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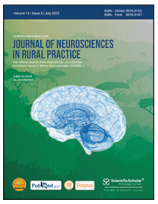

Original Article

Prevalence of restless legs syndrome and associated factors in rural West African country

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ABSTRACT

Objectives: This study aimed to assess the prevalence of restless legs syndrome (RLS) within the rural population of Adjohoun.

Materials and Methods: A cross-sectional analytical study was conducted, with data collected from March 25 to April 10, 2019. RLS was diagnosed when participants met the four diagnostic criteria defined by the International RLS Study Group. Data analysis was performed using R software version 3.5.1. Factors associated with RLS were assessed through logistic regression, with statistical significance set at $P < 0.05$.

Results: A total of 1655 subjects were interviewed. The prevalence of RLS was 0.97%, with a 95% confidence interval (CI) from 0.50 to 1.44. Abdominal obesity was identified as an associated factor, with an odds ratio of 2.9 and a 95% CI of 1.1–8.1.

Conclusion: RLS is uncommon in the rural population of Benin, consistent with findings from other studies conducted across Africa. Further research may enhance our understanding of this condition within the people of African descent.

Keywords: Adjohoun, African population, Prevalence, Restless legs syndrome, Rural area

INTRODUCTION

Restless legs syndrome (RLS) is characterized by uncomfortable sensations in the legs, particularly during sleep or rest, causing an urge to move the legs.[1] In sub-Saharan Africa, RLS is often under-recognized and underestimated by non-neurologists. This chronic sensory-motor disorder was first described by Ekbom and Ulfberg.[1] The prevalence of RLS ranges from 0.013% to 23% with most studies conducted on Caucasian populations, showing higher rates in North America and Western Europe.[2-4] In Africa, few studies have investigated the prevalence of RLS in rural areas or even in hospital settings.[3,5]

The pathophysiology of primary RLS remains unclear. Three main contributing factors have been proposed although they are not independent[6] dysfunction of the nigrostriatal dopaminergic system, iron and ferritin, and genetic predisposition.[7] Women are affected twice as often as men. Risk factors for RLS include female gender, pregnancy, lower socioeconomic status, poor health, low iron levels, advanced age, comorbidities such as Parkinson's disease or psychiatric disorders, and family history of similar conditions.[6,7] Given the impact of RLS on quality of life and its potential cardiovascular risk, studying the conduct, prevalence, and associated factors of RLS in rural areas of Benin is warranted.

MATERIALS AND METHODS

Study design

This study was cross-sectional and prospective with both descriptive and analytical aims and objectives.

Setting

The study was conducted in Adjohoun, a rural area in Benin with a population of 50,000 residents aged over 18. Data collection occurred from March 25 to April 10, 2019, using a two-stage sampling technique. A representative sample was randomly selected from a list of the 8 arrondissements in the Adjohoun commune, with four arrondissements chosen: Akpadanou, Adjohoun,

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Azowlissè, and Togbota. Lots were drawn to randomly select half the villages in each arrondissement. Within each selected village, participants were identified through door-to-door surveys. Interviewers positioned themselves in the center of each village and randomly determined a direction to begin(by tossing a pen in the air, with the tip indicating the starting direction). They interviewed all households in this direction until the required number was reached. If the target was not met, they returned to the center and repeated the process in a new direction until the goal was achieved. A standardized questionnaire was developed for the study, and incorporated into a digital data collection tool called Kobo Collect. This questionnaire comprises two sections: Sociodemographic information and data for diagnosing RLS. Before the survey, interviewers received 3 days of training on both the questionnaire and the Kobo Collect software. All interviewers were healthcare professionals, including a neurologist and neurology interns or students. The survey was conducted over 15 days, with groups of 1–4 interviewers assigned to various study sites based on each village's population size. Arrondissements were numbered from 1 to 4, villages from 01 to 05, and individuals aged 18 and over were assigned numbers starting from 001. These individuals were interviewed in their homes, often in the presence of their families, for a minimum of 15 min. RLS cases were confirmed by a neurologist according to the diagnostic criteria set by the International RLS Study Group (IRLSSG).

Participants

We included subjects aged 18 and over, who had lived in Adjohoun for at least 6 months, were present at home during the survey, and had provided informed verbal consent.

Variables

Data were collected through a structured individual interview. For each, participant, we gathered sociodemographic information (age, sex, occupation, marital status, education level, religion), medical history (high blood pressure (HBP), diabetes, alcohol abuse, tobacco use, chronic kidney failure, peripheral neuropathy, neuropathic pain using the DN4 score, hepatitis C, iron deficiency), physical measurements (blood pressure, weight, height, waist circumference), and biological data (glycemia, human immunodeficiency virus [HIV] Rapid Diagnostic Test). Participants were verbally informed about the HIV test procedure. The RLS questionnaire was translated to ensure data clarity and consistency. The dependent variable was RLS, characterized by a binary yes/no. RLS diagnosis was confirmed if participants met the four criteria established by the IRLSSG.[8]

Bias

Information bias

In a largely illiterate setting, age was self-reported; to reduce inaccuracies, birth certificates or identity cards were requested when available.

Selection bias

Although some individuals refused to participate, the sample size chosen for our study minimized the impact of non-respondents.

Confounding bias

This was minimized through univariate and multivariate analysis, allowing us to identify factors directly associated with RLS**.**

Study size

The sample size was calculated using the Schwartz formula based on a previous study in France by Tison *et al*. in 2005,[8] with an estimated prevalence of 8.5% and a desired precision of 1.5%, and the minimum required sample size was calculated to be of 1294 participants.

Statistical methods

Data analysis was performed using R 3.5.1 software. Descriptive statistics were produced for the study variables. Quantitative variables were presented as mean with standard deviation for normally distributed data (assessed by Shapiro's test) and as median with interquartile range for non-normal distribution. Qualitative variables were expressed as percentages. The analysis of factors associated with RLS included both univariate and multivariate approaches. In the univariate analysis, prevalence was compared across independent variables using Pearson's uncorrected Chi-square test (for expected counts >5) and Fisher's exact test (for expected counts <5). For the multivariate analysis, a stepwise logistic regression model was used to identify variables independently associated with RLS. The initial model included variables associated with RLS at a threshold of 5% or 20% in the univariate analysis. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify the strength of associations, with significance set at $P < 0.05$.

Ethics

The administrative authorities of the Adjohoun commune were informed about the study and its significance. Each participant, along with any immediate family members

present during household visits, was provided with an explanation of the study. Free and informed consent was obtained from all participants, and anonymity and confidentiality were assured.

RESULTS

Although the survey was initially planned for 1294 participants, 1655 individuals were ultimately enrolled and completed the IRLSSG questionnaire. The mean age was 41.44 ± 16.71 years, with ages ranging from 18 to 93 years. The sex ratio was 0.5, with uneducated individuals comprising 53.5% of the sample. The most common occupations were craftsmen (38.7%), retailers (23.1%), and farmers (21.4%). Among participants, 18 were diabetic and 101 reported neuropathic pain. The mean body mass index (BMI) was 23.7 ± 4.8 ranging from 13.0 to 49.8 and abdominal circumferences ranged from 56 to 151 cm, with an average of 82.1 ± 10.9 cm. HBP was diagnosed in 728 participants (44%; 95% CI: 41.6–46.4%) and Table 1 provides a summary of participants characteristics. HIV rapid diagnostic tests and glycemia measurements were performed on 1339 (80.9%) and 1088 (65.7%) of participants, respectively. The frequency of HIV was 1.2% (16 participants), and 6.1% (66 participants) had hyperglycemia (>1.26 g/L).

The prevalence of RLS was 0.97% (95% CI: 0.50–1.44%) with 16 cases out of 1655 participants, including 7 moderate cases, 5 severe cases, 3 mild cases, and 1 very severe case. Of those with RLS, 56.25% were under the age of 50. There were 9 men and 7 women with RLS, resulting in a sex ratio of 1.29. Among RLS cases, 56.25% had a BMI ≥25, and 62.5% had abdominal obesity.

In the bivariate analysis, RLS was significantly associated with abdominal obesity (OR= 2.9, 95% CI: 1.1–8.2, $P = 0.029$) and obesity (BMI ≥25) (OR= 2.9, 95% CI 1.1–7.8, $P = 0.030$), as shown in Table 2. In the multivariate analysis, after adjusting for other characteristics, abdominal obesity remained significantly associated with RLS (ORa = 2.9, 95% CI 1.1–8.1). Table 3 provides a summary of the multivariate analysis.

Table 1: Characteristics of the study population, Adjohoun, Benin 2019.

	Number (*n*)	Frequency (%)
Age in years		
<50	1,111	67.1
≥50	544	32.9
Sex		
Male	582	35.2
Female	1,073	64.8
Instruction level		
Schooled	770	46.5
No schooled	885	53.5
Marital status		
Single	414	25.0
In couple	1,241	75.0
Profession		
Craftsman/manufacturers	640	38.7
Retailers	382	23.1
Farmers	354	21.4
Employees	93	5.5
Students	77	4.7
Housewives	65	3.9
Retired persons	44	2.7
Antecedent		
High blood pressure	355	21,5
alcohol	273	16,5
Peripheral neuropathy	114	6,9
Neuropathic pain	101	6,1
Diabetes	18	1,1
Body mass index		
Obesity	170	10.3
Overweight	346	20.9
Normal	971	58.7
Emaciation	168	10.2
Waist obesity		
Yes	602	36.4
No	1,053	63.6
High blood pressure*		
Yes	728	44.0
No	927	56.0

n: Number of subjects, *High blood pressure at the time of survey or antihypertensive treatment before survey

DISCUSSION

The prevalence of RLS in our study was 0.97%, based on the IRLSSG criteria. Ekbom and Ulfberg estimated prevalence rates between 1 and 5%.[1,4] Since 1995, several epidemiological studies using the IRSSLG criteria have reported higher prevalence rates of 5–15% in population studies and predominantly conducted in Caucasian populations, with noted variations across geographic regions.[4]

In Africa, few studies have examined RLS prevalence. The first published study by Winkler *et al*., in a rural population in northern Tanzania, included 7654 individuals and found a low prevalence of 0.013%.[3] More recently, a study in Tanzania's urban area (Dar es Salaam, Kinondoni) involving a sample of 35,008 participants reported a prevalence of 0.037%,[5] using the IRLSSG criteria with an adaptation of the first question.

Table 2: Prevalence of RLS according to general characteristics; Adjohoun, Benin 2019.

	Total (*n*)	RLS			OR	CI 95%	*P*-value
		Yes %		No			
Age (years)							0.352
<50	1,111	9	(0.8)	1,102	1		
≥50	544	7	(1.3)	537	1.6	0.6–4.3	
Sex							0.352
Male	582	5	(0.9)	577	1		
Female	1,073	11	(1.0)	1,062	1.2	0.4–3.4	
Instruction							0.467
Schooled	770	6	(0.8)	764	1		
No schooled	885	10	(1.1)	875			
Marital status							0.999
Single	414	4	(1.0)	410	1		
In couple	1,241	12	(1.0)	1,229	1.6	0.5–4.0	
Profession							0.769
Craftsman/manufacturers	640	7	(1.1)	633	1		
Retailers	382	4	(1.0)	378	0.9	0.3–3.3	0.944
Farmers	354	4	(1.1)	350	1.0	0.3–3.6	0.958
Employees	93	0	(0.0)	93	-	-	0.311
Students	77	0	(0.0)	77	-	-	0.356
Housewives	65	0	(0.0)	65	-	-	0.397
Retired persons	44	1	(2.3)	43	2.1	0.3–17.5	0.482
High blood pressure							0.127
Yes	355	6	(1.7)	349	2.2	0.8–6.1	
No	1300	10	(0.8)	1,290	1	-	
Diabetes							0.161
Yes	18	1	(5.6)	17	6.4	0.8–50.9	
No	1637	15	(0.9)	1,622	1	-	
Peripheral neuropathy							1.000
Yes	114	1	(0.9)	113	0.9	0.1–6.9	
No	1541	15	(1.0)	1,526	1	-	
Neuropathic pain							0.618
Yes	101	1	(1.0)	100	1	1.0-1.1	
No	1554	15	(1.0)	1,539	1	-	
Alcoholism							0.495
Yes	273	1	(0.4)	272	0.3	0.1–2.5	
No	1382	15	(1.1)	1,367	1	-	
BMI (kg/m²)							0.030
≥25	516	9	(1.7)	507	2.9	(1.1–7.8)	
<25	1139	7	(0.6)	1,132	1	-	
Waist obesity							0.029
Yes	602	10	(1.7)	592	2.9	(1.1–8.2)	
No	1053	6	(0.6)	1,047	1	-	
HBP							0.626
Yes	728	8	(1.1)	720	1.3	(0.5–3.4)	

(*Contd*...)

Table 2: (*Continued*).

	Total (*n*)	RLS			OR	CI 95%	*P*-value
		Yes %		No			
No	927	8	(0.9)	919	1	-	
HIV							1.000
Yes	16	0	(0.0)	16	-	-	
No	1323	16	(1.2)	1,307			
Glycemia (g/L)							1.000
>1.26	66	0	(0.0)	66	-	-	
≤1.26	1,022	16	(1.6)	1,006	-	-	

RLS: Restless legs syndrome, CI: Confidence interval, OR: Odds ratio, BMI: Body mass index, HIV: Human immunodeficiency virus, HBP: High blood pressure

Table 3: Associated factors to RLS in multivariate analysis in Adjohoun, Bénin 2019.

	OR adjusted	CI 95%	*P*-value
Age (≥50/<50 years)	1.2	0.4–3.5	0.716
Sex (female/male)	0.7	0.2–2.4	0.575
High blood pressure (yes/no)	1.6	0.6–4.6	0.379
Diabetes (yes/no)	5.6	0.7–45.3	0.108
BMI (≥25/< 25 kg/m^2)	1.9	0.6–6.3	0.289
Waist obesity (yes/no)	2.9	1.1–8.1	0.037

RLS: Restless legs syndrome, BMI: Body mass index, CI: Confidence interval, OR: Odds ratio

In Europe, RLS prevalence ranges from 3.19% to 25%.[8-14] In the United States, several population studies using a single-question telephone survey found a prevalence of approximately 9.4%.[15] Asian populations show a lower prevalence, from 0.1% to −0.6%.[16-21] However, prevalence rates in South Korea vary significantly due to methodological differences. In 2008, it was based on IRLSSG criteria, compared to 0.9% in 2009 using diagnostic and statistical manual of mental disorders, 4th ed. criteria.[21,22] A study by Kim *et al*. in 2005, which used a single question ("Have you ever felt the need to move your legs or an unpleasant feeling like scary sensations in your legs before sleeping?") reported a high prevalence using,[23] but this method may overestimate RLS as it does not rule out other conditions.

Overall, RLS has a low prevalence in African countries, India, and several Asian countries, with higher rates observed in Northern Europe.[24] The north-south gradient in prevalence may be due to genetic and methodological factors as well as environmental influences such as climate and ecology.

Several studies, including ours, have found a higher RLS prevalence in females and individuals over 50 years old. Tison *et al*. reported RLS in 10.8% of women and 5.8% of men, with prevalence increasing until 64 years before declining in both sexes.[8] Allen *et al*. and Berger *et al*. also observed that RLS is twice as frequent in women, with a peak in prevalence up to age 79 before decreasing.[25,26] This female predominance is likely linked to estrogen, with an increase in RLS during the third trimester of pregnancy, coinciding with an estrogen peak. Iron deficiency, which plays a well-known role in RLS pathogenesis and is common during pregnancy and menstruation, may also contribute.[27,28] In addition, literature reviews show that, in addition to elderly subjects, RLS can affect children and adolescents though many studies, including ours, have not included these age groups.[28]

RLS may also complicate diabetes mellitus,[29,30] affecting 18% of diabetics, compared to 5.5% of non-diabetics.[29] The risk of RLS was 1.79 times higher in diabetics,[30] with a significative association between the syndrome and the diabète. Cho *et al*. found that diabetic individuals have a fourfold higher risk, which may be partly due to diabetic neuropathy.[31] Some researchers suggest a link between RLS and cardiovascular disease, citing sleep disruption, sympathetic hyperactivity in RLS, and underlying periodic limb movements, all of which can contribute to HBP. The majority of RLS patients report 200–300 periodic limb movements per night.[32] However, Elwood and Winter found this cardiovascular risk low.[33,34] Gao *et al*. observed that the RLS prevalence increases with BMI and waist circumference,[35] with an adjusted OR of 2.9 in our study. A separate cross-sectional study on 1803 individuals aged 18 and older found that each 5 kg/m^2 increase in BMI raised the likelihood of RLS by 31%.[15] Obesity may contribute to RLS by reducing dopaminergic receptor sensitivity and the development of type 2 diabetes.[36] In addition, both obesity and RLS share metabolic risk factors, and obese patients often suffer from vascular damage, further increasing RLS risk.[34] HIV was not associated with RLS in this study. The relationship between HIV-associated neurodegeneration in central nervous system (CNS) sensorimotor modulation areas and RLS symptoms remains unclear, though longer HIV duration may lead to

chronic CNS inflammation, iron deficiency in the CNS, and loss of myelin integrity.[37]

A primary limitation of our study is that age was self-reported by illiterate participants, which could. introduce bias. As one of the first studies of its kind in Benin and West Africa, this study employed rigorous methodology based on validated criteria and random sampling.

Data availability statement

All data generated or analyzed during this study are included in this published article and its online supplementary material. Further information can be specified to the corresponding author.

CONCLUSION

RLS remains a rare neurological condition in rural areas of Benin, with abdominal obesity as the main associated factor. RLS should be considered in individuals presenting symptoms, as understanding and managing RLS could play a role in addressing cardiovascular health.

Authors' contributions: JNM and DDG: Designed the project. TAA and PMG: Extracted the data and performed the analysis. JNM, MA, AS: Wrote the manuscript. GAMM, PKN, TAA: Revised the content. All authors refined the manuscript and revised it critically to improve valuable intellectual content. All authors approved the final manuscript.

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