, a total of 296 were recruited in 2002 and the remaining 202 cases, in 2003. Nineteen cases were recruited twice. Male cases vastly outnumbered female cases with a male-to-female sex ratio of 14%. Eighty-eight percent of the cases studied spoke French and a translator helped those who could not speak French. The subjects had been homeless less than 7 months in 45.2% of cases, from 7 to 12 months in 23.5%, from 13 to 24 months in 8.8.%, and more than 24 months in 22.9%. A majority (80%) said that they usually lived in the same shelter where they met the medical team. Only 7.4% told the interviewer that they slept on the streets. The rest frequented homes of friends and relatives and cheap hotels for sleeping at night. When asked specifically, only 7 out of 498 (1.4%) stated that they were intravenous drug abusers. The interview was estimated to be reliable in 47% of subjects interviewed. HIV antibodies were found in 1 of the 498 homeless people.

The mean age (± SD) of the cases homeless was significantly higher than that of the control subjects (41 ± 14.6 *versus* 35.4 ± 12.6 years; $p < 0.0001$. The male-to-female sex ratio was not significantly different between controls and homeless (14.2% *vs* 25.6%; $p = 0.33$). Compared to the control subjects, a significantly higher proportion of cases were native of north Africa (48.5% *vs* 4%, $p < 0.001$) and eastern Europe (16.2% *vs* 0%, $p < 0.001$) while a significantly lower proportion of cases were native of metropolitan France (28.7% *vs* 76.5%, $p < 0.001$), sub-Saharan Africa (11.5% *vs* 2%, $p < 0.001$) and Asia (0% *vs* 2%, $p = 0.007$) There were no statistical differences between cases and controls in native from French overseas territories (1.8% *vs* 1.5%, $p = 0.53$), western Europe (2.7% *vs* 3.5%, $p = 0.73$), and South America (0% *vs* 1%, $p = 0.084$).

Skin diseases *(table 1)* was a statistically significant occurrence (38% *vs* 0.5%; $p < 0.0001$). Compared to the control

**Table 1.** Dermatologic manifestations reported and observed in 498 homeless compared to 200 controls

| Variables | Homeless (%) | Control (%) | RR (95% CI) | p value* |
|---|---|---|---|---|
| **Self-reported manifestations** | 241 (48.4) | 5 (2.5) | 1.72 (1.59-1.87) | < 0.001 |
| Pruritus | 181 (36.3) | 2 (1) | 1.61 (1.50-1.72) | < 0.001 |
| Parasitism by body lice | 80 (16.1) | 0 | 1.48 (1.40-1.56) | < 0.001 |
| Parasitism by fleas | 36 (7.2) | 0 | 1.43 (1.36-1.51) | < 0.001 |
| **Observed manifestations** | | | | |
| Body lice (Pediculis corporis) | 103 (20.7) | 0 | 1.51 (1.42-1.59) | < 0.001 |
| Fleas | 2 (0.4) | 0 | 1.40 (1.34-1.47) | 0.369 |
| **Observed scratching lesions** | | | | |
| of axillae | 60 (13.5) | 1 (0.5) | 1.49 (1.4-1.59) | < 0.001 |
| of neck | 102 (22.8) | 0 | 1.58 (1.48-1.68) | < 0.001 |
| of thorax | 97 (21.8 | 0 | 1.57 (1.48-1.68) | < 0.001 |
| of waist | 69 (15.8) | 0 | 1.54 (1.45-1.64) | < 0.001 |
| of socks | 38 (8.7) | 0 | 1.50 (1.42-1.59) | < 0.001 |
| of interdigital spaces | 15 (3.5) | 2 (1) | 1.30 (1.09-1.56) | 0.093 |
| **Dermatologic diagnosis** | 190 (38) | 11(5.5) | 1.53 (1.41-1.65) | < 0.001 |
| Pediculosis Corporis | 95 (19.1) | 0 | 1.50 (1.41-1.58) | < 0.001 |
| Scabies | 19 (3.8) | 0 | 1.42 (1.35-1.49) | < 0.001 |
| Impetigo | 12 (2.4) | 0 | 1.41 (1.35-1.49) | < 0.001 |
| Folliculitis of back | 24 (4.8) | 3 (1.5) | 1.26 (1.09-1.45) | < 0.001 |
| Tinea pedis | 16 (3.2) | 1 (0.5) | 1.33 (1.17-1.51) | 0.023 |
| Abscess due to IVDI | 5 (1) | 0 | 1.41 (1.34-1.47) | 0.15 |
| Dermo-hypodermitis (erysipelas) | 7 (1.4) | 0 | 1.41 (1.34-1.48) | 0.119 |
| Onychomycosis | 26 (5.2) | 7 (3.5) | 1.11 (0.92-1.33) | 0.33 |
| Phthirus pubis | 4 (0.8) | 0 | 1.40 (1.34-1.47) | 0.20 |

**Khi-2 test or Fisher exact test when appropriate. IVDI: intravenous drug injection.*

**Figure 1.** Necrotizing ecthyma (impetigo) due to *Streptococcus pyogenes* localized in scratching areas in body lice-infested homeless.

subjects, a significantly higher proportion of cases had complaints referring to the skin (48.4% *vs* 2.5%; $p < 0.0001$). Pediculosis (19.1% *vs* 0%; $p < 0.0001$), scabies (3.8% *vs* 0%; $p < 0.0001$), impetigo (*figure 1*) (2.4% *vs* 0% $p < 0.0001$), folliculitis (4.8% *vs* 1.5%, $p < 0.0001$) and tinea pedis (3.2% *vs* 0.5% ; $p = 0.02\%$) were statistically significant occurrences in the cases as compared the control population. There were no statistical differences between the cases and control subjects in terms of abscess related to intravenous drug abuse, erysipelas (dermo-hypodermitis) and onychomycosis and *Phtirius pubis* infestation. When all variables with a p value < 0.2 were included in a stepwise logistic regression model, only pruritus, parasitism by body lice, observation of lice in clothes, and presence of scratching lesions were independently associated with homelessness.

Microscopic examinations of the scotch-tape swabs, taken as above, were unrevealing in 14 cases in whom scabies was suspected. Ten of them were treated on the spot with a single dose of ivermectin (200 microg/kg).

## Discussion

The snapshot study we undertook provides us with a unique opportunity to study the prevalence of skin diseases among homeless persons living in the residential facilities designated for them. Our data show a statistically significant association between homelessness and the presence of such skin diseases as pediculosis, scabies, *tinea pedis* and folliculitis. The prevalence of skin diseases in the homeless population has been studied before [6, 14, 15]. However, these studies recruited subjects predominantly from among homeless persons who had either been based in a hospital or seen at a specialized dermatology outpatient facility. To the best of our knowledge, ours is the first case-control study that examined the prevalence of skin diseases in the homeless population.

At the time of recruitment, 80.1% of cases included in our study had been living in the shelters designated for homeless people and another 7.4%, on the streets. This may not be surprising, considering the fact that we conducted our study in January, one of the coldest months in France. It seems more likely than unlikely that a near-freezing temperature and an unpleasant wind in open spaces might have discouraged many homeless people from sleeping on the streets. Only 1% of the cases included were found to be intravenous drug abusers. This may be attributed to the fact that in Marseilles intravenous drug users live in the residential facilities different from those designated for other homeless people.

The high prevalence of pruritus and infestation by body lice, as observed in the homeless persons studied herein is comparable to that reported by others [11, 12]. Two cases included herein reported previous contact with fleas, however, careful physical examination did not detect any fleas either on their persons or in the clothes they had been wearing. This underscores the difficulty in detecting otherwise highly mobile ectoparasites in a state of immobilization during the course of a single physical examination. We were somewhat baffled by the absence of classic flea-borne bacterial infections such as those caused by *Bartonella henselae* and *Rickettsia typhi* and *Rickettsia felis* in the homeless persons included in this study [10]. The reason for this remains unclear to us. Pruritis and localized scratching lesions are compatible with body-lice infection [13]. The biological plausibility of such a notion may not be questionable, considering the fact that the body louse injects antigens into the human hosts. These antigens provoke allergic reactions, leading to pruritis and scratching lesions within 3-4 weeks after they have been injected [16, 17].

Scabies was a statistically significant occurrence in cases as compared to the control subjects. This may not be surprising, given that homeless people often live in unhygienic conditions [5]. Furthermore, the residential facilities that accommodate them are often overcrowded. Promiscuity is also not infrequent in the homeless population [5].

The frequency of scabies as observed in homeless subjects herein (3.8%) is less than that (56.5%) reported by others [14]. This discrepancy could be explained by the fact that the study subjects included in the reports referred to above, were recruited from among the homeless who presented at hospitals for medical attention [6, 14]. Furthermore, ours is part of an ongoing study that was launched a decade ago. Understandably, the recommendations made by the medical team during their visits to the shelters accommodating homeless people are expected to have an impact [15] on the prevalence of various skin diseases in the population resident at those shelters.

In the present study, the prevalence of such superficial bacterial skin infections as folliculitis, impetigo or ecthyma was significantly higher in the cases as compared to controls. Our findings were similar to those observed by others [5]. Homeless people are at a higher risk of developing such superficial infections, the high frequency of impetigo (ecthyma) being likely due to skin inoculation of *Streptococcus pyogenes* during scratching.

As observed in the present study, homeless people are at increased risk of developing *tinea pedis*. This is mostly likely due to poor foot hygiene, prolonged exposure to moisture, failure to wear socks, and wearing shoes for nearly twenty-four hours [7].

Only seven of the 498 cases included in this study were intravenous drug abusers. Due to the small number of this sample size, it not possible to determine whether the prevalence and types of skin infections were different in the homeless people who were intravenous drug abusers from other homeless people studied herein. Two studies conducted outside Marseilles did show an increase in subcutaneous infections in homeless people who were intravenous drug abusers [5, 6].

Unlike others [4, 5], we did not find any statistically significant association between homelessness and such conditions as erysipelas, onychomycosis and *Phtirius pubis* infestation in the homeless population studied herein. However, caution should be exercised in comparing the published data as various studies may differ in term of the number of subjects evaluated, inclusion criteria used, and regional variation in the incidence and prevalence in various diseases.

Our study was limited by the mode of recruitment control subjects. The control subjects were recruited from among individuals seeking pre-travel advice, suggesting a higher socioeconomic status of these subjects in comparison with the general population of Marseilles. Therefore the incidence of skin infections could be particularly low in our control population compared to the general population of Marseilles. While the homeless persons were enrolled in winter, the control subjects were recruited in summer. This difference in recruitment period could also bias the comparison of incidence of skin infections between homeless persons and control subjects.

Despite these limitations, we submit that in Marseilles, the prevalence of skin infections in the institutionalized homeless population is high. These infections predominantly include body-lice infestation, scabies, impetigo and tinea pedis. Delousing, treatment of scabies and meticulous foot care should reduce the burden of these skin conditions in the homeless population. ■

***Acknowledgements***. *The authors thank Dr Mohamad Khan from the University of Dhaka, Bangladesh, for English review and suggestion.*

## References

**1**. Rossi PH, Wright JD, Fisher GA, Willis G. The urban homeless: estimating composition and size. *Science* 1987; 235(4794): 1336-41.

**2**. Lowry F. Impact on health care adds to the social cost of homelessness, MDs say. *CMAJ* 1996; 155(12): 1737-9.

**3**. Chauvin P, Mortier E, Carrat F, Imbert JC, Valleron AJ, Lebas J. A new out-patient care facility for HIV-infected destitute populations in Paris, France. *AIDS Care* 1997; 9(4): 451-9.

**4**. Raoult D, Foucault C, Brouqui P. Infections in the homeless. *Lancet Infect Dis* 2001; 1(2): 77-84.

**5**. Blum L, Bourrat E. Pathologie cutanée de la misère. *Rev Prat* 1996; 46: 1839-43.

**6**. Moy JA, Sanchez MR. The cutaneous manifestations of violence and poverty. *Arch Dermatol* 1992; 128(6): 829-39.

**7**. Wrenn K. Immersion foot. A problem of the homeless in the 1990s. *Arch Intern Med* 1991; 151(4): 785-8.

**8**. Crane M, Warnes AM. Primary health care services for single homeless people: defects and opportunities. *Fam Pract* 2001; 18(3): 272-6.

**9**. Paul EA, Lebowitz SM, Moore RE, Hoven CW, Bennett BA, Chen A. Nemesis revisited: tuberculosis infection in a New York City men's shelter. *Am J Public Health* 1993; 83(12): 1743-5.

**10**. Brouqui P, Stein A, Tissot-Dupont H, Gallian P, Badiaga S, Rolain JM, *et al.* Ectoparasitism and vector borne diseases in 930 homeless from Marseilles. *Medicine* 2005; 84(1): 1-8.

**11**. Brouqui P, Houpikian P, Dupont HT, Toubiana P, Obadia Y, Lafay V, *et al.* Survey of the seroprevalence of *Bartonella quintana* in homeless people. *Clin Infect Dis* 1996; 23(4): 756-9.

**12**. Brouqui P, Lascola B, Roux V, Raoult D. Chronic *Bartonella quintana* bacteremia in homeless patients. *N Engl J Med* 1999; 340(3): 184-9.

**13**. Foucault C, Barrau K, Brouqui P, Raoult D. *Bartonella quintana* Bacteremia among Homeless People. *Clin Infect Dis* 2002; 35(6): 684-9.
**14**. Arfi C, Dehen L, Benassaia E, Faure P, Farge D, Morel P, *et al.* Dermatologic consultation in a precarious situation: a prospective medical and social study at the Hopital Saint-Louis in Paris. *Ann Dermatol Venereol* 1999; 126(10): 682-6.
**15**. Stratigos AJ, Stern R, Gonzalez E, Johnson RA, O'Connell J, Dover JS. Prevalence of skin disease in a cohort of shelter-based homeless men. *J Am Acad Dermatol* 1999; 41(2 Pt 1): 197-202.
**16**. Burgess IF. Human lice and their managment. *Adv Parasitol* 1995; 36: 271-342.
**17**. Raoult D, Roux V. The body louse as a vector of reemerging human diseases. *Clin Infect Dis* 1999; 29(4): 888-911.