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How alcohol and/or tobacco use and raised glycemia are associated with oral hygiene practices among Burkinabè adults: Evidence from the first national non-communicable disease risk factors survey

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ABSTRACT

Socio-demographic correlates with oral hygiene practices are commonly investigated. The present study aimed to determine whether alcohol and/or tobacco use and hyperglycemia were associated with oral hygiene practices among Burkinabè adults. This descriptive, cross-sectional study included 4550 adults selected through multistage cluster sampling performed during the first WHO STEPS survey conducted in 2013 in Burkina Faso. The practices we considered were the frequencies of tooth cleaning, the fluoridated toothpaste use and the dentist visit within the past-six months. We collected data on self-reported alcohol and tobacco use and measured fasting blood glucose (FBG). About 82.8% of respondent reported they cleaned their teeth at least once a day, 31.5% cleaned them at least twice a day, 25.4% used fluoridated toothpaste, 2.2% had visited a dentist in the past six months, 38.8% used either alcohol or tobacco and 8.4% had raised FBG. After adjusting for socio-demographic factors, alcohol and/or tobacco use was an unfavorable factor for tooth cleaning at least once a day [aOR = 0.7 (0.6–0.8) $p < 0.001$], or at least twice a day [aOR = 0.6 (0.5–0.7) $p < 0.001$]. Moreover, raised FBG was negatively associated with cleaning tooth at least twice a day [aOR = 0.7 (0.5–0.9) $p < 0.01$] or the use of fluoridated toothpaste [aOR = 0.7 (0.6–0.9) $p < 0.05$]. Oral health education in addition to cardiovascular risk factor reduction should be efficiently integrated in the behavioral lifestyle interventions' strategies for the non-communicable diseases' prevention.

1. Introduction

Oral disorders are emerging in the low- and middle-income countries (LMICs) (Petersen and Baehni, 2012) and have remained among the three leading level three causes in terms of incident cases for more than four decades (GBD 2017 Disease and Injury Incidence and Prevalence

Abbreviations: FBG, Fasting blood glucose; LMICs, Low- and middle-income countries; mmol/l, millimole per liter; STEPS, Stepwise approach to surveillance; WHO, World Health Organization.

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Collaborators, 2018). In West Africa, oral disorders rank as the third commonest disease, accounting for 10.7% (Institute for Health Metrics and Evaluation (IHME), 2020). As with most non-communicable diseases, oral diseases (Park et al., 2019) including oral and digestive cancers (Cordero and Varela-Calviño, 2018; Gupta et al., 2017) can be prevented by the efficient oral hygiene practices. With regard to oral health determinants, especially oral hygiene practices, the socioeconomic inequalities (Varenne et al., 2011) or sociodemographic factors are usually investigated (Jiménez et al., 2004; Thapa et al., 2016). The World Health Organization (WHO) has reported the evidence on the relationships between oral diseases, poor oral hygiene, alcohol consumption, tobacco use and glycemic disorders (Petersen and Ogawa, 2005).

WHO recommends the implementation of a national surveillance system for measuring progress in the control of oral disease and promotion of oral health to countries (Petersen and Ogawa, 2005). The standardized tool it designed for the surveillance of the non-communicable diseases in LMICs (the *Stepwise approach to surveillance, WHO STEPS)* includes a specific section for the oral health status and related behaviors, lifestyle factors (alcohol and tobacco use) and the fasting blood glucose (FBG) measurement (World Health Organization, 2005). The first survey using this tool was conducted in 2013 in Burkina Faso. "In this low-income country with few existing oral health professionals, the scary population based-studies have been addressed the extent of dental disorders since 1989 (dental plaque and calculus adults of 25-54y in the East of the country) (Abellard et al., 1989), while no public health intervention is promoted at improving oral hygiene practices. There was an insufficient prevention for the licit psychoactive substances' use such as alcohol and tobacco in Burkina Faso and the WHO reported in 2014 as in 2018, the absence of a national monitoring system regarding alcohol consumption and alcohol policy response in Burkina Faso (World Health Organization (WHO), 2018, 2014). Moreover, the WHO also noticed the low level of achievement with regards to the international standards of tobacco control policy and the current study reported the prevalence of 5% for smoked tobacco use among adolescents (Kaboré et al., 2021). In Burkina Faso, no population-based study has as yet assessed the relationships between oral hygiene practices versus lifestyle factors and glycemic disorders. It is in this context that this study aimed to investigate the association between alcohol consumption, tobacco use and raised glycemia with oral hygiene practices among Burkinabè adults, using data from the first national population-based study.

2. Methods

Study design and settings: A secondary analysis was performed using data from the WHO STEPS (World Health Organization, 2005) survey conducted in 2013 in Burkina Faso. The WHO STEPS is the WHO's recommended standardized tool for surveillance of chronic diseases and their risk factors at a national level, in WHO member countries.

Sampling: The nationally representative sample size was calculated to be 4800 adults aged 25–64 years, according to the WHO STEPS methodology (World Health Organization, 2005). This sample size (4800) considered the estimates by age group and sex and achieved sufficient accuracy by weighting the numbers of age groups for each sex. It was also weighted to ensure representativeness with regard to the living environment (rural or urban areas).

Data collection and variables of interest: Data were collected from 3 September to 24 October 2013. Data were collected from a questionnaire and blood samples were collected for biological measurements. The data were collected using personal digital assistants with standardized WHO STEPS questionnaires. Sociodemographic information was recorded via face-to-face interviews in the language spoken by the participant. Participants' demographic variables included living environment, sex, age, marital status, education level, and occupation. Lifestyle factors included the current alcohol consumption (in the past one month), current tobacco (smoked or the smokeless) use in the past 12 months). The oral hygiene practices were: the frequencies of tooth cleaning, the use of fluoridated toothpaste and the visit to the dentist. The measurements of the biological parameters included fasting blood glucose (FBG). Raised glycemia was defined using the International Diabetes Federation threshold to identity an abnormal metabolic syndrome component based on the blood sugar i.e., FBG $\geq$ 5.6 mmol/l (Alberti et al., 2006).

Individuals included for our secondary analyses: We studied variables of individuals who had complete data with regard to sociodemographic parameters, oral hygiene practices, lifestyle and glycemic variables. Of the sample of 4800 individuals surveyed, 105 were not eligible; and 10, eight and 127 had missing or invalid data concerning respectively sociodemographic variables, dentist visit and the FBG values. Thus, we included 4550 participants for our secondary analyses.

Statistical analyses: We used StataCorp Stata Statistical Software for Windows (Version 12.0, College Station, Texas, US) to analyze the data. The continuous variables were expressed as the means $\pm$ standard deviations, and categorical variables expressed as percentages (%). The chi-squared test was used to compare categorical variables. In the stepwise logistic regressions' models, each oral hygiene practice was considered as a dependent variable, while the alcohol use, tobacco consumption and hyperglycemia were explanatory variables, with adjustment on sociodemographic factors (sex, age, living environment, marital status, education and occupation). For all analyses, a p-value below 0.05 was considered significant.

Ethical considerations: The protocol of the STEPS survey was approved by the Ethics Committee for Health Research of the Ministry of Health of Burkina Faso (deliberation No: 2012–12092; December 05, 2012). Written informed consent was systematically obtained from each participant in the STEPS survey.

3. Results

Table 1 describes the socio-demographic characteristics, oral hygiene practices, lifestyle practices and glycemic disorders. Of the sample studied, 82.8% cleaned the teeth at least once a day and 31.5% at least twice a day, 25.4% declared to use a fluoridated toothpaste, and only 2.2% have visited a dentist the last six months. The prevalence of alcohol consumption was 27.4%, tobacco use 19.9% and either alcohol or tobacco use, 38.8%. The prevalence of raised FBG was of 8.4%. Table 2 summarizes the distribution of oral hygiene practices by lifestyle practices and the FBG levels. Compared to those who did not use alcohol or tobacco, the users of at least one of these products had a significant lower prevalence of tooth cleaning, or of use of fluoridated paste. Individuals with raised glycemia also had a significant lower prevalence of tooth cleaning at least twice a day. Table 3 summarizes results from stepwise logistic regressions. Independently of sociodemographic factors, the consumption of only alcohol was negatively associated with tooth cleaning at least one a day [aOR = 0.7 (0.6–0.9) $p < 0.001$] or at least twice a day [aOR = 0.6 (0.5–0.7) $p < 0.001$], while the use of only tobacco was so for tooth cleaning at least once a day [aOR = 0.7 (0.6–0.8) $p < 0.001$] or with the fluoridated paste use [aOR = 0.8 (0.6–0.9) $p < 0.05$]. The use of either alcohol or tobacco was an unfavorable factor for tooth cleaning at least once a day [aOR = 0.7 (0.6–0.8) $p < 0.001$)], or at least twice a day [aOR = 0.6 (0.5–0.7) $p < 0.001$)]. Moreover, raised FBG was negatively associated with cleaning tooth at least twice a day [aOR = 0.7 (0.5–0.9) $p < 0.01$].

4. Discussion

Public health issues towards the unhealthy oral hygiene practices were significant and so call for behavioral lifestyle interventions to be initiated.

Table 1
Socio-demographic characteristic, oral hygiene practices, lifestyle practices and raised fasting blood glucose description.

	n (%)
Socio-demographic characteristics	
Age ranges (in years, y)	
- 25 – 29y	1265 (27.8)
- 30 – 44y	1931 (42.4)
- 45 – 64y	1354 (29.8)
Sex	
- Men	2187 (48.1)
- Women	2363 (51.9)
Residence area	
- Rural	899 (19.8)
- Urban	3651 (80.2)
Education level	
- No formal/no education	3528 (77.5)
- Primary achieved	700 (15.4)
- Secondary or more	322 (7.1)
Occupation	
- Professions providing regular income	3410 (74.9)
- Professions with no regular income	1140 (25.1)
Marital status	
- Singles/divorced/widows	623 (13.7)
- Married/cohabiting	3927 (86.3)
Dental status	
Presence of teeth	
- No teeth	9 (0.2)
- Had teeth	4541 (99.8)
Oral hygiene Practices	
Visiting a dentist within the last six months	
- No	(97.8)
- Yes	99 (2.2)
Tooth cleaning frequencies†	
- Never cleaned the teeth	242 (5.3)
- Less than once a day	539 (11.9)
- Cleaning the teeth once a day	2331 (51.3)
- Cleaning the teeth at least twice a day	1429 (31.5)
Using toothpaste†/‡	
- Yes	2873 (66.8)
- No	1426 (33.2)
Using the fluoridated toothpaste†/‡	
- Yes	1093 (25.4)
- No	2967 (69.0)
- Did not know	239 (5.6)
Lifestyle practices	
Current alcohol consumption	
- Not consumers	3303 (72.6)
- Consumers	1247 (27.4)
Current tobacco use	
- Not users	3643 (80.1)
- Users	907 (19.9)
Alcohol and/or tobacco use	
- Did not use alcohol or tobacco	2784 (61.2)
- Use at least alcohol or tobacco	1766 (38.8)
Fasting blood glucose (FBG) disorders	
Raised glycemia (FBG $\geq$ 5.6 mmol/l)	
- No	4166 (91.6)
- Yes	384 (8.4)
Hyperglycemia at FBG $\geq$ 6.1 mmol/l	
- No	4313 (94.8)
- Yes	237 (5.2)

4.1. Oral hygiene practices

Despite the recommendation to clean the teeth at least twice a day (Claydon, 2008), less than one-third did so as was also the case among Indian adults (29%) (Sreenivasan et al., 2016). Moreover, there was a low prevalence of people who used fluoridated paste, or visited a dentist and that may mirror a limited knowledge (Varenne et al., 2006), and difficult access the oral health care (Varenne et al., 2006; Hau et al., 2017).

Table 2
Distribution of oral hygiene practices by lifestyle practices and the level of fasting blood glucose.

lifestyle practices and the level of fasting blood glucose	Oral hygiene practices			
	Cleaning teeth at least once a day % (CI at 95%)	Cleaning teeth at least twice a day % (CI at 95%)	Use of fluoridated toothpaste % (CI at 95%)	Visiting dentist within the last 6 months % (CI at 95%)
	N = 4541†	N = 4541†	N = 4060‡	N = 4550
Alcohol consumption				
- No	84.2 (82.9–85.4)	34.0 (32.4–35.7)	26.8 (25.2–28.4)	2.3 (1.8–2.8)
- Yes	79.1 (76.7–81.3)	24.7 (22.3–27.2)	27.2 (24.6–30.0)	1.9 (1.2–2.9)
p-value	***	***	NS	NS
Tobacco use				
No	84.6 (83.3–85.7)	32.8 (31.3–34.4)	28.0 (26.4–29.5)	2.3 (1.9–2.9)
- Yes	75.7 (72.8–78.5)	26.0 (23.2–29.0)	22.7 (19.8–25.7)	1.5 (0.8–2.6)
p-value	***	***	**	NS
Alcohol-&-or-tobacco use				
- No	85.2 (83.8–86.5)	35.1 (33.3–36.9)	27.4 (25.6–29.2)	2.4 (1.9–3.1)
- Yes	79.1 (77.1–81.0)	25.7 (23.7–27.8)	26.2 (24.0–28.4)	1.8 (1.2–2.5)
p-value	***	***	NS	NS
Raised glycemia (FBG $\geq$ 5.6 mmol/l)				
- No	82.9 (81.7–84.0)	32.1 (30.7–33.5)	26.3 (24.9–27.8)	2.2 (1.7–2.6)
- Yes	82.0 (77.8–85.7)	24.7 (20.5–29.4)	33.5 (28.4–38.9)	2.3 (1.1–4.4)
p-value	NS	**	**	NS
Hyperglycemia at FBG $\geq$ 6.1 mmol/l				
- No	82.8 (81.6–83.9)	31.7 (30.3–33.2)	26.2 (24.9–27.7)	2.1 (1.7–2.6)
- Yes	82.7 (77.3–87.3)	26.6 (21.1–32.7)	40.3 (33.4–47.5)	3.4 (1.5–6.5)
p-value	NS	NS	***	NS

†: When converting the variable frequency of tooth cleaning into binary variable, individuals who had no teeth were excluded. ‡: When converting the variable use of the fluoridated toothpaste into binary variable, in addition to the individuals who had no teeth, or who did never clean the teeth, those whom response was "did not know" were also excluded. %: percentage, 95% CI: Confidence interval at 95%.
FBG: Fasting blood glucose; NS: Non-significant p-value; *p-value $<$ 0.05; **: p-value $<$ 0.01; ***: p-value $<$ 0.001.

4.2. Relationships between behavioral lifestyle factors: alcohol and/or tobacco use associations with oral hygiene practices

The use of alcohol or tobacco was an unfavorable factor for oral hygiene practices (Table 3). Licit or illicit drug users are not usually aware of the dangerous effects of the products used and frequently have unhealthy oral hygiene practices (Hossain et al., 2018) and do not adopt a behavior to attenuate the effects of the drugs. In addition, the healthy hygiene practices including oral hygiene behaviors depend on motivation (Balasuppramaniem et al., 2017), self-efficacy, decision-making (Halasa-Rappel et al., 2019; Nzabonimana et al., 2019), qualities that are interfered with by psychoactive substances (Chen et al., 2020). Alcohol and tobacco are both psychoactive or addictive substances containing, respectively, nicotine and ethanol molecules (Kenna et al.,

Table 3
Lifestyle, glycemic disorders associations with oral hygiene practices in logistic regressions.

	Cleaning teeth at least once a day (N = 4541†)				Cleaning teeth at least twice a day (N = 4541†)				Use of fluoridated toothpaste (N = 4060‡)				Visited a dentist within the last 6 months (N = 4550)			
	Univariable		Multivariable		Univariable		Multivariable		Univariable		Multivariable		Univariable		Multivariable	
	cOR		aOR	95% CI	cOR	95% CI	aOR	95% CI	cOR		aOR		cOR	95% CI	aOR	95% CI
Alcohol consumption																
- No	1		1		1		1		1		1		1		1	
- Yes	0.7	(0.6–0.8)***	0.7	(0.6–0.9)***	0.6	(0.5–0.7)***	0.6	(0.5–0.7)***	>1.0	(0.9–1.2)	0.9	(0.7->1.0)	0.8	(0.5–1.3)	0.7	(0.5–1.2)
Tobacco use																
- No	1		1		1		1		1		1		1		1	
- Yes	0.6	(0.5–0.7)***	0.7	(0.6–0.8)***	0.7	(0.6–0.8)***	0.9	(0.7–1.1)	0.8	(0.6–0.9)***	0.8	(0.6->0.9)*	0.7	(0.4–1.2)	0.9	(0.5–1.6)
Alcohol and/or tobacco use†																
- No	1		1		1		1		1		1		1		1	
- Yes	0.7	(0.6–0.8)***	0.7	(0.6–0.8)***	0.6	(0.5–0.7)***	0.6	(0.5–0.7)***	0.9	(0.8–1.1)	0.9	(0.7->1.0)	0.7	(0.5–1.1)	0.7	(0.4–1.1)
Raised fasting blood glucose																
- No	1		1		1		1		1		1		1		1	
- Yes	0.9	(0.7–1.2)	0.9	(0.7–1.3)	0.7	(0.5–0.9)**	0.7	(0.5–0.9)**	0.7	(0.6–0.9)**	0.7	(0.6->0.9)*	1.1	(0.5–2.2)	0.9	(0.5–1.9)
Sociodemographic variables of adjustment																
Sex																
- Males	1		1		1		1		1		1		1		1	
- Females	0.9	(0.8–1.1)	0.9	(0.8–1.1)	1.1	(>0.9–1.3)	1.3	(1.1–1.5)***	0.7	(0.6–0.8)***	0.6	(0.5–0.7)***	1.4	(>0.9–2.2)	1.7	(1.1–2.5)*
Residency																
- Rural	1		1		1		1		1		1		1		1	
- Urban	3.1	(2.4–4.1)***	2.3	(1.7–3.0)***	2.0	(1.8–2.4)***	1.7	(1.4–2.0)***	4.0	(3.4–4.7)***	2.4	(2.0–2.9)***	2.6	(1.7–3.9)***	1.4	(0.9–2.3)
Age																
- 45 – 64y	1		1		1		1		1		1		1		1	
- 30 – 44y	1.7	(1.5–2.1)***	1.6	(1.3–1.9)***	1.3	(1.1–1.5)**	1.2	(>0.9–1.4)	1.6	(1.3–1.9)***	1.5	(1.3–1.9)***	0.9	(0.6–1.4)	0.7	(0.5–1.2)
- 24 – 29y	1.8	(1.5–2.2)***	1.6	(1.3–2.0)***	1.6	(1.3–1.9)***	1.4	(1.2–1.6)***	1.6	(1.4–2.0)***	1.6	(1.3–2.0)***	0.7	(0.4–1.2)	0.5	(0.3–0.9)*
Education levels																
- No formal education	1		1		1		1		1		1		1		1	
- Primary completed	1.9	(1.5–2.5)***	1.5	(1.2–2.0)**	1.2	(>0.9–1.4)	1.1	(0.9–1.3)	2.7	(2.2–3.2)***	1.9	(1.6–2.3)***	2.1	(1.3–3.5)	2.4	(1.4–4.0)***
- Secondary/more	13	(5.8–29.2)***	7.8	(3.4–17.8)***	4.7	(3.7–5.9)***	4.2	(3.2–5.4)***	12.1	(9.2–15.8)***	6.6	(4.9–8.9)***	4.9	(3.0–8.2)***	5.7	(3.4–9.5)***
Marital status																
- Singles	1		1		1		1		1		1		1		1	
- Married/cohabiting	0.9	(0.7–1.2)	1.1	(0.9–1.4)	1.1	(0.9–1.3)	1.4	(1.1–1.7)**	0.6	(0.5–0.7)***	>1.0	(0.8–1.3)	0.8	(0.5–1.4)	1.1	(0.7–2.0)
Occupation																
- Professions without regular income	1		1		1		1		1		1		1		1	
- Professions with regular income	1.1	(0.9–1.3)	1.3	(1.1–1.6)**	1.3	(1.1–1.5)**	1.6	(1.4–1.9)***	<1.0	(0.8–1.1)	0.9	(0.7–1.1)	0.7	(0.5–1.1)	0.9	(0.5–1.4)

†: When converting the variable frequency of tooth cleaning into binary variable, individuals who had no teeth were excluded. ‡: When converting the variable use of the fluoridated toothpaste into binary variable, in addition to the individuals who had no teeth, or who did never clean the teeth, those whom response was "did not know" were also excluded.
†: The variable alcohol and/or tobacco use was tested in the model after removing alcohol consumption and tobacco use. *: P-value < 0.05, **: P-value < 0.01, ***: P-value < 0.001; aOR: adjusted odds-ratio; cOR: crude Odds-ratio. CI: confidence interval.

2007; Lajtha and Sershen, 2010) with evident psychological disturbances (Evren et al., 2015).

Psychoactive substance use, decision-making impairment, risky behaviors: An impaired reward-based decision-making in alcohol users was reported (Brevers et al., 2014; Galandra et al., 2018), and alcohol use was also associated with negative behaviors, such as sexual risky behaviors (Wandera et al., 2015), or unhealthy sleep behavior (Jefferson et al., 2005). Besides, the current neurobiological and neuro-computational data support the nicotine-induced alterations in decision-making (Naudé et al., 2015). A meta-analysis with meta-regression review showed a significant difference in risky decision-making performance between groups of substance users (alcohol, tobacco, cocaine, opioid) and groups of non-users (Chen et al., 2020). Oral hygiene-related self-efficacy is an influencing factor in the oral hygiene behavior and potentially predict oral hygiene outcomes (Woelber et al., 2015) while the alcohol and tobacco use lowered the level of self-efficacy (Zullig et al., 2014).

Potential influence of the psychoactive substance use' schedule on the healthy practices: Night-time, especially bedtime was determinant in the toothbrushing schedule (Chhaliyil et al., 2020) and considered as one of the key moment for the tooth cleaning (Macgregor et al., 1996). Interactions between the schedules (or the planning) of the psychoactive substance consumption and the tooth cleaning could would worsen the unhealthy practices (Hossain et al., 2018). Young people are especially exposed to alcohol and to its acute effects during the night-time (Liang and Chikritzhs, 2015), and that empirical pattern would be considered for the Burkinabè societies. The negative culminating effect of alcohol at this moment may consist of the forgetfulness of toothbrushing, the neglect or the impaired motivates or self-efficacy. Dysfunctional beliefs and attitudes about sleep may support substance uses at bedtime (Jin et al., 2018; Terry-McElrath et al., 2016). Concerning tobacco, the use of this product for sleep, or the fear of insomnia are the significant issues for the users (Patterson et al., 2019) and insomniacs do engage in specific poor sleep hygiene practices, such as smoking and drinking alcohol just before bedtime (Jefferson et al., 2005).

Expected psychoactive substance effect on prior potential dental discomfort: Dental pain and burning mouth are common (Abellard et al., 1989), and there is a poor oral health service in Burkina Faso (Tapsoba and Deschamps, 1997). The ethanol or nicotine (alcohol or tobacco) may be used to locally anesthetize teeth or the oral cavity (Al-Noori et al., 2021). That behavior was noted in a qualitative study (interview) in three Ethiopian pastoral communities with a long tradition of the substance use (Etu et al., 2017) and it suggests the users would have oral disorders beforehand and would avoid toothbrushing.

4.3. Raised FBG association with oral hygiene practices

Raised FBG was negatively associated with the good practice of tooth cleaning at least twice a day (aOR = 0.7, $p < 0.01$) or the use of the fluoridated toothpaste (aOR = 0.7, $p < 0.05$; Table 3). By controlling for sociodemographic factors, a population-based study found that Chinese individuals who barely brushed their teeth had a significant increase of 0.50 mmol/L in FBG, and a significant increase of 0.26% in glycated hemoglobin A1c (HbA1c), relative to those brushing at least twice daily (Su et al., 2016). Moreover, among diabetes, glycemic level control was associated with daily toothbrushing [aOR = 3.1 (1.3–7.6)] (Merchant et al., 2012). Authors reported an evident bidirectional relationship between diabetes and oral diseases (such as periodontitis) (Sanz et al., 2018) and the more frequent use of the fluoridated toothpaste by individuals with more worsened glycemic disorders (40.3% of those with $\geq$ 6.1 mmol/l of FBG, Table 2) we reported could reflect the benefit from the interactions between diabetes patients and the medical community in the framework of the illness. This positive result suggests the potential usefulness of the behavioral lifestyle interventions which should be integrated with regard to the cardiovascular risk factors.

4.4. Education and effectiveness of public health interventions for healthy behavioral lifestyle

Health literacy is a strong predictor of an individuals' health, health behavior and health outcomes (Baskaradoss, 2018) and we found that just attending primary school was associated to the favorable oral hygiene practices (Table 3) and is a positive result for the initiation of behavioral lifestyle interventions. Effective interventions should support health behavior change for cardiovascular disease prevention, and should preliminary make health professionals able to translate evidence-based medicine and shared decision-making into general practice (Bonner et al., 2019; Cupples et al., 2018). Moreover, the effectiveness of improving media message interpretation processing skills to promote healthy decision-making about substance use has been demonstrated (Kupersmidt et al., 2012).

The effectiveness of behavioral lifestyle interventions in the management of lifestyle disorders in adults (diabetes mellitus and cardiovascular disorders) has been reported and key psychological interventions include self-management and educational interventions based on learning and motivational principles, self-empowerment, behavioral skills and coaching (Sudhir, 2017). In the same perspective, behavior change theory offer strong support for screening and identifying adults at increased cardiometabolic risk and for providing early intervention to mitigate risk factors to prevent or delay the onset of disease (Venditti, 2017).

5. Limitations

Income variables were not collected and geographic data were not included in the analysis and thus, we missed their effect on in the multivariable models. Glycated hemoglobin but not FBG is more relevant to appreciate of the level of chronic exposure to hyperglycemia. Another limitation is that, in a cross-sectional design, we cannot be sure of the behavioral practices preceded the oral hygiene practices. "While these first nationally-representative data from 2013 may no longer reflect the current situation, they provide a baseline that can be compared with future WHO STEPS survey data.".

6. Conclusion

Behavioral lifestyles such as alcohol and/or tobacco use and raised glycemia in Burkinabè adults are associated with unhealthy oral hygiene practices. Oral health education in addition to cardiovascular risk factors reduction should be efficiently integrated in the national health interventions for the non-communicable diseases' prevention.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Consent for publication

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Authors' contributions

JD, WKB and SK contributed to drafting the manuscript, JD and WKB performed the statistical analysis, WLRO, SO, TK and ANZ, provided the first interpretation of the results, JD and WKB reviewed the last version. All authors read and approved the final manuscript.

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