

## Comparative study of isthmic spondylolisthesis and non-isthmic spondylolisthesis in Northern Togo

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### Abstract

**Objectives:** To describe the epidemiological and clinical characteristics of isthmic and non-isthmic spondylolisthesis in a rheumatological environment in northern Togo

**Methods:** This was a retrospective study lasting 2 years, from January 1, 2020 to December 31, 2022, of patients with lumbar spondylolisthesis with or without slippage at the CHU and CHR Kara.

**Results:** One hundred and six (86 women; 20 men) of the 1699 patients who attended our clinic suffered from lumbar spondylolisthesis. The mean age of the patients was  $54.15 \pm 12.21$  years. The average duration of evolution was  $46.57 \pm 54.09$  months. Overweight accounted for 51.6%, followed by moderate obesity at 25.8%. Low back pain radiated in 91.5% and bilateral in 62.3%. The walking distance was limited (62.3%) and the average was  $324.92 \pm 361.28$ m. Anterolisthesis was found in 79.2%, L4-L5 and L5-S1 seats were affected in 62.3% and 28.3% respectively. Meyerding grade I was found in 91.5%. Isthmic spondylolisthesis accounted for 51.9%. Among non-isthmic spondylolisthesis, the degenerative type accounted for 44.3%. A statistically significant correlation was observed between the patient's age ( $p=0.004$ ), the type of obesity ( $p=0.001$ ), anterolisthesis ( $p=0.001$ ), the site of the L4-L5 slip ( $p=0.001$ ) and Meyerding grade II ( $p=0.003$ ).

**Conclusion:** Spondylolisthesis is a frequent reason for consultation with a female predominance. Isthmic spondylolisthesis is the most frequent followed by degenerative spondylolisthesis. There was a statistically significant correlation with patient age, type of obesity, anterolisthesis, site of slippage, and Meyerding grade II.

**Key words:** Spondylolisthesis, Isthmic, Lumbar, Togo

### Introduction

Spondylolisthesis is generally defined as a sliding or displacement forward (ante) or backward (retro) of a vertebral body with its pedicles, its articular processes in relation to the underlying vertebra<sup>1</sup>. It is a ubiquitous condition, its prevalence is estimated at 6% in the European population and 13% in the Asian population<sup>2</sup>. In sub-Saharan Africa, it remains poorly documented and the available data are hospital-based<sup>3,4</sup>. It can be asymptomatic (discovered radiologically) or symptomatic in this case responsible for low back pain or lower back pain<sup>1</sup>. A new classification on the aetiology of spondylolisthesis was proposed by Marchetti *et al*<sup>2</sup> and made it possible to identify 2 types of causes (developmental causes on congenital dysplasia in type 1 and acquired causes in type 2). Type 1 is divided into two subgroups, subgroup A corresponding to isthmic lysis superimposed on isthmic elongation and subgroup B to pure isthmic elongation. Type 2 includes four subgroups. Subgroup A groups together traumatic causes, either macro-traumatic (A1) or micro-traumatic causing a stress fracture (A2). Subgroups B, C and D correspond to iatrogenic, pathological or degenerative origins respectively<sup>2</sup>. The objective of this study was to make a comparative study of isthmic spondylolisthesis and non-isthmic spondylolisthesis in northern Togo.

### Materials and methods

This was a retrospective study lasting 2 years, from January 1, 2020 to December 31, 2022, covering the files of patients with lumbar spondylolisthesis confirmed on imaging (standard radiography or CT lumbar spine). The recent classification by Marchetti *et al*<sup>2</sup> was used to determine the type of spondylolisthesis and that of Meyerding (the principle of which is to divide the upper plate of the underlying vertebra into four equal portions) to

evaluate the grade of slippage<sup>5</sup>. Grade 1 corresponds to the projection of the posterior wall of the overlying vertebra onto the first posterior quarter of the upper plate of the underlying vertebra; grade 2, in the second quarter; grade 3, in the third quarter and grade 4 in the last, most anterior quarter. Grade 5 corresponds to spondyloptosis where there is no contact between the posterior wall of the overlying vertebra and the upper plate of the underlying vertebra. A pre-established survey form was used for data collection. Obesity was defined in terms of Body Mass Index, (BMI) A BMI of < 18.5 kg/m<sup>2</sup> (underweight), between 18.5 - 24.9 kg/m<sup>2</sup> (normal weight), 25-29.9 kg/m<sup>2</sup> (overweight) and BMI ≥ 30.0 kg/m<sup>2</sup> (obesity)<sup>7</sup>.

The results were expressed in terms of number, frequency for quantitative variables and mean ± standard deviation for qualitative variables. To calculate statistically significant links between continuous variables and qualitative variables, the student t-test was used. Finally, the Chi<sup>2</sup> test was used for qualitative variables. A 95% confidence interval and a probability (p) value less than 0.05 was considered statistically significant.

## Results

Of the 2771 patients presenting for consultation over the two years of the study, 1699 (61.3%) suffered from low back pain (Table 1).

**Table 1:** Socio-demographic characteristics of patients with spondylolisthesis

	No.	(%)
Prevalence		
Spondylolisthesis	106	5.87
Other pathologies	1699	94.12
Sex		
Female	86	81.13
Male	20	18.86
Age groups (years)		
20-29	3	2.83
30-39	7	6.60
40-49	27	25.47
50-59	33	31.13
60-69	25	23.53
>70	11	10.37
Occupation		
Traders	49	46.22
Housewives	35	33.01
Civil servants	09	8.49
Cultivators	7	6.60
Drivers	5	4.71
Workers	1	0.94
Total	106	100

Average age : 54,15 ± 12,21 years old

Spondylolisthesis was detected in 106 patients (6.23%), 55 had Isthmic and 51 non isthmic type. There were 86 women and 20 men whose average age was 54.15 ± 12.21 years. Traders represented (46.22%) followed by housewives (33.01%) (Table I). The average duration of symptoms was 46.57 ± 54.09 months.

Overall lumboradiculopathy occurred in 91.5% and was bilateral in 62.3%. The walking distance was limited in two thirds (62.3%) and the average was 324.92 ± 361.28m. Sphincter disorders were found in 14.2%. Lumbar stiffness was noted, with forward and lateral flexion the most painful movements during lumbar spine mobilization in both groups. Tables 2 - 4 show the comparative demographic and clinical features of the 55 isthmic and 51 non isthmic patients in our study and in Table 5 the areas of significant differences between the two groups.

**Table 2:** Comparison between isthmic spondylolisthesis and non-isthmic spondylolisthesis according to sociodemographic data

	Isthmic (N=55) No. (%)	Non-isthmic N=51 No. (%)
Sex		
Female	45 (81.81)	41 (80.4)
Male	10 (18.18)	10 (19.6)
Age groups (years)		
20-29	2 (3.63)	0
30-39	5 (9.09)	2 (3.9%)
40-49	20 (36.36)	7 (13.7%)
50-59	12 (21.81)	23 (45.1%)
60-69	11 (20)	13 (25.5%)
>70	5 (9.09)	6 (%)

Average age of isthmic spondylolisthesis: 50,92 ± 12,80 years.

Average age of non-isthmic spondylolisthesis: 57,43 ± 10,51 years.

Overall the isthmic patients were younger and the non-isthmic patients heavier. The average body mass index in our patients was 27.6 ± 6.1 kg/m<sup>3</sup>. Moderate obesity was found in 24 non isthmic patients (47.05) and in (16.36%) patients in the isthmic group (p-value = 0,009) (Table 3). Lasegue sign was bilateral in 19 (34%) patients in the non-isthmique group compared to 9 (16.36%) isthmic patients (p-value = 0,05). The doorbell sign was bilateral in 10 (20%) patients in the non-isthmique spondylolisthesis group and in 8 (14.54%) patients in the second group. Eight patients in the isthmique group and 7 in the non-isthmique group presented sphincter disorders.

**Table 3:** Comparison between-isthmic spondylolisthesis and non-isthmic spondylolisthesis according to different types of obesity

	Isthmic spondylolisthesis (N=55) No. (%)	Non-isthmic spondylolisthesis (N=51) No. (%)	P-value
Overweight	29 (52.72)	20 (39.31)	0.19
Moderate obesity	9 (16.37)	24 (47.05)	0.009
Severe obesity	13 (23.63)	6 (11.76)	0.19
Morbid obesity	4 (7.28)	1 (1.96)	0.17
Total	55 (100)	51 (100)	-

Average body mass index: 27,3 ± 6,1

**Table 4:** comparison between isthmic spondylolisthesis and non-isthmic spondylolisthesis according to clinical data

	Isthmic spondylolisthesis (N=55) No. (%)	Non-isthmic spondylolisthesis (N=51) No. (%)
Lumbar radicular pain	55 (100)	48 (94,1)
Limitation of the walking distance	31 (56,36)	34 (66,7)
Lumbar spinal syndrome		
Scoliosis	5 (9.09)	16 (31,4)
Lumbar gibbus	2 (2.23)	4 (7,8)
Lumbar stiffness	5 (9.09)	6 (11,8)
Lumbar hyperlordosis	4 (7.27)	3 (5,9)
Painful movements		
Forward flexion	34 (61.81)	32 (62,7)
Lateral flexion	27 (49.09)	31 (60,8)
Extension	24 (43.63)	27 (52,9)
Rotation	11 (20)	11 (21,6)
Schober index	10 + 4.36 ± 1.06	10 + 4.47 ± 1.15
Painful site-		
L4	51 (92.72)	47 (92,2)
L5	48 (87.27)	47 (92,2)
L3	35 (63.63)	27 (52,9)
L2	13 (23.63)	13 (25,5)
L1	11 (20)	6 (11,8)
S1	3 (5.45)	7 (13,72)
Lumbar radicular syndrome		
Lasègue sign		
Bilateral	9 (16.36)	19 (34)
Unilateral	7 (12.72)	6 (24)
Doorbell sign		
Unilatéral	7 (12.72)	10 (20)
Bilatéral	8 (14.54)	10 (20)
Neurological disorders		
Sphincter disorder	8 (14.54)	7 (13,72)
Unintentional less of sandal	7 (12.72)	2 (3,9)
Hypoaesthesia	5 (9.09)	6 (11,1)
Paraparesis	2 (3.63)	4 (7,8)
Loss of reflexes	0 (0)	2 (3,9)

**Table 5:** Areas of statistically significant differences between two types of spondylolisthesis

	Isthmic spondylolisthesis (N=55) No. (%)	Non-isthmic spondylolisthesis (N=51) No. (%)	P-value
Patient age	50.5 ± 12.2 ans	57,7 ± 10.46 ans	0.04
Moderate obesity	14 (25.45)	25 (40.01)	0.01
Bilateral lumboradiculopathy	9 (16.36)	19 (34)	0.05
Anterolisthesis	53 (60.22)	35 (39.77)	0.01
Slip site	L4/L5 45 (81.81)	L5/S1 30 (58.82)	0.01
Meyerding Grade I	48 (87.27)	40 (78.43)	0.03

**Figure 1:** L4/L5 grade I spondylolisthesis Meyerding by isthmic lysis (orange arrow)**Figure 2:** Meyerding grade I L4/L5 spondylolisthesis of the degenerative type (orange arrow)

Anterolisthesis was found in 79.2%, the L4-L5 and L5-S1 sites were affected in 62.3% and 28.3% respectively. Meyerding grade I was found in 91.5%. Isthmic spondylolisthesis (Figure 1) represented 51.9% (Table 3). Among non-isthmic spondylolisthesis (Figure 2), the degenerative type represented 44.3%. A statistically significant correlation was observed between the age of the patient ( $p=0.004$ ), the type of obesity ( $p=0.001$ ), anterolisthesis ( $p=0.001$ ), the location of the L4-L5 slippage ( $p=0.001$ ) Meyerding grade I ( $p=0.003$ ) and the type of spondylolisthesis (Table 4).

## Discussion

This study made it possible to make an epidemiological and clinical comparison between isthmic spondylolisthesis and non-isthmic spondylolisthesis. This study encountered some limitations which include its retrospective nature, the inability of some patients to afford the cost of a lumbar scan.

Lumbar spondylolisthesis is a common pathology that can manifest as low back pain with or without radiculopathy<sup>3,6</sup>. Although some authors have reported a slight male predominance<sup>6,7</sup>, spondylolisthesis appears more common in women than in men as found in our study<sup>3,8,9</sup>. The frequency of degenerative pathology in women could explain this trend<sup>10</sup>. Spondylolisthesis occurs in relatively young subjects<sup>3,4,11</sup>. In our study, the overall average age at diagnosis was  $54.15 \pm 12.21$  years.

Isthmic spondylolisthesis was found in 55 (51.9% of cases) patients. These results are slightly higher than those reported from Cameroon and Burkino Faso 41.3% and 32% respectively<sup>3,12</sup>. The arduousness of domestic work (housework) and professional activities (resellers) could explain these results.

Non-isthmic spondylolisthesis (dominated by the degenerative type) occurred in subjects with an average age at diagnosis of  $57.7 \pm 10.46$  years and that of the isthmic type  $50.5 \pm 12.2$  years with a statistically significant difference ( $p$ -value = 0.04). Overweight represented 51.6%, followed by moderate obesity in 25.8% with an average body mass index of  $27.38 \pm 6.06$  kg/m<sup>2</sup>. A statically significant difference was found ( $p$ -value = 0.01). Kim *et al*<sup>7</sup> in his study on



factors associated with symptoms of young adults with L5 spondylolysis reported overweight with an average BMI of  $29.2 \pm 3.3 \text{ kg/m}^2$  in symptomatic patients and  $25.3 \pm 2.3 \text{ kg/m}^2$  in asymptomatic patients. In our context, obesity is perceived in the community as a sign of psychological and financial well-being. Found in 84 patients or 79.2% of cases, anterolisthesis was the most frequent radiographic lesion with the predilection site L4-L5 (62.3%), followed by L5-S1 (28.3%). Our result was comparable to certain authors<sup>3,4</sup>. The greater mobility of this area of the lumbar spine could explain these results. In our study, a statistically significant difference was found in the groups ( $p = 0.001$ ). Kim *et al*<sup>7</sup> also found a statistically significant difference with the type ( $p$ -value = 0.04) and the site of slippage ( $p$ -value = 0.03).

Grade I was found in 97 (91.5%) patients, followed by grade II in 6 (5.7%) patients. As reported in most African series, notably in Cameroon<sup>3</sup>, Congo<sup>4</sup>, and Togo<sup>13</sup>, grade I was the most common with respective frequencies of 87.3%, 71.4%, and 42.49%. Grade IV is exceptional and this rarity was confirmed by the absence of cases found in these studies<sup>3,4</sup>. The occurrence of grade IV spondylolisthesis was found in high-level professional athletes, which was not the case in our context<sup>14</sup>. As in the study by Kim *et al*<sup>7</sup>, a statistically significant difference was reported in our study ( $p$ -value = 0.03).

## Conclusion

Our study reveals the high frequency of spondylolisthesis with a predominance of the female type. The isthmic type was the most frequently reported. The factors associated with the differences in spondylolisthesis are the age of the patient, the type of obesity, the anterolisthesis, the location of the L4-L5 slippage and Meyerding grade I. Other non-hospital studies are necessary to better understand this pathological entity.

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