



## Traditional pipe smoking (*xanduca*) and respiratory function in the *Fulni-ô* indigenous people, Brazil: Project of Atherosclerosis among Indigenous Populations (PAI) study

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### TO THE EDITOR:

Smoking is the leading cause of preventable death worldwide,<sup>(1)</sup> accounting for about 6% of the global burden of disease.<sup>(2)</sup> Since the publication of the first WHO report on the tobacco epidemic in 2008, much progress has been made in tackling the global smoking epidemic.<sup>(1)</sup> Even so, smoking is still responsible for about 8 million deaths annually<sup>(3)</sup> and an annual cost of US\$ 1.4 trillion to the global economy.<sup>(1)</sup>

In specific groups, such as indigenous populations, little is known about the prevalence of smoking, whether traditional or commercial, and its consequences for the health of the respiratory system. Traditional pipe smoking differs from the commercial pipe smoking both in terms of chemical composition and the cosmology involved in the consumption of the substances.<sup>(4)</sup>

The aim of the present study was to describe the respiratory health in men and women from the *Fulni-ô* indigenous tribe, using pulmonary function parameters and their association with traditional pipe smoking in this community.

This was a cross-sectional study whose participants were inhabitants of the *Fulni-ô* indigenous village in the city of Águas Belas, in the state of Pernambuco, Brazil, in a transitional region between the *agreste* and the *sertão* of the state.<sup>(5)</sup> In the cosmology of the *Fulni-ô* indigenous people, the use of *xanduca*, a traditional pipe for smoking natural herbs from the Brazilian *caatinga* (e.g., *jurema*, *alecrim de caboclo*, *amecla*, among others) has a religious character that is associated with disease prevention.<sup>(6)</sup>

Inclusion criteria were men and women over 30 years of age. Exclusion criteria were individuals presenting with clinically manifest cardiac insufficiency, those with a history of an acute coronary event resulting in hospitalization, those with renal insufficiency on dialysis, those with a history of cardiac or peripheral artery surgical procedures, and those with a history of cerebrovascular disease requiring hospitalization.

This ancillary study included all the participants of the Project of Atherosclerosis among Indigenous Populations (PAI) recruited in the indigenous *Fulni-ô* village who agreed to undergo respiratory evaluation via spirometry. Individuals who used or had used commercial cigarettes, those who reported coughing at the time of data collection, and those who were diagnosed with another respiratory disease were excluded from the study. No *Fulni-ô* indigenous participant claimed to have never used tobacco in this study.

Sociodemographic, anthropometric, and clinical variables were analyzed: sex, age, educational level, height (cm), BMI, daily frequency of pipe smoking (times/day), duration of pipe smoking (years), smoking load (pipe-years), SpO<sub>2</sub>, proportion of wood stove users, self-reported dyspnea, and risk factors for cardiovascular disease (arterial hypertension, diabetes, and dyslipidemia). Anthropometric measures were taken, and, following a period of rest, blood pressure (three measurements in both arms), heart rate, and oximetry were registered.

Smoking load was measured as the number of times the user filled the traditional pipe (*xanduca*) and was calculated as the number of times the pipe was used per day multiplied by the duration of pipe smoking, in years.

Pulmonary function was measured using a portable Micro Quark spirometer (Cosmed; Pavona di Albano, Italy), in conformity with the criteria established by the American Thoracic Society.<sup>(7)</sup> All participants received instructions on how to perform the test and tried up to six forced expiratory maneuvers, without coughing and without the use of bronchodilators. Participants were seated and used nose clips. The three best measures were considered for analysis. The spirometer was calibrated with a three-liter syringe before use every day.

The following respiratory parameters were collected: FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC ratio, PEF, and FEF<sub>25-75%</sub>. All variables were also evaluated as percentage of predicted values for the Brazilian population.<sup>(8)</sup> For the purpose of comparing lung function, subjects were divided into

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two groups (above and below median smoking load of 169.5 pipe-years). The t-test and the chi-square test were used to evaluate sex-related differences in the univariate analysis. Analyses were performed with the Stata statistical software package, version 10 (StataCorp LP, College Station, TX, USA). This study was approved by the Brazilian National Committee for Ethics in Research under the catalogue number 48235615.9.0000.5196.

We included a total of 116 participants from the *Fulni-ô* tribe, and 114 (98.3%) were active traditional pipe smokers. The mean age was  $56.3 \pm 11.0$  years, and the mean BMI was  $27.7 \pm 4.5$  kg/m<sup>2</sup>, with no differences between genders. The mean daily frequency of pipe smoking was  $6.2 \pm 5.7$  times/day, the duration

of pipe smoking reached four decades ( $39.8 \pm 15.1$  years), and the mean smoking load was  $261.3 \pm 271.3$  pipe-years. Importantly, 41% and 60% of the *Fulni-ô* men and women, respectively, started smoking before reaching 15 years of age. The use of wood stoves was reported by 11 individuals (9.5%; Table 1).

In the sample as a whole, 60 women (8.6%) and 8 men (17.4%) had FEV<sub>1</sub> below 80% of the predicted values. In contrast, 34 women (48.6%) and 20 men (43.5%) had FEV<sub>1</sub> values above 100% of the predicted values. Additionally, FEV<sub>1</sub> (in L) and FVC (in L) values were higher in the group with a smoking load below the median. Possible restrictive disorders were found in 5 (10.9%) and 7 (10.0%) of the men and women, respectively (Table 1).

**Table 1.** Epidemiological characterization, lung function parameters, and prevalence of respiratory disorders among *Fulni-ô* indigenous participants. Águas Belas, state of Pernambuco, Brazil.

Parameter	Epidemiological characterization						p*	
	Total		Women (n = 70)		Men (n = 46)			
	Mean	SD	Mean	SD	Mean	SD		
Age, years	56.3	11.1	56.3	11.9	56.3	9.9	0.99	
BMI, kg/m <sup>2</sup>	27.7	4.4	27.6	4.5	27.9	4.5	0.74	
Height, cm	157.8	15.9	152.2	17.7	166.5	6.2	< 0.001	
Daily frequency of pipe smoking, times/day	6.2	5.7	6.3	5.8	6.0	5.7	0.82	
Duration of pipe smoking, years	39.8	15.1	40.8	15.4	38.4	14.7	0.42	
Smoking load, pipe-years	261.3	271.4	265.3	264.9	255.3	284.8	0.85	
SpO <sub>2</sub> , % <sup>a</sup>	95.5	1.5	97.6	1.8	97.5	0.9	0.70	
Educational level, years <sup>b</sup>	5.3	5.0	4.5	4.9	6.1	5.0	0.09	
	n (%)		n (%)		n (%)			
Wood stove use	11 (9.5)		5 (7.1)		6 (13.0)		0.29	
Dyspnea	6 (5.2)		4 (5.7)		2 (4.3)		0.74	
Other cardiovascular risk factors	50 (43.1)		33 (47.1)		17 (36.9)		0.28	
Lung function parameters according to median smoking load of 169.5 pipe-years								
Parameter	Above median (n = 58)		Below median (n = 58)		p*			
	Mean	SD	Mean	SD				
FEV <sub>1</sub> , L	2.54	0.66	2.82	0.72	-			
FEV <sub>1</sub> , % predicted	97.12	15.87	98.35	15.03	0.04			
FVC, L	3.16	0.85	3.50	0.90	-			
FVC, % predicted	97.03	14.84	99.72	14.88	0.14			
FEV <sub>1</sub> /FVC, %	81.01	6.76	80.21	6.50	-			
FEF <sub>25-75%</sub> , L/s	2.63	0.96	4.32	10.68	0.75			
FEF <sub>25-75%</sub> , % predicted	104.78	34.86	102.38	33.48	0.05			
PEF, L/s	5.38	2.01	5.78	1.94	-			
PEF, % predicted	67.83	20.77	68.91	18.25	0.14			
Prevalence of respiratory disorders, n (%)								
	Women (n = 70)				Men (n = 46)			
Obstructive respiratory disorder	Mild	Mild with reduced FVC	Mild with reduced FVC (> 0.7)	Mild (> 0.7)	Mild	Mild with reduced FVC	Mild with reduced FVC (> 0.7)	Mild (> 0.7)
	5 (7.14)	1 (1.42)	1 (1.42)	0 (0.0)	2 (4.34)	1 (2.17)	1 (2.17)	1 (2.17)
Possible restrictive disorder	7 (10.00)				5 (10.86)			

<sup>a</sup>Information available from 58 women and 40 men. <sup>b</sup>Information available from 66 women and 45 men. \*The independent t-test and the chi-square test were used for continuous and categorical variables, respectively.

In this ancillary analysis of the PAI study, we show for the first time in the literature that smoking the traditional *xanduca* pipe has a high prevalence in the *Fulni-ô* indigenous community. There are few publications that deal with the deleterious effects associated with that use. In a study carried out in rural communities in Asia that use traditional hand-rolled cigarettes (*bidis*), a high prevalence of cardiorespiratory symptoms was observed among the population that were heavy smokers, who also showed lower ventilatory capacity and higher airflow obstruction than did those who were not.<sup>(9)</sup>

Although a higher prevalence of smoking among men has been described in urban environments,<sup>(1,3)</sup> the relationships between tradition and traditional pipe smoking in the *Fulni-ô* tribe seem to influence the elevated prevalence that we described in both sexes. The high prevalence of traditional pipe (*xanduca*) smoking among *Fulni-ô* indigenous people may, in part, be explained by the fact that traditional pipe smoking in indigenous communities is held not only as part of their traditions, but also as a practice that brings them closer to their deities through rituals that are unique to each people.<sup>(6,10)</sup>

The prolonged exposure to *xanduca* smoking described in our study indicates that *Fulni-ô* indigenous people have had the habit of smoking since childhood.<sup>(10)</sup> Little is known regarding the effects of *xanduca* smoke exposure in children, especially in the context of indigenous traditions.

Genetic factors that protect against damage caused by *xanduca* smoking might be present in the *Fulni-ô*

community, which is the least urbanized indigenous community in the Northeast of Brazil. The pressure of natural selection of continuous exposure to intense *xanduca* smoking over many years might have molded favorable genetics in this population. Another factor worth mentioning concerns the fact that pipe users tend not to inhale the smoke, which means that they actively inhale less smoke than do cigarette smokers.<sup>(11)</sup>

In conclusion, we described the elevated prevalence of intense traditional pipe (*xanduca*) smoking in indigenous men and women in the *Fulni-ô* community, which often starts in childhood. Unfavorable pulmonary function parameters were predominant in men in comparison with women. In addition, FEV<sub>1</sub> (in L) and FVC (in L) values were higher in the group with a smoking load below the median.

### AUTHOR CONTRIBUTIONS

VCP, DC, AAC, ACA, JM, DMFOA, RMPV, PVAMP, and JACL: conception and design of the research; data analysis and interpretation; and critical revision of the manuscript for intellectual content. VCP, ACA, and JM: data acquisition. VCP, ACA, DC, PVAMP, and CDFS: statistical analysis. VCP, ACA, AAC, JM, DMFOA, and CDFS: drafting and revision of the manuscript. All authors: approval of the final version.

### CONFLICT OF INTEREST

None declared.

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