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Familial Forms of Spondyloarthritis: A Study of 100 West African Multiplex Families

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Abstract

Introduction: Spondyloarthritis (SpA) comprises a group of chronic inflammatory rheumatic diseases characterized by predominant axial involvement. These include ankylosing spondylitis (AS), reactive arthritis (ReA), psoriatic arthritis (PsA), arthritis associated with inflammatory bowel diseases (IBD), SAPHO syndrome (Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis), juvenile spondyloarthritis (JSPA), and undifferentiated SpA. Their exact cause is unknown but is believed to stem from a combination of factors. The first familial forms were described by de Blécourt *et al.* in 1961. The objective was to evaluate the epidemiological, clinical, therapeutic and evolutionary aspects of familial forms of SpA and in particular, to prove the severity of the disease in family members compared to index cases in the rheumatology department of the Aristide Le Dantec University Hospital in Dakar. **Methodology:** This was a prospective, cross-sectional and descriptive study with an analytical aim on patients with the familial form of spondyloarthritis defined by the existence of at least one other family member with SpA outside the propositus, collected within the Aristide Le Dantec rheumatology department in Dakar over a period of 10 years between January 2012 and December 2021. There were two phases of study, the first of which consisted of collecting index cases with miserly SpA and the second of which consisted of family screening after consent. The data analysed were epidemiological, clinical, paraclinical, therapeutic and evolving. **Results:** Out of 100 families of 1905 members, 667 SpA patients included, *i.e.* a prevalence of 35%, including 225 (33.73%) men and 412 women (61.17%), *i.e.* a ratio of 1.8. The mean age at diagnosis among relatives was 26.3 years (range 13 and 80 years), 47.14 years

among the propositus, in whom the mean age at onset was 36.26 years and that of relatives 49.9 years in the first degree, 15 years in the second degree and 1 year in the third degree. The time to diagnosis was 11.20 years in the first degree, 2.5 years in the second degree, 1 year in the third degree and 10.88 years in the case of the proposes. The number of marriages in families was 420 of which 116 were consanguineous (consanguinity rate 27.62%), 19% among the propositus. HLA-B27 positive in 92% of the proposers and 33.43% in the families; 70% of the propositus had an inflammatory syndrome and 17.54% in the families; 87% of sacroilliitis in the propositus and 5.54% in the families. Clinical forms were dominated by undifferentiated SpA (338 cases) and APS (295 cases). The average BASFI was 3.23 on D0; 2.59 in the 3rd month and 1 in the 6th month for the propositus versus 2.55 at D0; 1.86 at the 3rd month and 1.55 in the 6th month in the families. Average BASDAI was 3.92 at D0; 3.12 at the 3rd month and 2.07 at the 6th month in the propositus and 3 at D0; 2.21 at the 3rd month and 1 at the 6th month in the families. Autoimmune associated conditions were 18 cases, degenerative 24 cases, autoinflammatory 2 metabolic cases 18 cases. They all received: NSAIDs, methotrexate, salazopyrine (11 cases) and anti-TNF-α (1 case). The evolution was generally favourable. **Conclusion:** SpA is on the rise in Senegalese hospitals, frequent in young people, SPA and undifferentiated SpA are the most frequent, management is essentially based on conventional care, and the disease is less severe in family members than index cases.

Keywords

Familial Forms of Spondyloarthritis, Propositus, Senegal

1. Introduction

Spondyloarthritis (SpA) is a group of chronic inflammatory rheumatisms characterized by a predominant axial involvement [1]-[5]. These are ankylosing spondylitis (APS), reactive arthritis (RA), psoriatic arthritis (RP), rheumatism associated with inflammatory bowel disease (IBD), SAPHO (acronym for Synovitis, Acne, Palmoplantar Pustulosis, Hyperostosis and Osteitis), certain juvenile idiopathic arthritis (JIA) and undifferentiated SpA. Their exact cause is unknown. However, they are considered to be the result of a multifactorial mechanism, combining genetic [6]-[8] and environmental (epigenetic, reactive arthritis) risk factors acting in concert. The involvement of genetic factors in the determinism of the disease is illustrated by the existence of familial forms [9] [10], the first familial forms being reported by de Blécourt *et al.* in 1961 [11].

In Africa, studies on SpA have focused mainly on their epidemiological [11], diagnostic [1] and evolutionary [9] aspects. To our knowledge, genetic genetic diversity appears to be rare or even exceptional, only in North Africa [9] [12]

[13], sub-Saharan Africa, Senegal [14] [15] and Guinea [16]. But this rarity is called into question by recent studies in Senegal, where the incidence of SpA is constantly increasing [10] [11]. No doubt because of their better knowledge.

The objective of this study is to evaluate the epidemiological, clinical, therapeutic and evolutionary aspects of familial forms of SpA and in particular, to prove the severity of the disease in family members compared to index cases in the rheumatology department of the Aristide Le Dantec University Hospital in Dakar.

2. Methodology

This was a prospective, cross-sectional and descriptive study with analytical aims on patients with the familial form of spondyloarthritis, collected in the rheumatology department of the Aristide Le Dantec University Hospital Center (CHU) in Dakar over a period of 10 years from January 2012 to December 2021.

The diagnosis was established on the basis of a comparison of epidemiological, clinical and paraclinical arguments in accordance with the classification criteria of Amor, ESSG, modified New York and ASAS.

Familial forms of spondyloarthritis are defined by the existence of at least one other family member with SpA outside the propositus or index case (the first case in which the diagnosis is miserly) by creating the family tree.

Thus, there were two phases of the study:

The first phase consisted of collecting the index cases with SpA, whose diagnosis had been established on the basis of clinical and paraclinical arguments helped by the classification criteria, so after establishing the diagnosis of SpA, the data collected and analyzed through a survey sheet were as follows:

Epidemiological: Prevalence, gender, age and ethnicity.

Clinical: Age at on set, age at diagnosis, time to diagnosis, clinical forms:

Axial involvement: coccyx, sacroiliac, spine (cervical, dorsal and lumbar), anterior chest wall, temporomandibular.

Peripheral involvement: arthritis (monoarthritis, oligoarthritis, polyarthritis), enthesitis, dactylitis.

Paraclinical: Biology: inflammatory syndrome, **Immunology**: HLA-B27, **Imaging**: radiographic or non-radiographic (magnetic) sacroilliitis.

Therapeutics: Non-pharmacological: information, communication and education.

Pharmacologic: Symptomatic and background (NSAIDs, Methotrexate, Salazopyrine, anti-TNF).

Evolution and prognosis: BASDAI activity index (Bath ankylosing spondylitis Activity index) active disease if BASDAI ≥ 4, BASFI functional index (Bath ankylosing spondylitis functional index) reflects the inability to perform actions of daily living during the past month. Rated from 0 to 10 for each of the ten activities, 0 means total ease and 10 means impossibility.

The second phase consisted of family screening, after obtaining consent, by drawing up the family tree at home for some and in the department for others, making it possible to identify members with symptoms of the disease for early diagnosis.

The data analyzed in the families were as follows:

Epidemiological: The average age at the beginning, at diagnosis and the diagnosis at the first, second and third degrees. The number of marriages in families, the rate of inbreeding, the smallest and largest family. The prevalence of first, second and third degree SpA cases.

First degree includes: father/mother, son/daughter, fully adopting/fully adopting.

Second degree is composed of: grandfather/grandmother, grandson/granddaughter, brother/sister.

Third degree: great-grandfather/great-grandmother, great-grandson/great-granddaughter, uncle/aunt, nephew/niece.

Clinical: clinical forms

Paraclinical: Biology: inflammatory syndrome, **Immunology:** HLA-B27, **Imaging:** radiological or magnetic sacroilliitis (non-radiological).

Associated pathologies and comorbidities: Autoimmune pathologies (rheumatoid arthritis, dry syndrome and scleroderma), degenerative pathologies (osteoarthritis and osteoporosis), metabolic pathologies (hypertension, diabetes, obesity, and dyslipidemia) and autoinflammatory pathologies (gout, Still's disease).

Statistical analysis was performed using SPSS 20.0 software. By first making a descriptive analysis of the different data and then a comparison of the different parameters.

3. Results

Out of 100 families of propositus (index cases) of 1905 members, 667 SpA patients were included, *i.e.* a prevalence of 35%, including 225 men (33.73%) and 412 women (61.17%), *i.e.* a ratio of 1.8.

The mean age at diagnosis among relatives was 26.3 years, 47.14 years among the propositus, in whom the mean age at onset was 36.26 years and that of relatives 49.9 years in the first degree, 15 years in the second degree and 1 year in the third degree.

The time to diagnosis was 11.20 years in the first degree, 2.5 years in the second degree, 1 year in the third degree and 10.88 years in the case of the proposes.

The Halpoulaar ethnic group was the most dominant 59% among the propositus, the number of marriages in families was 420 of which 116 were consanguineous (27.62%), 19% among the propositus.

The smallest family had 7 members and 76 members for the largest. The prevalence of first, second and third degree SpA cases were 491 cases or 73.61%, 170 cases or 25.49% and 6 cases or 0.90% respectively (**Figure 1**).

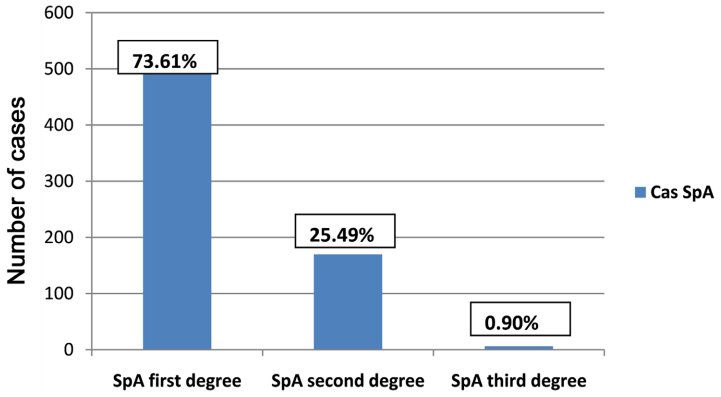

Figure 1. Prevalence of SpA by degree of relatedness.

Axial involvement was constant, noted in all patients. It was dominated by lumbo-pelvic involvement noted in 77 cases, followed by dorsal involvement (12 cases including chest wall involvement 10 cases), temporomandibular involvement 6 cases and cervical spine involvement 3 cases (Table 1).

Table 1. Distribution by axial involvement in index cases.

Axial expectations	Number	%
Coccys	9	13
Sacroiliac	**44**	**44**
Lumbar spine	**24**	**24**
Dorsal Spine	2	23
Anterior wall of the thorax	10	10
Cervical spine	3	3
Temporomandibular joint	6	6

Peripheral involvement was noted in 77 patients. It was dominated by arthritis in 40 cases, including monoarthritis in 3 cases, oligoarthritis in 11 cases and polyarthritis in 26 cases, followed by enthesic involvement in 37 cases, including posterior talalgia in 21 cases, and anterior talalgia in 16 cases (Table 2).

Clinical forms were dominated by undifferentiated SpA (338 cases) and APS (295 cases).

HLA-B27 positive in 92% of propositus and 33.43% in families; 70% of the propositus had an inflammatory syndrome and 17.54% in the families; 87% of sacroilliitis in the propositus and 5.54% in the families (Table 3).

Non-pharmacological (information, communication and education) and background pharmacological treatment were instituted in all patients (NSAIDs 100%, methotrexate 88%, 11 cases of salazopyrine and 1 case of anti-TNF).

The evolution was generally favourable; however, we deplored 179 deaths in families of exactly unknown causes. The mean BASDAI was 5.12 at D0, 3.67 at

the 3rd month and 2.97 at the 6th month and the mean BASFI was 3.23 at D0; 2.59 at the 3rd month and 1 at the 6th month for the propositus.

Autoimmune associated conditions were at 18 cases including 5 cases of rheumatoid arthritis, 12 cases of dry syndrome and 1 case of scleroderma. The degenerative cases were 24 cases including 17 cases of osteoarthritis and 7 cases of osteoporosis, autoinflammatory 2 cases (1 case of gout and 1 case of Still's disease), metabolic 18 cases (11 hypertension, 4 diabetes, 2 obesity, and 1 dyslipidemia).

Table 2. Distribution of peripheral involvement in index cases.

Peripheral Impairment	Number	%
Arthritis	**40**	**40**
- Monoarthritis	3	3
- Oligoarthritis	11	11
- Polyarthritis	26	36
Enthésitis	**37**	**37**
- Anterior talalgia	16	16
- Posterior talalgia	21	21
- Dactylitis	0	0

Table 3. Mean paraclinical characteristics.

Patients	SIB prevalence	HLA B27+ prevalence	Prevalence Sacroilliitis
Propositus	70%	92%	87%
Families	17.54%	33.43%	5.54%

Table 4. Summary of family characteristics.

Characteristics	Number	%
Total number of family members	1905	100
Number of women	**1017**	**53.39**
Number of men	**888**	**46.61**
Number of members of the largest family	**76**	
Number of members of the smallest family	**7**	
Number of marriages	420	22.04
Number of consanguineous marriages	116	27.62
Number of first degree consanguineous marriages	25	5.95
Number of second degree consanguineous marriages	91	21.66

Continued

Average number of children per woman	8	-
Number of SpA cases in relatives of index cases	**667**	**35**
Number of women	412	**61.76**
Number of men	225	**33.73**
Number of cases in 1st degree relatives	**491**	**73.61**
Number of cases in 2nd degree relatives	**170**	**25.48**
Number of cases in 3rd degree relatives	**6**	**0.90**
Total	**667**	**100**
Average age at diagnosis in the 1st degree	**49.9 years**	**-**
Average age at diagnosis in the 2nd degree	**15 years**	**-**
Average age at diagnosis in the 3rd degree	**1 year**	**-**
Ag HLA-B27	**223**	**33.43**

4. Discussion

Our study focused on the familial forms of spondyloarthritis in its epidemiological, clinical, therapeutic and evolutionary aspects and in particular, to prove the severity of the disease in family members compared to index cases.

To our knowledge, studies on SpA in Africa have so far focused mainly on their epidemiological aspects. [9] Thus, our work appears, to our knowledge, to have been the first to have studied these familial forms of SpA in sub-Saharan Africa. In the literature, the first description of a family form of SpA (in particular SPA) would go back to de Blécourt *et al.* in 1961. [11] Since then, several studies have confirmed this familial character, in particular in its SPA phenotype, in pairs of germans (Sib pairs) in 2 cohorts, a North American and English one [12], twins in 2 cohorts, a Finnish one [13] and a Dutch one [9] and in its SpA phenotype mainly in 2 cohorts, a French one [9] and one Chinese [13].

Thus our study confirms the familial nature of SpA, in agreement with the data in the literature. The number of cases of SpA in our study of 100 families of 1905 members is 667 cases, i.e. a prevalence of 35%, however, in the French and Chinese cohorts, it is 329 and 330 cases, respectively. The greater number of cases among our patients could be linked to several facts, including our methodology, which consisted of systematically screening members of the propositus' family for the disease; Better recognition of the disease; the use of effective disease classification criteria, in particular the Amor, ESSG, modified New York and ASAS criteria which allow better detection of early forms; the characteristics of our families which are extensive, with several cases of polygamy (114 cases), several marriages (420 cases), consanguinity 116 cases (27.62%), a high average number of children per woman 8 children (see **Table 4**, **Figure 2**, **Figure 3**).

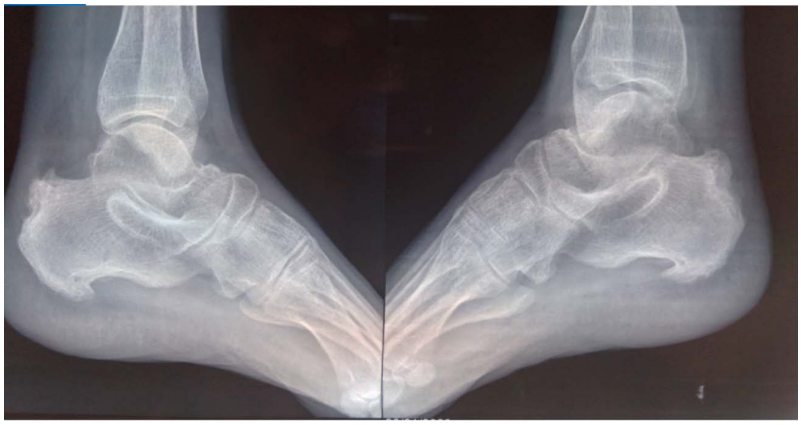

Figure 2. Profile radiograph of the forefeet showing prominent bilateral posterior and anterior heel spurs in a proband at the Rheumatology Department of HLD Dakar.

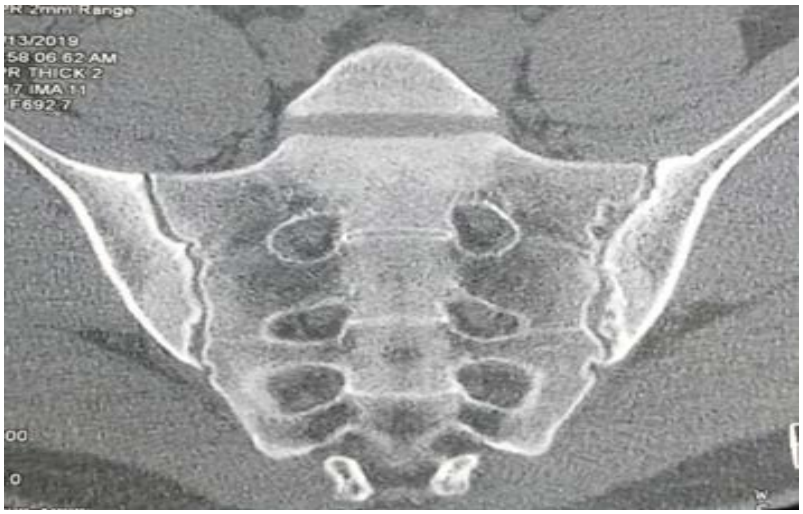

Figure 3. Pelvic CT scan of the same proband showing stage 3 sacroiliitis on the left and stage 2 on the right according to the Forestier classification at the Rheumatology Department of HLD Dakar.

Our prevalence of 35% is much higher than that found in Caucasian populations which were 0.3 to 1.2% [13] and 0.26 and 0.15% in Asians. Thus, it is considerably higher than that expected in the general Western and Asian population. In Africa, the prevalence of SpA in the general population has not been reported to our knowledge. This significant difference suggests the existence of a genetic susceptibility to the disease but also the existence, in accordance with the data in the literature, of environmental factors common to families [14].

The prevalence among first-degree relatives is higher than that in the second degree, which is higher than that in the third degree. This decrease in prevalence according to the degree of relatedness is in favor of the polygenic nature of this genetic component in which several genes contribute to the appearance of the "disease" phenotype. [6] [7]

Our 667 cases are divided between 412 women and 225 men, *i.e.* a predominance of women with a male/female ratio of 0.54. In previous studies, a Male

dominance is reported in most studies, with a male-to-female ratio ranging from E3 to 8 to 1. This predominance tends to decrease in the most recent studies, such as ours, perhaps due to a better knowledge of the disease in women. The feminine forms would have been underestimated earlier. [15] The predominance of women among our patients could also be linked to a population effect since women predominate in our country according to the latest census. [16] Our result was superimposed on that of several studies where the ratio was 1 [17] [18], although difficult to confirm precisely, the onset of symptoms is in the majority of cases, between the ages of 20 and 40. [19] Early-onset juvenile forms are more common in North Africa. For Masi [19], Beginnings before the age of 20 represent more than 20% of cases. Cases beginning after the age of 40 are much rarer and often correspond to forms with a late onset, with little or no symptoms until then. For Will [20] and Cuddle [7], the age of onset increased between 1940 and 1983 in the United Kingdom, while it remained stable in Rochester from 1935 to 1989. [18]

The average age of our patients at the apparent onset of the disease was 21.9 years; It is 24 years and 41.87 years respectively in the French and Chinese studies. The diagnosis rate for affected families was 26.5 years, while it was 47.14 years for the proposed. This earlier onset comforts the family nature of the SpA. [18] [21] [22]. Also, a population effect is not excluded, since according to the latest census, our population appears younger, composed of at least 70% of people under 25 years of age. [23] Certain factors, particularly environmental ones, are thought to intervene through epigenetic mechanisms (DNA methylation, histone acetylation, microRNA) by inhibiting the extinction of the X chromosome. [24]

Our families had been discovered from the diagnosis of SpA propositus who presented a late form of the disease and therefore severe. This severity is of multifactorial origin in particular: the delay in consultation (diagnosis time of 10.88 years) often linked to self-medication, alternative medicine, insufficient medical coverage, the genetic determinism of the disease by their familial nature expressed in our study and the involvement of environmental factors (infectious, chemical, toxic, etc.).

The phenotype of SpA was variable among affected members of our families. This variability of the phenotype expresses, in accordance with the data in the literature, the multifactorial aspect [18], hence the interest in family screening and diagnosing the disease at the inflammatory low back pain stage, as demonstrated by the results of the DESIR cohort. [25] This cohort included axial involvement that initiates the disease as in our study. The interest of systematic screening is to recognize the variability of the phenotype of SpA, which is from atypical forms (low back pain, undifferentiated arthritis) to the most proven forms such as in propositus.

Genetic analysis was not systematic. However, the search for HLA was positive in 92 propositus (92%) of our patients. The paraclinical assessment was systematic in all patients, which explains the high frequency of undifferentiated

forms, [26] due to the inadequacy of our technical platform because radiographic assessments could show sub-clinical erosion. [27] In the face of any axial and even peripheral involvement, it is necessary to look for an SpA.

The care of our patients with SpA was based on 4 components. In our patients, the non-pharmacological component was systematic, which allowed family screening, they all received NSAIDs and immunosuppressant's (methotrexate 88%, salazopyrine in 11 patients) and only one benefited from biotherapy (anti-TNF) and the evolution was generally favorable. We deplored 179 deaths in families, however the exact cause of death could not be evaluated in the majority of cases, in the literature we found that in patients with SpA, mortality was linked to cardiovascular, pulmonary, neurological, renal, gastrointestinal, musculoskeletal, and cancer diseases. [28]

5. Conclusion

SpA is on the rise in Senegalese hospitals, frequent in young people, SPA and undifferentiated SpA are the most frequent, the Halpoulaar ethnic group is the most affected due to high inbreeding, the decrease in prevalence according to the degree of relatedness would be in favor of the polygenic nature of this genetic component in which, several genes contribute to the appearance of the phenotype. The treatment is essentially based on conventional care, the disease is less severe in family members detected early than the propositus. The prospect of systematically doing predictive medicine through the tree.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Corinne, M.-R. (2010) HLA B27 et spondyarthropaties. *Revue du rhumatisme*, **77**, 288-292. https://doi.org/10.1016/j.monrhu.2010.07.003

[2] Sibilia, J., Pham, T., Sordet, C., Jaulhac, B. and Claudepierre, P. (2005) Spondylarthrite ankylosante et autres spondylarthropathies. *EMC-Médecine*, **2**, 488-511. https://doi.org/10.1016/j.emcmed.2005.08.005

[3] Cotten, A., Philippe, P. and Flipo, R.-M. (2013) Spondyloarthritis. In: Cotten, A., Ed., *Imagerie Musculosquelettique. Pathologies Générales*, Masson, 137-187. https://doi.org/10.1016/B978-2-294-71924-0.00004-8

[4] Claudepierre, P. and Wendling, D. (2009) Ankylosing Spondyloarthritis. Masson.

[5] Mangone, M., Paoloni, M., Procopio, S., *et al.* (2020) Sagittal Spinal Alignment in Patients with Ankylosing Spondylitis by Rasterstereographic Back Shape Analysis: An Observational Retrospective Study. *European Journal of Physical and Rehabilitation Medicine*, **56**, 191-196. https://doi.org/10.23736/S1973-9087.20.05993-6

[6] Feingolg, J. (2005) Maladies multifactorielles: Un cauchemar pour le généticien. *Medical Sciences*, **21**, 327-933.

[7] Feingolg, J. (2005) Maladies multifactorielles: Un cauchemar pour le généticien. *Medecine/Science*, **21**, 927-933. https://doi.org/10.1051/medsci/20052111927

[8] Bowden, D.W., An, S.S., Palmer, N.D., Brown, W.M., Norris, J.M., Haffner, S.M., *et al.* (2010) Molecular Basis of a Linkage Peak: Exome Sequencing and Family-Based Analysis Identify a Rare Genetic Variant in the ADIPOQ Gene in the IRAS Family Study. *Human Molecular Genetics*, **19**, 4112-4120. https://doi.org/10.1093/hmg/ddq327

[9] Said-Nahal, R., Miceli-Richard, C. and Berthelot, J.-M. (2000) The Familial Forme of Spondylarthropathy: A Clinical Study of 115 Multiplex. *Arthritis et Rheumatism*, **43**, 1356-1365. https://doi.org/10.1002/1529-0131(200006)43:6%3C1356::AID-ANR20%3E3.0.CO;2-Y

[10] Breban, M., Said-Nahal, R., Hugot, J.P. and Miceli-Richard, C. (2003) Familial and Genetic Aspects of Spondyloarthropathy. *Rheumatic Disease Clinics of North America*, **29**, 575-594. https://doi.org/10.1016/S0889-857X(03)00029-2

[11] de Blecourt, J.J., *et al.* (1961) Facteurs héréditaires dans la polyarthrite rhumatoïde et spondylarthrite ankylosante. *Annals of the Rheumatic Diseases*, **20**, Article No. 215.

[12] Mijiyawa, M. (1993) Pathologies rhumatismales en Afrique noire. *Revue du Rhumatisme*, **60**, 451-457.

[13] Hassouni, N., Maetzel, A., Dougados, M. and Amor, B. (1993) Comparaison des malades examinés pour spondylarthropathies en France et au Maroc. *Revue du Rhumatisme*, **60**, 420-425.

[14] Diallo, S., Dieye, A., Siby, T., Niang, E.H., Ndongo, S., Diop, T.M. and Kane, B. (2007) Formes familiales des spondylarthropathies (SpA). Etude de 50 familles multiplex au Sénégal. *Revue du Rhumatisme*, **74**, 1039-1208. https://doi.org/10.1016/j.rhum.2007.10.338

[15] Diaw, C.A.B. (2015) Formes familiales de spondylarthrite ankylosante: étude préliminaire de 17 familles multiplex sénégalaises.

[16] Barry, A., Kamissoko, A.B., Condé, K., Touré, M. and Camara, G. (2022) Formes familiales des spoldylarthrite ankylosante au servise de rhumatologie de l'hopital national Ignace Deen de Conakry. 1*er Congrès de la Société Africaine de Rhumatologie*, Ouagadougou, 16-18 Mars 2022, 28.

[17] Diallo, S., Mbengue, M.M., Diouf, M.L., Kane, B., Mbaye, P.S. and Sakho, Y. (2001) Les spondylarthropathies chez les noirs africains du Sénégal. Etude de 130 observations. *Revue du rhumatisme*, **68**, Article 1081.

[18] Diallo, S., Ndiaye, D., Mbaye, P.S., Thiam, A. and Diop, T.M. (2001) L'allèle HLA B-27 et les sous types HLA B-27 dans les spondyarthropaties de noir africain du Sénégal. *Revue du Rhumatisme*, 68, 1081.

[19] Carter, K.W., *et al.* (2007) Analyse combinée de trois analyses de liaison du génome entier pour la spondylarthrite ankylosante. *Rheumatology*, **46**, 763-771.

[20] Chou, C.T., *et al.* (2005) Study of Undifferentiated Spondyloarthropathy among First-Degree Relatives of Ankylosing Spondylitis Probands. *Rheumatology*, **44**, 662-665. https://doi.org/10.1093/rheumatology/keh577

[21] Sieper, J., Rudwaleit, M., Asim Khan, M. and Braun, J. (2006) Concepts and Epidemiology of Spondyloarthritis. *Best Practice & Research Clinical Rheumatology*, **20**, 401-417. https://doi.org/10.1016/j.berh.2006.02.001

[22] Vasseur, F. (2010-2011) Les maladies génétiques complexes.

[23] Gran, J.T. and Husby, G. (1990) Ankylosing Spondylitis in Women. *Seminars in Arthritis and Rheumatism*, **19**, 303-312. https://doi.org/10.1016/0049-0172(90)90053-I

[24] Berthelot, J.M., *et al.* (2009) Par quels signes cliniques s'assurer au mieux qu'une douleur est bien d'origine sacro-iliaque (sensu lato)? *Revue du Rhumatisme*, **76**, 741-749.https://doi.org/10.1016/j.rhum.2009.01.010

[25] Claudepierre, P. and Voisin, M.-C. (2005) Les enthèses: Histologie, anatomie, pathologie et physiopathologie. *Revue de rhumatisme*, **72**, 32-37. https://doi.org/10.1016/j.rhum.2004.02.008

[26] Haglund, E., Bremander, A.B., *et al.* (2011) Prevalence of Spondyloarthritis and Its Subtypes in Southern Sweden. *Annals of the Rheumatic Diseases*, **70**, 943-948. https://doi.org/10.1136/ard.2010.141598

[27] Carbone, L.D., *et al.* (1992) Ankylosing Spondylitis in Rochester Minnesota, 1935-1989. Is the Epidemiology Changing? *Arthritis & Rheumatology*, **35**, 1476-1482. https://doi.org/10.1002/art.1780351211

[28] Masi, A.T. and Wilkins, W.R. (1993) Does Male/Female Sex-Ratio in Ankylosing Spondylitis Change with Age? *The Journal of Rheumatology*, **23**, 947-948.