Epidemiological Aspects of Nicotinism Among Students of Antananarivo Suburban High School (Madagascar)

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Abstract

Introduction: Nicotinism is of world-wide growing concern among adolescents. The goal is to describe the epidemiological aspects of nicotinism among Antananarivo suburban high school students. **Methods:** This is a descriptive and analytical cross-sectional study conducted in 2015 through a cluster sampling. A standardised, anonymous self-completion questionnaire was given to 903 high school students. **Results:** We enrolled 901 students. The prevalence of students who experimented with tobacco use was 46.3% next to 11.7% of active smokers . Among active smokers, 47.6% were non-dependent, 14.3% slightly dependent, 29.5% moderately dependent and 6.7% strongly dependent on tobacco. The motive of 70.3% of smokers was to test tobacco. Among former smokers 72.7% stoped smoking for fear of the drawbacks of tobacco-related diseases.

Fear of heart disease (p = 0.004) and cancer (p = 0.008) was significantly associated with non-smoking status. Female gender (p = 0.000, OR 0.261 [0.164-0.415], 95% IC) and having been informed on tobacco consequences (p = 0.003, OR 0.401 [0.213-0.753, 95% IC] were protecting factors against tobacco use. The existence of a smoking circle was a risk factor of being a smoker: close friend (p = 0.000, OR 2,677 [2,027-3,534], 95% IC), cousin (p = 0.002, OR 1,529 [1,174-1,993], 95% IC), brother/sister (p = 0.023, OR 1,478 [1,054-2,072], 95% IC). **Conclusion:** The prevalence of nicotinism is significant despite the current prevention measures. The influence of the smoking circle and education are paramount. An active participation of non-smokers adolescents in passing the message or raising awareness could improve the outcomes because they have influence on their peers.

Keywords: Nicotinism, students, adolescents, epidemiology, Madagascar

Introduction

Nicotinism is one of the leading causes of preventable death in the world. It is known to cause various cancers. It is also the most common risk factor of cardiovascular diseases among young people. In fact, cigarette smoking leads to endothelial injury and dysfunction, an increased risk of thrombosis, atherogenic disease processes and cardiovascular events (Centers for Disease Control and Prevention, 2010).

Recent trends indicate a decline in age when children and adolescents start to smoke (Harrabi et al., 2002). The future of the tobacco epidemic depends on their attitude (Afifa et al., 2009).

In Malagasy previous studies, considerable variations of the prevalence rate of adolescent smoking were reported. We need a regular assessment so that anti-smoking measures may be more adapted to the current situation. In Antananarivo, the recent study on adolescent smoking was done in the urban area (Razakandisa, 2013). We conducted this study to describe the epidemiological aspects of nicotinism among high school students in the suburban environment where conditions may be different from that of urban areas.

Methods

We conducted a descriptive and analytical study from January to June 2015 in suburban high schools of Antananarivo which includes 3 districts: Antananarivo Atsimondrano, Antananarivo Avaradrano and Ambohidratrimo. Antananarivo Atsimondrano was drawn for the realization of our study. A cluster sampling was conducted with the maximum possible prevalence of 0.5 and a 95% confidence interval. Sample size was calculated according to the formula (Giezendanner, 2012):

$$\mathbf{n} = \frac{\mathbf{t^2 p(1-p)}}{e^2}$$

n: sample size
t: confidence level (t = 1.96 for 95% confidence)
p: maximum prevalence rate (p = 0.5)
e: margin of error (e = 0.05)

=> **n1 = 384**

With the effect of the sampling plan, we multiplied the result by two:

=> n2 = 384 x 2 = 768

With the imponderable (the non-response error or the registration error): we increased the result by 5%:

=> N = 768 + 768 x 5/100 = **806,4**

Among the 97 high schools of Antananarivo Atsimondrano (statistical database 2013-2014, Department of Statistics DPE / MEN), we drew lots: 2 public high schools, 4 private denominational high schools (2 Catholic schools and 2 others) and 3 non-denominational private high schools. We included all students who attended the survey and wishing to participate after receiving the necessary explanation. The questionnaire was completed with the presence of the investigator in the classroom. The investigator could thus intervene in case of request for explanation by the students. We excluded those who did not complete their questionnaire correctly.

A student who smokes regularly and answered "yes" to the question "are you currently a smoker?" was considered as a current smoker. A student who had smoked a cigarette, even once in his life, was considered to "have already smoked" (or "smoked before").

The Fagerström test was used to measure tobacco dependence. It is a standard instrument for assessing the intensity of physical addiction to nicotine. It contains six items that evaluate the quantity of cigarette consumption, the compulsion to use and dependance. The items are summed to yield a total score of 0-10. The higher the total Fagerström score, the more intense is the patient's physical dependence on nicotine (Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO, 1991; American College of Chest Physicians, 2008).

We used the IBM® SPSS® Statistics 20 software for data processing. A bivariate analysis was performed to evaluate the risk of being a smoker with a 95% confidence interval. The association between variables was evaluated using the Khi-square test. The significance level was $p \leq 0.05$.

In ethical considerations, an authorization was obtained from the school's headmaster. Students gave their consent to participate in the survey and completed the questionnaire anonymously.

Results

Out of the 903 distributed questionnaires, 901 (99.78%) were completed correctly. Students' general characteristics are described in Table I. Mean age was 16.7 years (10-25).

Table I: General characteristics of high school students

		n	%
Age	Minor (< 18)	647	71.8
	Major (≥ 18)	254	28.2
Gender	Male	431	47.8
	Female	470	52.2
High school status	Public	401	44.5
	Private	500	55.5
	- Denominational	319	35.4
	- Non denominational	181	20.1

Cigarette consumption

The rate of students who smoked even once in their lifetime was 46.3% (n = 417) with male predominance (66% of boys versus 27% of girls). Among them, 58 (14.14%) smoked their first cigarette before the age of 10; 187 (44.84%) from 10 to 14 years and 171 (41%) from 15 to 19 years.

The prevalence of current active smokers was 11.7% (n = 105). Current smoking students were aged between 14 and 25.

Determinants of smoking are cited in Table II and Table III.

Tobacco dependance

According to the Fagerström test, 50 (47.6%) of the 105 current smokers were not tobacco dependent, 15 (14.3%) were slightly dependent, 31 (29.5%) moderately dependent, and 7 (6.7%) strongly dependent.

Table II: Determinants of current smoking

		n	Current smoking	p	Odds Ratio
Gender	Male	431	79	0.000	0.261
	Female	470	26		[0.164-0.415]
Age	Major	254	34	NS	-
	Minor	647	71		
Marital status of parents	Single	130	17	NS	-
	Biparental	771	88		
High school status	Private	500	51	NS	-
	Public	401	54		
Have you received informations on the composition of tobacco?	No	395	57	NS	-
	Yes	339	41		
Have you received informations on the consequences of tobacco?	No	58	15	0.003	0.401
	Yes	677	83		[0.213-0.753]
Are students punished if	No	53	8	NS	-

they are caught smoking?	Yes	848	97		
Are there regulations in your high school that prohibit smoking?	No	28	4	NS	-
	Yes	873	101		
Is there an anti-smoking law in Madagascar?	No	125	15	NS	-
	Yes	776	90		

NS : not significant

Why did students smoke and why did they stop smoking ?

We asked the reason why the 417 students smoked: 293 (70.3%) cited "to test tobacco", 68 (16.3%) "influence of others", 19 (4.6%) "fun", 12 (2.9%) "conviction", 6 (1.4%) "fashion", 3 (0.7%) "prohibition" and 15 (3.6%) "other reasons".

Three hundred and twelve high school students had stopped smoking for different reasons: 227 (72.7%) because of the fear of tobacco-related diseases ; 71 (22.7%) because of the ban ; 39 (12.5%) say not tolerating tobacco ; 26 (8.3%) stopped because of lack of money and 3 (0.9%) cited other reasons. Many students cited more than one reason.

Table III: Influence of the smoking circle on student's nicotinism

		Never smoked	**Smoked before**	**p**	**Odds Ratio**
Close friend	Smoking	130	207	0.000	2.677
	Non-smoking	353	210		[2.027-3.534]
Father	Smoking	155	157	NS	-
	Non-smoking	329	259		
Mother	Smoking	50	52	NS	-
	Non-smoking	434	365		
Brother/sister	Smoking	76	90	0.023	1.478
	Non-smoking	408	327		[1.054-2.072]
Teacher	Smoking	354	324	NS	-
	Non-smoking	130	93		
Cousin	Smoking	237	248	0.002	1.529
	Non-smoking	247	169		[1.174-1.993]
Uncle/Aunt	Smoking	364	306	NS	-
	Non-smoking	118	111		
Grandparents	Smoking	200	185	NS	-
	Non-smoking	283	231		

NS : not significant

Anti-smoking measures in Madagascar

Smokers or non-smokers, 776 (86.1%) students knew the existence of anti-smoking laws in Madagascar but 653 (72.5%) admitted they did not know the means of fight against tobacco in the country.

High school's discipline such as punishment brought fear to 552 (61.3%) students but did nothing to 200 (22.2%) ; 136 (15.1%) did not care and laughed and 13 (1.4%) students stood for other options (like thinking).

Buying cigarettes

Out of the 105 current smokers, 88 (83.8%) bought cigarettes in grocery stores, 16 (15.2%) on the street and 4 (3.8%) in other places.

Eight hundred and sixty-two (95.6%) students affirmed that the seller does not ask their age when they buy cigarettes.

To the question "with what money do you buy cigarettes?" 85 (80.9%) answered "pocket money", 10 (9.5%) "tobacco budget", 4 (3.8%) "money for something else" and 6 (5.7%) "others".

Table IV: Evaluation of the price of cigarettes by students

	Non-smokers	Current smokers	p
Expensive	124 (15.6%)	25 (23.8%)	0.000
Affordable	114 (14.3%)	46 (43.8%)	
Cheap	95 (11.9%)	16 (15.2%)	
I do not know	463 (58.2%)	18 (17.1%)	

Table V: Existence of an impact of the means of fight against tobacco on students
(Answer to the question: "Did the means of fight against tobacco have any impact on you?")

	Impact	
	Yes	**No**
Increase price tobacco	450 (49.9%)	451 (50.1%)
Prohibition of the purchase of cigaretttes to younger than 18 years old	312 (34.6%)	589 (65.4%)
Cigarette package warning	298 (33.1%)	603 (66.9%)
No smoking in certain public places	488 (54.2%)	413 (45.8%)

Table VI: Knowledge of tobacco-related diseases

	Smoking	**Strongly agree (%)**	**Agree (%)**	**Unsure (%)**	**Disagree (%)**	**Strongly disagree (%)**	**p**
Cardiac diseases	No	23.7	21.6	34.2	15.3	5.2	0.004
	Yes	16. 2	17.1	32.4	21	13.3	
Vascular diseases	No	33.9	28.8	26.8	8.2	2.4	NS
	Yes	21.9	37.1	24.8	12.4	3.8	
Respiratory diseases	No	79.9	17.8	1.5	0.3	0.5	NS
	Yes	68.6	26.7	3.8	0	1	
Sexual diseases	No	5	7.7	30	30.7	26.6	NS
	Yes	5.7	7.6	22.9	28.6	35.2	
Cancers	No	72.4	19.8	4.9	1.4	1.5	0.008
	Yes	57.1	28.6	11.4	1.9	1	

NS : not significant

Discussion

Students who smoked before

In our study, the prevalence rate of students who experimented with tobacco was 46.3% with a male predominance. In Madagascar, during the 2008 Global Youth Tobacco Survey (GYTS) conducted by WHO, this prevalence was 27% (42% of boys and 15% of girls) (Rakotoniaina, 2008). In Befinoana and Razanamihaja (2011) study in all Madagascar in 2011, 36.3% of the 711 schoolchildren reported having already tasted tobacco and boys smoked twice as much as girls. In Senegal in the GYTS survey in 2007, the prevalence of students who experimented with tobacco was 12% (20% of boys and 5% of girls) (Samba, Mohamadou, Doulo, Aliou & Khady, 2007). In France, however, with a high rate of 52% of adolescents who experimented with smoking in 2011, the predominance of girls (62%) was striking (Minary et al., 2011). In Denmark, in 2007 in ″the European School Survey Project on Alcohol and Other Drugs″ (ESPAD), there was no difference in the prevalence between girls and boys (30%) (Hibell et al., 2009). We see that the prevalence of those who have experimented with smoking among our teenagers seems to be increasing. Male dominance is found as in other African countries. In Madagascar, as in many African countries, the smoking of girls is more likely frowned upon. Actually, in our contry, the smoking girl is considered as a bad girl, poorly educated and rebellious. In contrast, in some western countries a smoking girl can be considered as an emancipated and confident girl (Kouassi et al., 2013).

Current smoking

On one hand, the prevalence of active current smoking was 11% in our study versus 12% in urban Antananarivo in 2013 (Razakandisa, 2013), 19% in all of Madagascar in 2008 (GYTS survey) (Rakotoniaina, 2008), 5.1% in the whole island in 2011 in schools (Befinoana & Razanamihaja, 2011) and 6.59% among high school students in Mahajanga in 2014 (Randriamihangy, Adamo Ben Allaoui, Raveloson & Raharimanana, 2016). It was 13% in Dakar in 2011 (Faye, Seck, Seye Ndiaye, Ndiaye & Tal-dia, 2011), 12% in South Africa (GYTS 2011) (WHO, 2011), 9% in the 2013 GYST in Algeria (WHO, 2013). On the other hand, this prevalence during high school years was 30.8% in France in 2011 (Spilka & Nézet, 2013) and 32% in Denmark in 2007 (Hibell et al., 2009). Thus, the prevalence of smoking in Africa were closer to ours with a lower rate than that of European countries. The prevalence of active smoking in suburban areas of Antananarivo was not far from that of the urban area two years earlier.

Influence of smoking circle

The influence of the smoking circle on the increased risk of smoking,

especially smoking teanagers (close friend, brother/sister, cousin), was found in our study (Table III). In Senegalese schools, smoking students had a close friend who smoked in 29% of cases (Faye et al., 2011). According to the study by Hutchinson, having a smoking best friend increased the chance of being a smoker by 5 times (Hutchinson, Richardson & Bottorff, 2008). According to Lalonde, having smokers among his best friends was probably the strongest and most regularly identified predictor of smoking among 14- to 18-year-olds (Lalonde & Heneman, 2004).

Tobacco dependence

We found that 52% of active smokers were tobacco addicts and 7% were highly dependent. In Senegal in 2011, 2% of pupils were highly dependent (Faye et al., 2011). In France, in 2010, in the TABADO program, 30% of daily smokers aged 17 to 18 were highly dependent on tobacco (Minary et al, 2010). Tobacco dependence can vary considerably as it depends on several factors including the importance of smoking and the sensitivity of the adolescent.

Why did students smoke and why did they stop smoking ?

The motive of smokers students reflects the importance of the influence of others. This has also been found by other authors (Afifa et al., 2009).

The main causes of tobacco consumption cessation were fear of tobacco-related diseases. The literature also reports it (Afifa et al., 2009; Chabrol et al, 2000). But awareness of tobacco-related diseases seems insufficient (Table VI). The students easily cited respiratory diseases then cancers. In contrast, the association of tobacco with cardiovascular, sexual and other diseases was much less well known, as elsewhere (Faye et al., 2011). This probably requires revisions in the anti-smoking messages.

Anti-smoking measures in Madagascar

Most of the students found that the means of fight against tobacco had no impact on them (Table V). Nevertheless, sanctions scared 61.3% of all participants. Students bought their cigarettes in grocery stores without being refused despite their age. Actually, sellers rarely asked their age. This situation has hardly changed since the 2008 GYTS Report in Madagascar (Rakotoniaina, 2008) and even the 2007 GYTS Global Survey (Warren et al., 2007). Students had unrestricted access to tobacco as the majority of anti-smoking laws were not enforced. Moreover, the price of cigarettes is not a significant barrier for youth, as 59% of high-school smokers found it's price to be either affordable or cheap (Table IV), while young people are sensitive to the price of cigarettes (Befinoana & Razanamihaja, 2011). The inefficiency

of adolescent tobacco control is well known in Africa and Europe (WHO, 2013). In France, only the increase in the price of tobacco had significantly changed young people's tobacco consumption (Bogdan et al., 2010). It seems that the most effective way is to make access to smoking impossible for teenagers.

Limitations of the study and future study plan

First, the student's intellectual level varies from one class to another and each student has his own personality. Thus, possible biases could have been eliminated by personal interview. But personal interview is not compatible with the respect for anonymity.

Then, in Madagascar, a significant proportion of adolescents are no longer in school and are therefore not accessible with this type of survey. Thus, in order to have a more accurate assessment of adolescent smoking, a study among those who left school too early is required. Indeed, the fight against smoking should also concern them.

Conclusion

The prevalence of nicotinism among suburban high school students in Antananarivo is worrying and similar to that of the urban area. Most of tobacco control measures seem ineffective. Given the influence of the smoking circle, especially that of other teenagers, we suggest an active anti-smoking strategy involving non-smoking teenagers.

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