Smokeless tobacco use: its prevalence and relationships with dental symptoms, nutritional status and blood pressure among rural women in Burkina Faso

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Research article

Keywords: smokeless tobacco, alcohol co-use, dental symptoms, undernourishment, differential blood pressure, rural women, Burkina Faso

Posted Date: December 3rd, 2019

DOI: https://doi.org/10.21203/rs.2.14436/v2

Version of Record: A version of this preprint was published at BMC Public Health on April 28th, 2020. See the published version at https://doi.org/10.1186/s12889-020-08700-x.

Abstract

Introduction: Sub-Saharan women use smokeless tobacco (SLT) more than smoked tobacco. Among Western Africa countries, the estimated weighted prevalence of SLT use in rural women was the highest in Burkina Faso (after Sierra Leone). This study aimed to assess the prevalence of SLT use and its associated factors among rural women in Burkina Faso by using nationally representative data. Methods: We used data from the 2013 STEPwise approach to Surveillance (STEPS) study, which provided sociodemographic, clinical (anthropometric, systolic blood pressure [SBP], diastolic blood pressure [DBP], dental symptoms), biological (total and high-density lipoprotein cholesterol and fasting blood sugar), and tobacco and alcohol consumption data. Data for 1730 rural women were used, and we performed Student's, chi-squared, and Fisher's exact tests and logistic regression. Results: The prevalence of current SLT use was 13.8% (95% CI: 12.2-15.5). Significant risks for SLT use were the presence of dental symptoms (adjusted odds ratio [aOR] = 2.59; p = 0.0001), undernourishment (aOR = 1.78; p = 0.002), a decrease in waist circumference (aOR = 0.98; p = 0.023), a decrease in DBP (aOR = 0.97; p = 0.006), increase in the unit of SBP (aOR = 1.01; p = 0.017), and an increase in differential blood pressure (aOR = 1.01; p = 0.041). The co-use of alcohol was also a significant risk factor (aOR = 2.80; p = 0.0001). Conclusion: The prevalence of current SLT use was high among rural women in Burkina Faso, and significant concerns for users included alcohol co-use, the occurrence of dental symptoms, undernourishment, and an increase in differential blood pressure. National Public Health interventions are needed to reduce SLT use and its health-related concerns.

Introduction

Smokeless tobacco (SLT) and smoked tobacco (ST) are both used in sub-Saharan African (SSA) countries, and SLT is used more than twice as often in rural areas than in urban areas [1]. The prevalence of SLT use in women is more than three times higher in rural areas than in urban areas [1]. In SSA countries, the most favoured form of tobacco for females is SLT, mostly used orally in a chewable form [2, 3]. In Qatar, women have impaired oral health approximately twice as frequently as men do, and SLT use was approximately four times higher when people had impaired oral health [4], which is sometimes considered to be a motivation for using SLT. The level of awareness of the health risks related to the consumption of SLT products is low, particularly among people with low socioeconomic status or those in rural areas [5]. The sociocultural environment is an important influencing factor in the initiation of SLT use [6]. In a report concerning 10 West African countries between 2008 and 2012, the weighted prevalence estimate of SLT use in rural women was highest in Burkina Faso (after Sierra Leone), and more than 80% of the women used chewing tobacco [1]. Compared to the use of ST, the use of SLT (especially chewing tobacco) by females is not socially stigmatizing in Burkina Faso. The harmfulness of SLT appears to be misunderstood, and traditionally, symbolic gifts (from urban residents) to elders in rural areas often include tobacco products. National Public Health interventions regarding tobacco use exclusively target ST consumption, devoting only limited attention to other types of products, including SLT. However, the toxicity, mutagenicity, and carcinogenic effects of the hazardous chemicals present in SLT products have been documented [7]. Like ST, SLT includes nicotine as the primary psychoactive and addictive molecule, and the systemic absorption and nicotine levels were similar in SLT users and cigarette smokers [8]. In addition, depending on the cultivated soils and production processes, some unusually high levels of known components and unexpected toxins have been identified in SLT leaves [9, 10]. Recent international studies revealed serious health concerns related to SLT consumption, specifically oral health impairment [11, 12], nutritional disorders [13], co-use of psychoactive substances, and cardiovascular disease [14–16]. In Burkina Faso, no previous study using a representative sample has reported the national prevalence of SLT use and its health-related consequences in rural areas, particularly among females. The first national survey using the World Health Organization (WHO) standardized STEPwise approach to Surveillance (STEPS) also provided data on tobacco consumption. Our study aimed to assess the prevalence of SLT use and its relationships with dental symptoms, nutritional status, and blood pressure level among rural women in Burkina Faso using nationally representative data.

Methods

We used data from the first Burkina Faso national survey conducted in 2013, which was based on the WHO STEPS methodology [17]. The study surveyed 1920 rural women, and we analysed variables for those with complete data regarding sociodemographic, lifestyle, nutritional and biological parameters and with responses on items that screened dental symptoms. The authors had previously described the data collection methods used in Burkina Faso [18, 19]. We included 1730 women in the analyses, and the figure 1 presented the diagram flow of the women we studied.

Variables of interest

Participants' demographic variables included age, marital status, education level, and occupation. We also reported whether the women were living in households with at least one member aged ≥ 18 years. The anthropometric characteristics were weight (kg), height (m), body mass index (BMI = weight/height², in kg/m², which was used to characterize an underweight state when BMI<18.5 kg/m², a normal state when 18.5 – 24.9 kg/m² and an overweight/obese state when ≥25 kg/m²) and waist circumference (cm). The biological characteristics tested in blood were total cholesterol (mmol/l), high-density lipoprotein cholesterol (HDL cholesterol in mmol/l), and fasting sugar (mmol/l). Blood pressure (in mmHg, which included systolic blood pressure [SBP] and diastolic blood pressure [DBP] values) was measured three times, and we kept only the mean value for each indicator; levels ≥ 140/90 mmHg defined high blood pressure (HBP), and the difference between means value of SBP and DBP (SBP - DBP) defined the differential blood pressure . Lifestyle factors were determined by using self-reporting techniques and included current (past month) alcohol consumption and current (past year) smokeless (chewing, snorting) or smoked tobacco consumption. Dental problems were also recorded by using a self-reported method and defined as having the following during the past 12 months: i) difficulties chewing food or ii) difficulties with speech/trouble pronouncing word or iii) teeth/mouth causing any pain or discomfort.

Statistical Analyses

We used StataCorp Stata Statistical Software for Windows (Version 12.0, College Station, Texas, US) to analyse the data. The quantitative variables were expressed as means ± standard deviations, and the categorical variables were expressed as percentages (%), with a confidence interval of 95% (95%, CI). Student's t-test was used to compare quantitative variables, and the $\chi 2$ test and Fischer's exact test were used for qualitative variables. Logistic regression analysis was performed to reveal clinical, biological, and lifestyle factors associated with SLT after adjusting for sociodemographic features. The final model was determined by backward elimination (i.e., the progressive elimination of nonsignificant factors by decreasing order of significance). For all analyses, a p-value below 0.05 was considered significant.

Results

The mean age in the sample was 37.8 ± 10.9 years, and other sociodemographic characteristics are presented in Table 1. Only one woman used ST (> 0.0%). The prevalence of SLT users was 13.8% (95% CI: 12.2-15.5), the prevalence of current alcohol users was 24.6% (95% CI: 22.6-26.7), the prevalence of women with dental symptoms was 24.1% (95%; CI: 22.1-26.2), the prevalence of individuals who were undernourished was 16.0% (95%; CI: 14.3-17.8), and the prevalence of those with HBP was 14.6% (95%; CI: 13.0-16.4). The means of all anthropometric parameters for SLT users were significantly lower than those for non-users: 53.2 ± 9.0 kg vs 56.9 ± 10.3 for weight, 20.2 ± 3.1 kg/m² vs 21.7 ± 3.6 for BMI and 74.6 ± 10.7 cm vs 76.4 ± 11.7 for waist circumference (each p-value<0.05). The mean SBP was significantly higher in SLT users compared to non-users (122.9±19.8 mmHg vs 119.6±16.1; p = 0.005), as was the differential blood pressure (46.3±13.9 mmHg vs 42.8±11.3; p = 0.0001). However, there was no significant difference between the means of DBP for SLT users and nonusers (76.6 ± 10.3 mmHg vs. 76.8 ± 10.0; p = 0.72). The mean glycaemia was also higher for SLT users (4.1 ± 1.5 mmol/l vs. 3.8 ± 1.5 for nonusers, p = 0.022; Table 2).

The results of the logistic regression are reported in Table 3. Significant risks associated with SLT use were the co-use of alcohol (adjusted odds ratio [aOR] = 2.80; 95% CI: 2.06-3.80), the presence of dental symptoms (aOR = 2.59; 95% CI: 1.91-3.51), undernourishment (aOR = 1.78; 95% CI: 1.24-2.55), a lower waist circumference (0.98; 95% CI: 0.97- < 1.00; p = 0.023), a lower DBP (aOR = 0.97; 95% CI: 0.95-0.99) and a higher SBP (1.01; 95% CI: > 1.00-1.03; p = 0.017). When replacing both the SBP and DBP variables by the single differential blood pressure (SBP-DBP in mmHg) in the multivariable model, the differential unit increase was also significant (aOR = 1.01; 95% CI: > 1.00-1.02; p = 0.041). Concerning sociodemographic variables, significant risk factors were old age (with respect to the 25-34-years subgroup; aOR = 2.14; 95% CI: 1.46-3.13 in the 35-49-years subgroup and 4.31; 95% CI: 2.86-6.48 in the > 49-years subgroup) and lack of education (aOR = 3.02; 95% CI: 1.28-7.10).

Discussion

The prevalence of current SLT use was high among rural women in Burkina Faso, and given the current state of epidemiologic transition, its relationship with noncommunicable diseases should make SLT use a public health concern.

Prevalence of SLT use

The prevalence of current SLT use among rural women in Burkina Faso was 13.8% (95% CI: 12.2-15.5), while only one woman used ST. Such statistics suggest the socially permissive attitude towards SLT use by females. A lower standardized prevalence estimate of 3.86% (95% CI: 3.22-4.48) was noted two years earlier (in 2011 and only in the sample of women aged 15-49years) [1]. The current SLT use of 17.4% (95% CI: 14.5-20.5) was found in rural women in three Ethiopian pastoral communities in which SLT chewing was a longstanding tradition [6], and the current SLT use is 10.1% (95% CI: 8.8-11.4) in Mozambique [20]. Studies focusing on female SLT consumption with details for subgroups of rural and urban women are scarce in SSA, especially in West Africa. However, 3.3% of women and 4.7% of rural residents in Kenya were reported to be SLT users [21], as were 2.8% of women in Uganda [3].

Co-use of alcohol

Current SLT users were frequently current alcohol users (aOR = 2.80; 95% CI: 2.06-3.80), as has been reported for women in Cambodia (aOR = 1.49; 95% CI: 1.12-1.98) [22] and in Kenya (aOR = 2.58; p = 0.001 for those with alcohol experience; aOR = 4.84; p = 0.007 for episodic binge drinkers) [21]. SLT and alcohol are both psychoactive substances containing nicotine and ethanol molecules, respectively, that individually induce dopaminergic or reward pathway activation [23, 24], and their synergistic interactive effects potentiate dopamine levels in the synapses, which might increase physical and psychological pleasure [25]. Klenowski and Tapper reported the existence of potential molecular and neuronal processes underlying the high incidence of ethanol and nicotine co-use, which explains the development of ethanol and nicotine co-addiction [26]. It has been noted that nicotine delivered by SLT products may induce dependence or addiction [27] and that users combining different classes of psychoactive substances over time, i.e., polyconsumption, was not surprising [28]. Unfortunately, tobacco and alcohol are considered major cardiovascular risk factors. Drinking alcohol is known to raise both HDL-C and total cholesterol concentrations [29], and the concurrent use of tobacco and alcohol enhances these increases [30]. Although the mean values of HDL- and total cholesterol were not higher in SLT users (compared to nonusers), the mean values of concurrent current SLT and alcohol users increased, significantly for total cholesterol (Table 2).

SBP increase, DBP decrease, and differential blood pressure increase

SLT use was associated with an increase in SBP (aOR = 1.01; p = 0.017) or differential blood pressure (aOR = 1.01; p = 0.041) (Table 3). Substantial nicotine is absorbed from SLT products [14]. The predominant cardiovascular effects of nicotine result from activation of the sympathetic nervous system, which causes a hypertensive effect [31], and the increase in SBP in our sample (aOR = 1.01; p = 0.017) was consistent with this effect and corroborated by Onwuchekwa in rural Niger (aOR = 2.32; p < 0.05 among rural residents) [32]. However, an age-related increase in SBP was reported that was greater in women than men [33, 34] and thus more perceptible in our sample. However, we observed a decrease in DBP (0.97; p = 0.006) (Table 3) in SLT users. We should note that there was an increase in DBP level with age from an average of 78.4 (±9.5) mmHg at approximately 36 years of age to 83.1 (±11.8) at 53 years, and then a decrease to 73.4 (±10.1) at 69 years of age [35]. This phenomenon may confound the observation in our 24-69-year population. More specifically, in Black people, DBP increases are more frequently in the cerebral pathological conditions **(Marcus et al 2011)**, whereas the STEPS design only included heathy individuals. Nicotine interacts with central oestrogenic pathways [36]. These different modulations may explain the non-homogenous effects of nicotine on SBP and DBP in our sample, which were observed in 19.0% of women aged > 49 years (suspected menopausal women), of whom more than 40% used SLT (Table 1). Data from the period portion of the menstrual cycle for non-menopausal women should have been complete. However, we also considered that the most commonly used form of SLT in Burkina Faso is chewing tobacco. It is usually locally produced (for personal use), using a non-standardized processed, and the tobacco is grown in different types of soils that have various physical and chemical characteristics. Soil composition affects the salt level in tobacco leaves. The salt dynamics of the arid and semi-arid lands in Burkina Faso may affect mineralogic contents, such as that of sodium, in local SLT [37]. In addition, nationally, the use of pesticides is widespread for crops such as cotton, and the use of pesticides in rural Burkina Faso may cause soil contamination. Thus, the leaves of unregulated tobacco may include pesticides [38], and some pesticides, such as organochlorine, have been implicated in BP increases [39]. The rate of absorption of tobacco contents (such as nicotine, salt, and pesticides) may vary among different forms of smokeless tobacco depending on the hydrogen level of the product and the amount of nicotine [14, 40]. The effects of chronic consumption of kola nuts on the cardiovascular system should be considered [41, 42]. One adult out of two used kola nuts in Burkina Faso [43], usually under similar conditions (i.e., dental health impairment conditions [44]).

Unspecified effects of interactions between SLT and kola nut products on BP may be possible. Knowledge about the content of locally grown tobacco leaves in Burkina Faso is relevant. In short, the cardiovascular disturbance in SLT users was evident in the respectable increase in the differential blood pressure (aOR = 1.01; p = 0.041; Table 3), and public health considerations should integrate this factor.

Dental symptoms

SLT use was associated with the presence of some dental symptoms (aOR = 2.59; 95% CI: 1.91-3.51). Cheema et al. reported an association with poor oral status (aOR = 3.90; 95% CI: 1.75-8.69) in Qatar [4]. Users of this psychoactive substance (SLT) develop specific expectancies according to the different effects generated by its consumption depending on the specific context. Oro-dental pain and burning mouth syndrome were common, and poor oral health service utilization was reported in SSA countries [45, 46]. The nicotine delivered by SLT products increases sensory irritation [47], and because dental care is not available in rural Burkina Faso [44], rural women were likely to use SLT for the pain or discomfort associated with dental symptoms. Because chewing food might exacerbate dental pain, in the absence of treatment, SLT would be used by those with dental symptoms to locally anaesthetize teeth or the oral cavity to be able to eat without pain. Such behaviour was noted in a supplemental qualitative study (interview) in three Ethiopian pastoral communities with a long tradition of SLT chewing [6]. Furthermore, psychoactive substance consumption resulting from addictive behaviours or habits involved gestural rituals [48], and stimuli associated with different stages of the smoking ritual triggered various neuronal responses depending on the addiction network activation or deactivation [49, 50]. Chewing tobacco involves manipulating its container and performing a hand gesture to place the tobacco bolus in the mouth. The memory of dental pain and the perception that the application of SLT will suppress that pain might trigger the performance of SLT gestural rituals. Tooth and periodontal damage was common in SL and SLT users [51], mainly in female chewers [52]. A deficiency in the host response exacerbated periodontal impairment and recovery [53], which could establish a vicious circle of dental symptoms and the repeated and inefficient application of SLT as treatment.

Undernourishment

In the previous study on 1297 mothers of young children from 55 Burkinabe villages, the prevalence of underweight was 19.9% (at baseline in a study including 787 beneficiaries of a food production programme, of whom 23% were initially underweight, and 510 nonbeneficiaries, of whom 15% were underweight) [54]. Among 33 SSA countries explored between 2008 and 2016, the weighted percentage of underweight (BMI<18.5 kg/m²) in women (rural plus urban) aged 15-49 years in Burkina Faso was 14.8% (level in 2010), which was the greatest percentage in Western Africa, after the percentages in Senegal (20.8% in 2011) and Gambia (15.7% in 2013) [55]. Among 1045 women aged 40-60 years who lived in rural Nanoro (data provided by the Health and Demographic Surveillance System area of the unique locality of Nanoro in the Centre-West of Burkina Faso), the mean BMI was 19.7 kg/m² (95% CI: 18.1-21.6), with a prevalence of underweight of 31.0% [56], the highest among the three rural African areas involved. SLT use was associated with undernourishment (aOR = 1.78; p = 0.002), as it was in rural Ghanaian women (aOR = 2.78; p = 0.002) [57]. Nicotinic receptor-mediated appetite regulation and food intake [58] were related, and nicotine was considered to be the anti-appetite component of tobacco [59]. There was low food availability in Burkina Faso [60] that worsened in rural areas, and hunger related to the empty stomach generated discomfort. Food restrictions and going to bed hungry were reported in rural Ghanaian women [57]. In this context of chronic hunger, expectations related to tobacco used as a psychoactive substance might include hunger extinction, and thus, rural women might respond to immediate hunger via SLT consumption. Furthermore, the belief that minimum food intake combined with SLT absorption helps allay hunger may act as an appetite-suppressant, reinforcing insufficient food intake. Similar habits were reported for addictions to tea and SLT among Malian Tuaregs living in Sahelian areas and suffering from hunger in a harsh climate [61]. Unfortunately, this manner of adapting to hunger did not offset weight impairment, and the means of all anthropometric parameters (weight, BMI, and waist circumference) in SLT users were significantly lower than those for nonusers (Table 2). The decrease in waist circumference (aOR = 0.98; p = 0.023) of the SLT users was not surprising because an increase in waist circumference might result from the accumulation of excess subcutaneous fat in the abdominal area. Undernourishment implies moderate or insufficient fat in the body.

No significant impairment in the lipid profile or blood sugar among SLT users

The authors reported a decrease in HDL cholesterol and an increase in total cholesterol among smokers and tobacco chewers (with respect to nonusers) [62, 63]. However, the SLT users and nonusers in our sample had identical mean values of HDL cholesterol and

total cholesterol, and there was no significant risk of lipid profile impairment in SLT users (Tables 2 & 3). These results were not surprising in our context because SLT users were more frequently affected by undernourishment (28.6% vs. 13.9% in nonusers; p = 0.0001) and not by overweight/obesity (only 5.5% vs. 14.4% in nonusers; p = 0.0002; Table 2). The women in our study had only moderate or insufficient underlying fat matter in their bodies, including that in blood vessels. Similarly, there was no association with increased blood sugar in users; their mean blood sugar was in fact significantly lower (3.8 ± 1.5 mmol/l vs. 4.1 ± 1.5 in nonusers; p = 0.0223; Table 2). However, further investigations should consider the hypothesis of positive association.

Sociodemographic factor influences

SLT use increased with age in our study (Table 3). It has been reported previously that elderly individuals have an increased number of cardiovascular risk factors [64], and the SSA countries under demographic and epidemiologic transitions were severely affected cardiovascular risk [65]. An additional modifiable factor, such as SLT use, should be avoided. Uneducated people were frequently exposed to SLT use (Table 3) and indicated that formal instruction, as well as public health education, focused on cardiovascular risk factors and SLT-related health consequences would be effective in reducing prevalence and risk [66]. The efficacy of a brief dental office intervention for the general population of smokeless tobacco users was described [67]. Nevertheless, dentists and dental assistants should be more available in Burkina Faso. Interventions that could be undertaken may be to identify smokeless tobacco-related oral health problems, offer encouragement to set a quit date for cessation, provide tips on quitting, provide and encourage watching educational videos, provide and encourage reading the written educational materials, and call by phone to provide reminders regarding decisions to quit using smokeless tobacco [68].

Limitations

We used national data from the STEPS survey, which studied the prevalence of and knowledge about concerning common risk factors for noncommunicable diseases. However, the sample size calculation was based on the prevalence of HBP. Data collection methods for dental symptoms were based only on self-reporting and did not include examinations by health professionals. Thus, self-reporting may have included incorrect statements and dental assessments.

Conclusion

The high prevalence of SLT use in women, unlike ST use, which is nearly non-existent in rural Burkina Faso, indicates the socially permissive attitude towards SLT use by females. The frequent occurrence of dental symptoms among SLT users reinforces the practice and reveals problematic access to oral health care in rural Burkina Faso. The frequent co-use of alcohol does not exclude the addictive practice known as polyconsumption (of these 2 psychoactive substances), which potentiates the psychological and physical effects and, unfortunately, includes adverse effects. Addictive habits may also include the expectation of immediate hunger suppression in an environment with low food availability. Thus, worsening undernourishment in SLT users might be connected to the insufficient food intake resulting from the appetite-suppressant effects of the nicotine delivered by SLT used over the long term. The increase in SBP or differential blood pressure suggests serious cardiovascular concerns associated with SLT use. Furthermore, an overview of the chemical compounds and their levels in locally produced tobacco leaves should be given attention. The lack of increases in waist circumference and total cholesterol may be due to the severity of the undernourishment status of SLT users. Regarding ST use, National Public Health interventions are needed to reduce SLT use and its health-related concerns.

List Of Abbreviations

aOR: Adjusted odds ratios; BMI: Body mass index; CI: Confidence interval; cOR: Crude odds ratio; DBP: Diastolic blood pressure; HBP: High blood pressure; HDL: High-density lipoprotein; mmHg: Millimetre per mercury; mmol/l: millimole per liter; NCDs: Non-communicable diseases; OR: Odds ratio; SBP: Systolic blood pressure; SLT: Smokeless tobacco; SSA: Sub-Saharan-African; ST: Smoked tobacco; STEPS: STEPwise approach to Surveillance; WHO: World Health Organization.

Declarations

Ethics approval and consent to participate: The protocol of the STEPS survey was approved by the Ethics Committee for Health Research of the Ministry of Health (deliberation No: 2012-12092; December 05, 2012). Informed consent was systematically obtained from each participant in the STEPS survey.

Consent for publication: Non applicable.

Availability of data: The database of the STEPS survey used for this secondary analysis is available at the Ministry of Health of Burkina Faso. It can be requested.

Competing interests: The authors declare that they have no competing interests.

Funding: None.

Authors' contributions: JD, ANZ and LN contributed to drafting the manuscript, JD and LN performed the statistical analysis, ANZ, JD, AO, LN, HT and AK provided the first interpretation of the results, and AK and JD reviewed the last English version. All authors read and approved the final manuscript.

Acknowledgements: The authors thank the Ministry of Health for providing them with the STEP survey database.

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Tables

Table 1: Sociodemographic characteristics for all rural women (n = 1730)

	Overall		Not users of smokeless tobacco		Users of smokeless tobacco		
	n = 1730		n =1492		n = 238		
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	p
Age mean ± standard deviation*	1730	37.8±10.9		36.7±10.5		44.6±11.0	0.0001
Age range (years)							0.0001*
- 25-34	809	46.8 (44.4-49.1)	757	50.7 (48.2-53.3)	52	21.8 (16.8-27.6)	
- 35-49	592	34.2 (32.0-36.5)	503	33.7 (31.3-36.2)	89	37.4 (31.2-43.9)	
- >49	329	19.0 (17.2-20.9)	232	15.6 (13.7-17.5)	97	40.8 (34.5-47.3)	
Marital status							0.0001
- Married/cohabitating	1553	89.8 (88.2-91.2)	1357	91.0 (89.4-92.4)	196	82.4 (76.9-87.0)	
- Singles	177	10.2 (8.8-11.8)	135	9.0 (7.6-10.6)	42	17.6 (13.0-23.1)	
Education level							0.0001
- No formal education	1558	90.1 (88.6-91.4)	1326	88.9 (87.2-90.4)	232	97.5 (94.6-99.1)	
- Primary school or more	172	9.9 (8.6-11.4)	166	11.1 (9.6-12.8)	6	2.5 (0.9-5.4)	
Occupation							0.794
- Employed/Self-employed	1002	57.9 (55.6-60.3)	866	58.0 (55.5-60.6)	136	57.1 (50.6-63.5)	
- Others (Students+household-keepers+unemployed)	728	42.1 (39.7-44.4)	626	42.0 (39.4-	102	42.9 (36.5-	

				44.5)		49.4)	
Having at least one family member aged≥18 years, yes	1,286	74.3 (72.2-76.4)	1118	74.9 (72.7-77.1)	168	70.6 (64.4-76.3)	0.154
Current alcohol use, yes	425	24.6 (22.6-26.7)	316	21.2 (19.1-23.3)	109	45.8 (39.3-52.4)	0.0001
Presence of dental symptom, yes	417	24.1 (22.1-26.2)	312	20.9 (18.9-23.1)	105	44.1 (37.7-50.7)	0.0001

Only one woman used the ST (> 0.0%; 95% CI: > 0.0-0.03).

Table 2: Nutritional, clinical, and biological features of rural women according to the use of psychoactive substances (n=1730).

Parameters	Mean ± standard deviation or % (95% confident interval)						
	Overall	SLT use			SLT and alcohol Use		
		Current SLT users	Not current SLT users	p	Current SLT and alcohol users	Current SLT and not alcohol users	p
	(n=1730)	(n=238)	(n=1492)		(n=109)	(n=1621)	
Waist circumference (cm)	76.2±11.6	74.6±10.7	76.4±11.7	0.026	75.0±11.8	76.3±11.6	0.29
Weight (kg)	56.4±10.2	53.2±9.0	56.9±10.3	0.0001	52.7±8.1	56.7±10.3	0.0001
Body mass index (kg/m□)	21.5±3.6	20.2±3.1	21.7±3.6	0.0001	20.2±2.8	21.6±3.6	0.0002
Nutritional state, % (95% CI)				0.0001*			0.0001*
- Underweight	16.0 (14.3-17.8)	28.6 (22.9-34.8)	13.9 (12.2-15.8)	0.0001	28.4 (20.2-37.9)	15.1 (13.4-17.0)	0.003
- Normal	70.9 (68.7-73.1)	66.0 (59.6-72.0)	71.7 (69.4-74.0)	0.07	66.1 (56.4-74.9)	71.3 (69.0-73.4)	0.27
- Overweight/obesity	13.1 (11.6-14.8)	5.5 (2.9-9.2)	14.4 (12.6-16.2)	0.0002	5.5 (2.0-11.6)	13.6 (12.0-15.4)	0.0006
Systolic blood pressure (mmHg)	120.0±16.7	122.9±19.8	119.6±16.1	0.005	119.9±16.3	120.1±16.7	0.94
Diastolic blood pressure (mmHg)	76.8±10.0	76.6±10.3	76.8±10.0	0.72	76.3±9.8	76.8±10.05	0.60
Differential blood pressure (mmHg)	43.3±11.8	46.3±13.9	42.8±11.3	0.0001	43.6±11.3	43.2±11.8	0.74
High blood pressure (>140/90 mmHg), yes (%)	14.6 (13.0-16.4)	16.39 (11.9-21.7)	14.34 (12.6-16.2)	0.41	13.8 (7.9-21.7)	14.7 (13.0-16.5)	0.89
Blood sugar (mmol/l)	3.9±1.5	4.1±1.5	3.8±1.5	0.022	4.2±1.4	3.9±1.5	0.014
Hyperglycemia (>6.1mmol/l), yes (%)	5.0 (4.0-6.1)	5.5 (2.9-9.2)	4.9 (3.9-6.1)	0.75	5.5 (2.0-11.6)	4.6 (3.6-5.7)	0.64
HDL cholesterol (mmo/l)	0.9 (0.5)	0.9±0.4	0.9±0.5	0.60	1.0±0.5	0.9±0.5	0.21
Total cholesterol (mmol/l)	3.1 (0.8)	3.1±0.8	3.1±0.8	0.60	3.2±1.0	3.0±0.8	0.04

*Global p value

Table 3: Factors associated with smokeless tobacco use among rural women in Burkina Faso (n = 1730)

	Univariate analysis			Multivariate analysis		
Factors	cOR	95% CI	p	aOR	95% CI	p
Age range (years)			0.0001			0.0001
- 25-34	1					
- 35-49	1.58	1.80-3.69	0.0001	2.14	1.46-3.13	0.0001
- > 49	6.09	4.21-8.79	0.0001	4.31	2.86-6.48	0.0001
Occupation: others, vs employed/self-employed	1.04	0.79-1.37	0.79	0.97	0.71-1.32	0.84
Marital status: Singles vs married/cohabiting (ref)	2.15	1.48-3.14	0.0001	1.12	0.73-1.74	0.60
Having at least one family member aged ≥ 18years: No, vs yes (ref)	1.25	0.92-1.69	0.16	0.89	0.61-1.26	0.47
*Education level: no education or primary school vs secondary or more (ref)	4.84	2.12-11.06	0.0001	3.02	1.28-7.10	0.011
Current alcohol use: yes, vs no (ref.)	3.14	2.37-4.18	0.0001	2.80	2.06-3.80	0.0001
Presence of dental symptom: yes, vs no (ref)	2.99	2.25-3.97	0.0001	2.59	1.91-3.51	0.0001
Waist circumference (cm)	0.98	0.97-0.99	0.025	0.98	0.97-<1.00	0.023
Undernourishment (BMI<18.5 kg/m): yes, vs no (ref)	2.47	1.80-3.39	0.0001	1.78	1.24-2.55	0.002
Systolic blood pressure	1.01	>1.00-1.02	0.005	1.01	>1.00-1.03	0.017
Diastolic blood pressure	>0.99	0.98-1.01	0.72	0.97	0.95-0.99	0.006
Blood sugar (mmol/L)	1.10	1.01-1.20	0.024	1.06	0.96-1.18	0.25
HDL cholesterol (mmol/l)	1.08	0.81-1.43	0.60	0.90	0.64-1.25	0.53
Total cholesterol (mmol/L)	1.05	0.88-1.24	0.60	0.97	0.78-1.21	0.78

cOR: crude odds ratio; aOR: adjusted odds ratio; 95% CI: 95% confidence interval; others: included professions with inconstant incomes (students, homemakers, and the unemployed). In this multivariate model, by replacing the dichotomic variable “undernourishment: yes or no” with the quantitative variable “BMI in kg/m” and the two quantitative variables SBP and DBP with the differential blood pressure (SBP-DBP in mmHg), we observed that the decrease in the unit of BMI (aOR = 0.88; 95% CI: 0.83-0.93; p = 0.0001) or the increase in the unit of differential blood pressure (aOR = 1.01; 95% CI: > 1.00-1.02; p = 0.041) were significantly associated with SLT use.