



Research Article

Bacterial Dermohypodermatitis in the Elderly: Epidemiological, Clinical, Etiological, and Progressive Profile in 89 Patients, a Review of the Literature

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Abstract

Background: Bacterial dermohypodermatitis (BDH) is the leading reason for hospitalization in our dermatology departments. Voluntary Cosmetic Depigmentation is one of the main risk factors. In sub-Saharan Africa, studies focusing on BDH in the elderly are rare. Our objective was to determine the epidemiological-clinical, etiological, and progressive profile of bacterial dermohypodermatitis (BDH) in elderly subjects. **Material and methods:** This is a cross-sectional, retrospective study, carried out in the two dermatology reference departments in Dakar, over a period of 11 years (January 1, 2011, to December 31, 2021). Any patient aged 65 or over, hospitalized for BDH was included. **Results:** We collected 89 patients, or 7.66% of BDH cases. The mean age was 73.79 ± 7 years. The sex ratio (M/F) was 0.67. High blood pressure was present in 56.2% (n=50), obesity in 31.5% (n=28) and diabetes in 22.5% (n=20). Patients were febrile in 39.3% (n=35). BDH was necrotizing in 35% (n=31). The topography was leg in 92% (n=82) and buttock in one patient. Polynuclear neutrophil leukocytosis was noted in 63% (52/82). C-Reactive Protein (CRP) was elevated in 95.7% (67/70). The entry point was inter-toe intertrigo in 51.8% (43/83) and plantar fissures in 5.6% (5/83). Death from septic shock was noted in 3 patients. **Conclusion:** BDH in the elderly is often associated with cardiovascular risk factors. The necrotizing form is very common. However, the prognosis does not seem to be more severe than in adults.

Keywords: Bacterial dermohypodermitis; Elderly; High blood pressure; Obesity.

Introduction

Bacterial dermohypodermitis (BDH) are acute infections of the dermis and hypodermis, most often linked to group A hemolytic beta streptococcus and sometimes to other germs. They include three entities: non-necrotizing bacterial dermohypodermitis or erysipelas (NNBDH), necrotizing bacterial dermohypodermitis without involvement of the fascia (NBDH) and necrotizing bacterial dermohypodermitis with involvement of the fascia or necrotizing fasciitis. In Senegal, they constitute the primary reason for hospitalization in dermatology departments [1,2]. Bacterial dermohypodermitis occurs preferentially in the lower limbs, more rarely in the upper limbs, face, or buttocks. The diagnosis of bacterial dermohypodermitis is essentially clinical. It is based on the appearance of a febrile inflammatory swelling, most often topped by an erythematous plaque. Paraclinical examinations are not necessary for diagnosis but may show a biological inflammatory syndrome. Blood cultures rarely allow a germ to be isolated. The treatment of erysipelas is medical and is essentially based on beta-lactam antibiotics [3]. As for necrotizing bacterial dermohypodermitis, its treatment is medico surgical. The evolution of bacterial dermohypodermitis is generally favorable, but sequelae such as lymphedema, which can progress to elephantiasis, are possible. Primary and secondary prevention of bacterial dermohypodermitis is mainly based on the management of risk factors.

In sub-Saharan Africa, bacterial dermohypodermitis constitutes a public health problem, especially due to voluntary cosmetic depigmentation [4]. In West Africa, particularly in Senegal, studies on bacterial dermohypodermitis in elderly subjects are almost non-existent. Therefore, we carried out this work with the aim of determining the epidemiological, clinical, etiological, and progressive profile of bacterial dermohypodermitis in elderly subjects.

Material and Methods

This is a cross-sectional study, with retrospective data collection, covering the period from January 1, 2011, to December 31, 2021 (11 years). The study was carried out in the two-reference university hospital dermatology departments in Dakar (dermatology departments of the Aristide Le Dantec hospital and the Institute of Social Hygiene of Dakar). Patients were recruited from the hospitalization registers of these two units. All patients aged 65 or over, hospitalized with a febrile or non-febrile inflammatory swelling and diagnosed with bacterial dermohypodermitis, were included. Patients with incomplete or unusable records were not included. A standardized survey form was created for data

collection. To ensure data confidentiality, patients' first and last names were initialed on the survey form. The following data were collected: sociodemographic, clinical, paraclinical, therapeutic and evolutionary. Data entry and analysis were performed using Office 2019 pack software and SPSS 25.0 for mac. Proportions of variables were compared using Chi-square or Fisher tests. The relationship was statistically significant if $p \leq 0.05$.

Results

We identified 89 patients aged 65 or over, out of 1161 hospitalized with bacterial dermohypodermitis, a frequency of 7.66%. Non-necrotizing bacterial dermohypodermitis (Figure 1) or erysipelas was reported in 65.2% (n=58) of patients and necrotizing bacterial dermohypodermitis (Figure 2) in 34.8% (n=31).



Figure 1: Erysipelas of the foot and lower extremity of the right leg in an elderly patient with psoriasis.



Figure 2: Necrotizing bacterial dermohypodermitis after necrosectomy in an elderly subject.

The mean age of patients was 73.79 ± 7 years, with extremes of 65 and 94 years. The 65 to 74 age group accounted for 59.55% (n=53) of patients, and the 75 to 84 age group for 33.71% (n=30). Women accounted for 59.6% (n=53), and the sex ratio (M/F) was 0.67. An episode of bacterial dermohypodermitis was reported in 13.5% (n=12) of patients. Arterial hypertension was noted in 56.2% (n=50) of patients, obesity in 31.5% (n=28) and diabetes in 22.5% (n=20). Lymphedema was found in 16.8% (n=15) and voluntary cosmetic depigmentation was performed in 9.4% (n=5) of patients. Non-steroidal anti-inflammatory drugs were taken by 22.5% (n=20) and phytotherapy by 19% (n=17). Table 1 shows the distribution of ground and conditions according to the type of bacterial dermohypodermitis.

Ground	Clinical Forms Of BDH			
	BDHN (n=31)		BDHNN (n=58)	
	Effective	Percentage %	Effective	Percentage %
HT	17	54.8	33	56.9
Diabetes	9	29	11	19
Heart disease	5	16	0	
Obesity	5	16	23	39.6
Phytotherapy	5	16	12	20.7
NSAIDs	7	22.6	13	22.4
PAD	5	16.1	2	3.4
Lymphedema	4	12.9	11	19
Venous insufficiency	2	6.4	2	3.4
Voluntary Cosmetic Depigmentation	1	3.2	4	6.9
Elephantiasis	0	0	1	1.7
HIV	0	0	1	1.7

Table 1: Distribution of the history and ground of the 89 elderly patients according to the type of bacterial dermohypodermitis; BDH: Bacterial dermohypodermitis; NBDH: Necrotizing bacterial dermohypodermitis; NNBDH: Non-necrotizing bacterial dermohypodermitis; Hypertension: High blood pressure; NSAIDs: Nonsteroidal anti-inflammatory drugs; PAD: Peripheral artery disease.

Local pain was observed in all (100%) and functional impotence in 97.8% (n=87). Edema of the lower limbs was present in 95.5% (n=85), fever in 39.3% (n=35) and altered consciousness in 3.4% (n=3). Regarding dermatological lesions (Table 2), swelling of the affected area and an erythematous placard were present in all patients, and local heat was noted in 97.8% (n=87). Of the 58 patients with NNBDH, a bullous form was present in 58.6% (n=34), a simple form in 36.2% (n=21) and an abscessed form in 5.2% (n=3). Depending on topography (Table 3), BDH was located in the lower limbs in 92% (n=82) of patients and was bilateral in 7.9% (n=7). A portal of entry was found in 93.26% (n=83), including an intertrigo between the toes in 51.8% (n=43). In addition, there was a traumatic wound in 22.9% (n=19), an excoriated dermatosis in 19.3% (n=16) and plantar fissures in 6.02% (n=5). In terms of biological testing (Table 4), blood counts were carried out in 92% (n=82) of patients and showed neutrophilic hyperleukocytosis in 63.4% (n=52). Local bacteriological sampling was carried out in 6.7% (n=6) of patients and revealed *Staphylococcus aureus* in 2. *Staphylococcus aureus* was isolated from an abscess and a bulla in 2 NNBDH patients.

Dermatological Signs	Effective	Percentage (%)
Inflammatory placard	89	100
Erythema	89	100
Swelling	89	100
Local Heat	87	97.8

Bubbles	52	58.4
Necrosis	31	34.8
Dander	24	27

Table 2: Distribution of 89 elderly patients suffering from bacterial dermohypodermatitis according to dermatological signs.

Topography		Effective	Percentage (%)
Legs (n=82)	Right	40	44.9
	LEFT	35	39.3
	Right + Left	7	7.9
Left upper limb		4	4.5
2 Lower Limbs + 2 Upper Limbs		1	1.1
Flank		1	1.1
Buttocks		1	1.1
Total		89	100

Table 3: Distribution of 89 elderly patients with bacterial dermohypodermatitis according to topography of dermatological lesions.

Biological Examinations	Results	Frequency	Percentage (%)
NFS (N=82)	Anemia	61	74.4
	Hyperleukocytosis	52	63.4
CRP (N=70)	High	67	95.7
	Normal	3	4.3
HIV Serology (N=10)	Positive	1	1
	Negative	9	10
Ag Hbs (N=9)	Positive	1	1
	Negative	8	9
Fasting blood sugar (n=62)	Normal	47	75.8
	High	15	24.2

Table 4: Distribution of 89 elderly patients with bacterial dermohypodermatitis according to biological test results.

Vascular ultrasound (arterial and/or venous) was performed in 22.5% (n=20) of patients. Arterial Doppler ultrasound, performed in 13.5% (n=12) of patients, revealed a peripheral artery disease (PAD) in 58.3% (n=7) of cases. This PAD concerned 16% (n=5) of NBDH cases and 3.4% (n=2) of NNBDH cases. Venous ultrasound, performed in 16 patients, was normal in 75% (n=12), and showed venous insufficiency in 25% (n=4). Venous insufficiency occurred in 6.4% (n=2) of patients with NBDH and 3.4% (n=2) of patients with NNBDH. The combination of amoxicillin and clavulanic acid was used in 87.6% (n=78) of patients, metronidazole in 54% (n=48), ceftriaxone in 24.7% (n=22), penicillin G in 15.7% (n=14) and gentamicin in 11.2% (n=10). In patients with NBDH, at least one bi-antibiotic therapy was used, combining at least a beta-lactam antibiotic and metronidazole. Necrosectomy surgery was performed in all 31 patients with NBDH, and skin grafting was performed in 9.7% (n=3) of cases. The average hospital stay was 13.5 days, with extremes of 2 and 41 days. The outcome was favorable in 93.3% (n=83) of patients, stationary in 3.4% (n=3), and unfavorable in 3.4% (n=3). Regarding complications (Table 5), 15% (11/73) of patients who had no complications at the time of hospitalization developed lymphedema. Bivariate analysis (Table 6) showed a statistically significant relationship between: obesity and NNBDH (p=0.02), PAD and NBDH (p=0.05), and heart disease and NBDH (p=0.004).

Complications	Clinical Forms Of BDH	
	BDHN	BDHNN
Septic shock	6.4% (2/31)	1.7% (1/58)
Lymphoedema	7.4% (2/27)	19.6% (9/46)
Recurrences	3.2% (1/31)	1.7% (1/58)

Table 5: Distribution of complications in the 89 elderly patients by type of bacterial dermohypodermatitis.

Ground	Positive Diagnosis		P
	NBDH	NNBDH	
HT	17	33	0.85
Diabetes	9	11	0.28
Obesity	5	23	0.02
PAD	5	2	0.05
Lymphedema	4	11	0.47
Elephantiasis	0	1	0.65
Venous insufficiency	1	2	0.72
HIV	0	1	0.65
Heart disease	5	0	0.004
Voluntary Cosmetic Depigmentation	1	4	0.43
Phytotherapy	8	12	0.58
NSAIDs	7	13	0.99

Table 6: Distribution of the 89 elderly patients according to statistical relationship between type of bacterial dermohypodermatitis and ground.

Studies On Entrance Doors	Our Study N=83	Diatta et al. [13] N=146	Diédhiou et al. [11] N=161	Saka et al. [37] N=89
Inter-toe intertrigos	51.80%	41%	18.50%	41.60%
Traumatic wounds	22.90%	34.30%	16.40%	39.30%
Pre-existing dermatosis	19.30%	13%	11.30%	11.20%
Plantar cracks	6.02%	-	-	-
Leg ulcer	-	11.70%	34%	12.40%

Table 7: Comparison of gateway frequencies between our elderly patients with bacterial dermohypodermatitis and 3 studies of adult patients of all ages.

Discussion

The limitations of our study lie in its retrospective nature. However, we carried out our work in the two referral dermatology departments in Dakar: Aristide Le Dantec Hospital and the Institut d'Hygiène Sociale de Dakar (IHS). In our study, the frequency of BDH patients aged 65 or over was 7.66%. In the study by Dioussé et al. [2], carried out at the Thiès regional hospital, a frequency of 14% of patients aged 60 or over was reported.

Our patients were predominantly females (59.6%). In Senegal, studies by Diédhiou et al. [5], Diatta et al. [6] and Dioussé et al. [2] showed the same results in subjects of all ages. In elderly subjects, this predominance of women could be explained by the progressive feminization of the population [7] and the fact that women's life expectancy is higher than that of men [8].

Regarding fever, the frequency of 39.3% (n=35) is lower than the results of Diédhiou et al. [5] and Thioub et al. [9], who reported it in 46.3% and 48% respectively of their adult patients of all ages. In Tunisia, the study by Mzabi et al. [10], involving 158 elderly subjects with BDH, showed an almost similar frequency of fever (37%). In Morocco, Chmali et al. [11] found fever in all their patients, in contrast to their elderly population. Indeed, during infection in the elderly, fever is inconstant due to quantitative and qualitative abnormalities in the production of pyrogenic cytokines (Tumor Necrosis Factor alpha (TNF α) and Interleukin-1) and the hypothalamic response to these substances [12,13].

In the case of necrotizing bacterial dermohypodermatitis, its frequency of 34.8% in our patients remains higher than reported by Diédhiou et al. [5] (29.9%) and Diatta et al. [6] (10%) in their studies of adults of all ages. In the series by Diédhiou et al. [5], the necrotizing character was mainly related to diabetes. In our series, diabetes, which was not statistically associated with this clinical form (p=0.28), was noted in only 29% of patients presenting this necrotizing form. Our results are also superior to those of Dioussé et al. [2], who found a 10.4% frequency of NBDH in their series of 425 patients of all ages; the same applies to those of Cissé et al. [14], who found 12.7% in 244 patients of all ages. This disparity could be explained by the failure of immunity (immunosenescence), particularly cell-mediated immunity, in the elderly [15,16], and locoregional aggravating factors (lymphedema and peripheral artery disease). However, in the study by Mzabi et al. [10], only 8.8% (14/158) of elderly subjects with BDH had a necrotizing form.

The bilateral nature of BDH, noted in 7.8% of our patients, is rarely reported in the literature [17]. In the study by Diédhiou et al. [5], bilateral topography was found in only 4.6% of their patients. In contrast, the study by Dieng et al. [18], involving 60 patients of all ages, found no bilateral leg forms; the same applied to the study by Gathse et al. [19] (n=53) in Congo. In our patients, this relatively high frequency of bilateral topography could be explained, apart from the numerous conditions, by the skin's fragility, which exposes it to several immediate entry points. These were found in 93.25% (n=83) of our patients. This result is close to those of the study by Saka et al. [20], who found an entry point in 85.6% of their patients of all ages. Similarly, Cissé et al. [14] reported it in 80% of their series. On the other hand, our results are far superior to those of Dioussé et al. [2], who reported the existence of an entry portal in only 52.5% of their patients. In our

study, half of the entry sites were intertrigos between the toes. In the study by Saka et al. [20], intertrigo accounted for 41.6% of entry sites. In the study by Diédhiou et al. [5], carried out on adults of all ages, mainly diabetics, intertrigo accounted for 18.5% of the sites of entry, and in the study by Diatta et al. [6], it represented 41% of cases.

Table 7 shows that inter-toe intertrigo is more frequent in elderly subjects with BDH than in adults of any age, and that plantar fissures are a feature of advanced age. This finding may be explained by the increased susceptibility to infection in this population, due to immunosenescence [21] and greater xerosis. General risk factors were mainly arterial hypertension (56.2%), obesity (31.5%), diabetes (22.5%) and heart disease (5.6%). In the study by Mzabi et al. [10] carried out in an internal medicine and rheumatology departments, involving the same population, diabetes was found in 50.6% of patients, obesity in 33% and heart failure in 15.8%. In the studies by Pitché et al. [22] and Tianyi et al. [4], the general risk factors statistically correlated with BDH were voluntary cosmetic depigmentation and obesity.

Lymphedema, found in 16% of patients with NBDH and 3.4% of patients with a non-necrotizing form, tends to be responsible for severe forms of BDH, as the protein-rich interstitial fluid provides an ideal culture medium for germ growth [23]. In addition, in lymphedematous tissue, both innate and adaptive immunity are impaired [24]. In terms of bacteriology, *Staphylococcus Aureus* was the only germ isolated in an abscessed form and in a bullous form in 6.7% (n=6) of patients in whom a sample was taken. In the literature, local sampling of the entry site is known for its lack of sensitivity [25] explained by the bacteria's mechanism of action. However, in the study by Saka et al. [20], 13 out of 16 entry portal samples isolated *Streptococcus* in 4 patients, *Staphylococcus aureus* in 7 and Gram-negative bacilli in 2.

In terms of vascular investigation, Doppler ultrasonography of the lower limbs revealed PAD in 58.3% (7/12), including 5 cases of NBDH. This result is far superior to those of the study by Ndiaye et al. [26], who reported only one case of arterial abnormality in their 36 adult patients of any age. This difference can be explained by the fact that cardiovascular risk factors, especially those responsible for arteriopathy, are much more frequent in the elderly, as found in our study. In patients with NNBDH, PAD was only found in those with a bullous or abscessed form. Therefore, PAD, which is statistically linked to NBDH (p=0.05), should be researched in any elderly subject with severe BDH. About aggravating factors, the use of non-steroidal anti-inflammatory drugs is often reported in the literature [14,27]. Although it was found in 22.4% (20/89) of our patients, it was not statistically significantly associated with necrotizing disease (p=0.99). In the Mzabi et al. study [10], NSAID use was noted in only 2.5% of patients. These results suggest that elderly subjects are less likely

to be exposed to NSAIDs during BDH, probably because they are less likely to be prescribed or recommended by pharmacies due to the side-effects, which are more pronounced in this population. As for phytotherapy, noted in 16% of our patients with DHBN, it is incriminated as a risk factor for the onset of this form in 26% of patients in the study by Cissé et al. [14]. In our study, there was no statistically significant association ($p=0.6$) between this necrotizing form and phytotherapy.

For venous anomalies, the 20% frequency in our patients is lower than the 52.7% (19/36) found by Ndiaye et al. [26]. These authors found 17 cases of venous insufficiency and 3 cases of thrombosis. In the study by Zaghoud et al [28], carried out in Tunisia in adults of all ages, there were 10% ($n=3$) cases of venous thrombosis in 30 patients with BDH. Favorable outcome in 93.3% of our patients is described in several studies, including the one of Diatta et al. [6], who reported favorable outcome in 96% of their patients of all ages. In the studies by Dioussé et al. [2] and Diédhiou et al. [5], favorable outcome was less frequent, with 89% and 77.3% of their patients respectively.

In our patients, the 3.4% mortality due to septic shock was higher in patients with NBDH, in whom it was 6.4%, as opposed to 1.7% in those with NNBDH. This mortality is similar to the one reported in the study by Cissé et al. [14], involving patients of all ages with NBDH. It is also almost identical with the study by Diédhiou et al. [5], where it was 7.7%, and correlated with the necrotizing form ($p=0.00001$). On the other hand, in the study by Saka et al. [20], involving 104 patients of all ages, mortality was noted in 28.6% of cases of necrotizing fasciitis. This finding shows that mortality in bacterial dermohypodermatitis does not appear to be age-related.

Regarding long-term complications, lymphedema was more frequent in patients with NBDH (19.6%) than in patients with NNBDH (7.4%). The onset of lymphedema during BDH may be related to a pre-existing abnormality of the lymphatic vessels, rather than the infection itself. The study by Damstra et al. [29], involving lymphoscintigraphy of both limbs in 40 patients with unilateral bacterial dermohypodermatitis, showed that 90% (36/40) had contralateral lymphatic abnormalities at an uptake threshold of over 20%; and at a threshold of 15%, this abnormality was 68% (27/40). Similar results were reported by Soo et al. [30]. This predisposition is aggravated by bacterial dermohypodermatitis, especially if repeated [31]. Moreover, recent studies [32,33] have shown that the proper function and density of cutaneous lymphatic vessels are diminished in the elderly.

Lymphedema is a well-known factor in recurrence. Recurrence was noted in 2.2% of patients, including one with NNBDH and another with a necrotizing form. The frequency of recurrence was higher in the studies by Pitché et al [22] and

Saka et al. [20], who reported it in 10% and 7.7% of their patients respectively. Similarly, in the study by Diallo et al. [34], recurrence was noted in 9% of patients of all ages. In the series of 235 patients by Madeira et al. [35], subjects aged 60 or over were at greater risk of recurrence than others. In the study by Inghammar et al. [36], involving 502 patients, the risk factors for recurrence were lymphedema, venous insufficiency, dermatosis and chronic obstructive pulmonary disease (COPD). Apart from these risk factors, this disparity could be explained by the heterogeneity of patient follow-up periods between series. In the study by Ellis Simonsen et al. [37], involving 5780 patients aged under 65, recurrence was 11% within one year, 3.6% within 2 years and 3.3% after more than 2 years. In our patients, nearly complete control (97.6%) of entry sites would be one of the factors reducing recurrence.

Conclusion

Bacterial dermohypodermatitis is relatively common in the elderly. Although fever may be absent, the necrotizing form is more frequent in this population than in adults. The main entry sites are inter-trigonal toes, but plantar fissures are a particular feature in the elderly. Moreover, the aggravating factors are essentially cardiovascular. Lastly, age is an additional factor in the occurrence of lymphedema.

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