Original article

Prevalence and predictors of smoking in Butajira town, Ethiopia

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Abstract

Background: In order to design effective tobacco control policy in low income countries, it is essential to understand smoking prevalence and predictors. In Ethiopia, most of what is known on the prevalence of smoking comes from studies in larger towns. Little is known about predictors of smoking in any Ethiopian setting.

Objectives: The analyses reported were designed to determine smoking prevalence and social factors associated with ever smoking in Butajira town.

Methods: Cross-sectional study nested within a large questionnaire-based survey undertaken in Butajira, southern Ethiopia, between February and April 2003.

Results: Prevalence data were available on 1895 individuals aged 15 years and over. 15.4% of men and 0.2% of women had ever smoked, and 11.8% and 0.2% respectively, were current smokers. Using logistic regression, male gender ($p<0.001$), increasing age ($p<0.001$), being a follower of Islam ($p=0.002$), and being in formal employment ($p=0.033$) were found to be independent predictors of ever smoking.

Conclusions: Socio-demographic predictors of cigarette smoking in Butajira Ethiopia are different to those found in high income countries. The predictors found here suggest that increased taxation may be the most effective tobacco control measure in this low income country setting. [*Ethiop.J.Health Dev.* 2005;19(3):182-187]

Introduction

During the past two decades, cigarette consumption in high income countries has declined by 0.5%, while in low income countries it has increased by 2.5% (1). The effects of these changes in consumption are already becoming apparent in terms of tobacco-related deaths. In the year 2000 there were at least a million deaths attributable to tobacco world wide, with the increase being most marked in low income countries (2). Within a country, cigarette consumption differs in different socio-economic groups, with the distribution of consumption being a phenomenon that is dynamic rather than fixed over time. Early in a country's tobacco epidemic, smoking levels increase with income as smokers increase their consumption to the extent to which they can afford, but later, tobacco consumption becomes concentrated among those with lowest income and education (3). Studies conducted in South Africa (4,5,6) and Nigeria (7) illustrate this predominance of tobacco consumption among higher socio-economic groups. However, in urban Tanzania and another population in Nigeria, socio-economic status was found to be inversely associated with smoking status, suggesting populations further along the epidemiological transition (8,9). Similarly, in urban Chad, smoking was associated with unemployment among men (10). Although few studies have directly explored the association between socio-economic status and smoking in Ethiopia, in one study conducted among Ethiopian university instructors, lifetime prevalence of smoking was shown to increase with level of education and level of income (11).

One key reason that it is important to correctly determine tobacco consumption according to socio-economic status for a given country is that the distribution will determine the type of preventive interventions that may be effective in reducing intake. Among lower socio-economic groups, both overall prevalence and per capita cigarette consumption are reduced significantly more in reaction to cigarette price increase than among higher socio-economic groups (12). However, the effect of different forms of health education appears to follow a positive linear correlation with socio-economic status, with the greatest effect in reducing cigarette consumption among the higher socio-economic groups. Ranson et al estimated the effectiveness and cost-effectiveness of various tobacco control policies, and demonstrated that tax increases raising the price of cigarettes by 10% were most cost-effective in low- and middle-income countries (13). Recently, van Walbeek ascribed most of the reduction in cigarette consumption between 1993 and 2000 in South Africa to sharp increases in cigarette prices (14). Thus, in order to determine which measures may be most effective and cost-effective in curbing the tobacco epidemic in a given country, it is important to understand the socio-economic distribution of tobacco consumption in that country.

To date, little is known about either the prevalence of smoking or its predictors in Ethiopia. Studies have tended to focus on large cities (11,15,16), and the scale of

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tobacco consumption in small towns or rural areas, where more than 90% of the population lives, is little studied. We took the opportunity of a large scale community-based small town survey undertaken for other reasons to nest within it analyses designed to address the following objectives: to determine the prevalence of ever- and current smoking in a small town of Ethiopia; and to investigate socio-demographic predictors of ever-smoking in the same setting.

Methods

Study site. The original survey was conducted in Butajira, a small town 135 km south-west of Addis Ababa, the capital of Ethiopia. This location was chosen because Butajira town and surrounding rural areas are part of an ongoing demographic surveillance project (the Butajira Rural Health Programme, BRHP) started in 1985. Thus up-to-date lists of residents of one of the four *kebeles* (administrative units) of the town are available as an electronic database.

Sampling technique and sample size. As part of a larger research project, a random sample of approximately one in seven urban residents aged five years and over was taken from the BRHP database. A sample size of 1867 over 15-year-olds was calculated to have 90% power to yield an estimate of smoking prevalence not exceeding 10% (95% confidence interval 9% to 11%), data from an earlier study in Jimma town, (17) in this age group. While data collection was ongoing, it became apparent that significant migration both in and out of the town had occurred as a consequence of the drought in southern and eastern Ethiopia. The pragmatic decision to substitute selected household residents with in-migrants of the same gender and +/- 5 years of age was made and adhered to.

Instruments. Fifty data collectors and ten supervisors were trained to administer a questionnaire derived from the International Union Against Tuberculosis and Lung Disease questionnaire with local adaptations, translated into Amharic. This questionnaire covers a range of socio-demographic factors and a section on smoking. The questions on smoking included 'Have you ever smoked for as long as a year?' and 'Do you smoke now?' Respondents were asked the age of onset of smoking, the number and type of cigarettes currently or previously smoked, and subsidiary questions on cutting down or ceasing smoking. In order to assess socio-demographic status, questions on education, occupation and income were asked.

Data Categorization. Respondents could choose one of five categories of educational level attained (cannot read or write; can read and write; grade 1-6; grade 7-12; or higher education). For later analysis, educational level was categorized to 'no formal education' (the two lowest educational categories) and 'formal education' (the three higher educational categories). Occupation was categorized into 'employed' (those describing themselves as farmers, merchants, both farmers and merchants or the military) and 'unemployed' (those describing themselves as unemployed, students or housewives) on the basis that people in the latter groups were less likely to have an independent source of income. Average monthly income (in Birr, 8.5 Birr ≈ 1 USD) was categorized into six groups (none, 1-10 Birr, 11-50 Birr, 51-100 Birr, 101-300 Birr and >300 Birr). Age 15 years and above was selected as the cut-off in order that results could be compared with other studies in low-income countries.

Other Operational Definitions.

Ever smoker. Any individual answering 'Yes' to the question: "Have you ever smoked for as long as one year?"

Current smoker. Any individual answering 'Yes' to the question: "Do you smoke now?"

Data Analysis. The data were entered into Epi-Info version 6, checked and cleaned, and then exported to SPSS version 10 for analysis. We calculated the percentage of ever- and current smokers in the whole group, the mean daily cigarette consumption of smokers, and the mean age of smoking debut. We used the X^2 test to calculate the significance of univariate cross-tabulations. We used step-wise binary logistic regression to investigate predictors of ever-smoking with never smokers as the reference level.

Ethical Approval. Approval for the study was given by ethics committees in Addis Ababa and Nottingham Universities.

Results

Of 3019 respondents to the original study, 1895 were 15 years and more. This group was used for all subsequent analyses. The response rate was 62% before, and 81% after, the substitutions made as described in the Methods. Socio-demographic characteristics of participants are shown in Table 1.

The percentage of ever-smokers among respondents aged 15 years and more was 5.8% (95% confidence interval 4.7 to 6.9), with 15.4% of men and 0.2% of women having ever smoked ($p<0.001$ for difference between genders). Only 4.4% (95% CI 3.5% to 5.4%) of respondents were current smokers (11.8% of men and 0.2% of women, again, $p<0.001$). For further analysis, males and females were combined because of the small numbers of female smokers.

The average age of smoking debut was 23.2 years (range 4 to 55 years), and the average daily cigarette consumption was 6.6 cigarettes (range 1 to 20 cigarettes), almost exclusively of the brand *Nyala*. Per annum, this works out to a per capita consumption of 138.5 cigarettes per person aged 15 years and over.

Table 1: **Socio-demographic characteristics of study population, Butajira, 2003**

Variable		Number	Percentage
Gender	Male	693	36.6
	Female	1202	63.4
Age group (years)	15-19	616	32.5
	20-39	819	43.2
	40-59	291	15.4
	60+	169	8.9
Religion	Orthodox Christian	648	29.6
	Muslim	1464	66.2
	Other	99	4.2
Ethnicity	Meskan	1159	61.2
	Silti	165	8.7
	Dobi	148	7.8
	Sodo	122	6.4
	Amhara	93	4.9
	Weleney	50	2.6
	Oromo	34	1.8
	Other	124	6.5
Education	Cannot read/write	511	27.0
	Read & write	173	9.1
	Grade 1-6	475	25.1
	Grade 7-12	660	34.9
	Higher	74	3.9
Occupation	Farmer	66	3.5
	Merchant	626	33.0
	Unemployed	76	4.0
	Housewife	307	16.2
	Student	561	29.6
	Other	259	13.7
Monthly Income (Birr)	Up to 10	980	51.7
	More than 10	915	48.3

Ever-smoking was significantly associated with age (X^2 for trend across 10-year age groups $p<0.001$), and with being a follower of Islam rather than an Orthodox or other Christian (6.6% vs. 4.1%, respectively, $p = 0.025$). However, no associations were noted by ethnic group. The unemployed were less likely to be ever smokers than those in employment (1.1% vs. 6.7%, respectively, $p<0.001$). There was a strong and significant increasing prevalence of smoking with increasing income group (1.4% lowest income group to 23.2% highest income group, p for trend <0.001). When grouped into two around the median income value, 9.8% of those earning more than 10 Birr per month and 1.9% of those earning 10 Birr or less per month were ever-smokers ($p<0.001$). Similarly, there was increased prevalence of smoking with increasing educational achievement (2.5% illiterate group to 16.2% higher education, p for trend <0.001). Binary classification into no formal education and any formal education demonstrated that 3.9% vs. 6.8%, respectively, were ever smokers (p=0.009), Table 2.

Table 2: **Predictors of ever-smoking in small town Ethiopia, Butajira, 2003**

Variable		Crude Analysis			Multivariate Analysis*		
		OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Gender	Male	109.56	26.58-643.19	**<0.001**	104	25.0-431.5	**<0.001**
	Female	1.00	-		1.00	-	
Age group	15-19	1.00	-	For	1.00	-	For
(years)	20-39	10.16	3.50-33.23	trend	8.11	2.09-31.43	trend
	40-59	27.99	9.52-92.56	**<0.001**	31.76	7.20-140.14	**<0.001**
	60+	8.61	2.39-33.63		20.09	3.82-105.30	
Religion	Muslim	1.67	1.04-2.69	**0.025**	4.37	1.74-10.98	**0.002**
	Other	1.00	-		1.00	-	
Employment	Yes	6.75	3.27-14.34	**<0.001**	3.05	1.09-8.50	**0.033**
	No	1.00	-		1.00		
Education	Formal	1.77	1.11-2.84	**0.011**	2.21	0.88-5.54	0.091
	No Formal	1.00	-		1.00	-	
Monthly	10+ Birr	5.52	3.26-9.44	**<0.001**	1.29	0.52-3.18	0.583
Income	≤10 Birr	1.00	-		1.00	-	

* Adjusted for gender, age, religion, employment, education and income

After adjustment using binary logistic regression, factors independently associated with ever-smoking were male gender ($p<0.001$), increasing age ($p<0.001$), being a follower of Islam ($p = 0.002$) and being in formal employment ($p = 0.033$), Table 2. Both having formal education and income over 10 Birr per month remained positively associated with ever-smoking, but lost statistical significance.

Discussion

Although our study has several potential limitations, including reporting bias in relation to smoking status and income, and the difficulties of temporal interpretation of associations in a cross-sectional study, we consider it may still contribute to understanding of smoking in the context of small town sitting in Ethiopia.

At 5.8% and 4.4% respectively of over 15 year-olds, ever-smoking and current smoking prevalence is still low in small-town in Ethiopia. The prevalence of current smoking in the present study is lower than that reported from comparable populations in any other African country, including South Africa (6, 14), Sudan (18), Tanzania (8, 19), The Gambia (20), Zimbabwe (21) and Nigeria (9). The prevalence of current smoking in each study is summarized in Table 3.

Table 3: **Prevalence of current smoking in six African countries, 1990 to 2002**

Country	Type of data	Current Smokers (%)	Reference/ Year Published
South Africa	DHS survey N = 13,826	24.6%	6 2002
South Africa	Commercial product usage database	27%	14 2002
Tanzania	Urban population survey N = 973	27% (males) 5% (females)	19 2002
Tanzania	Urban population survey N = 9254	22.0% (males) 2.6% (females)	8 2002
The Gambia	Urban/rural population survey N = 5389	34%/42% (urban/rural males) 1.5%/6% (urban/rural females)	20 2001
Zimbabwe	Urban population survey N = 1023	36.1% (males) 1.3% (females)	21 1997
Nigeria	Population survey N = 1271	22.6%	9 1990
Sudan	Population survey N = 21,648	12.0% (males) 0.9% (females)	18 1998

Earlier studies in Ethiopia have generally been in large urban centres or among specific sub-communities. A study of young people aged 15 to 24 years in Addis Ababa demonstrated current smoking prevalence of 11.8% in males and 1.1% in females (16). Among instructors at four colleges in north-west Ethiopia, 13.3% were current smokers (11). Among diabetic patients attending a clinic in Addis Ababa, 6.6% were current smokers (15). Fourteen percent of urban and 6% of rural blood donors in Gondar were current smokers (22).

The reasons for our lower prevalence estimate may include different study populations and differences in the manner in which 'ever-smoker' is defined. Several of the other African studies were conducted in larger towns (8,19,21), and the Ethiopian populations are drawn from the capital (15,16) or a large university town (11,22). Urbanization is associated with smoking (20), thus it is not surprising to find a lower prevalence in the small town setting of the present study than in the earlier Ethiopian studies.

We considered a smoker to be an individual who had smoked for as long as one year, while Kebede (11) considered anyone who had smoked even a single cigarette to be an 'ever-smoker'. The most similar previous study in Ethiopia, which used the same definition of an ever-smoker, but in a larger town (Jimma), yielded an overall prevalence of smoking of less than 6% (17).

Daily cigarette consumption (6.6 cigarettes per day) was lower than that reported from Nigeria (9), but approximately equivalent to estimates from Kenya (23) and among high-school students in Ethiopia in the late1970s (24). Calculation of annual per capita cigarette consumption from daily consumption among smokers yields an estimate higher than that made by the World Health Organization for Ethiopia in 1997(1), but the figure we calculated is in line with the increase shown over previous years. However, per capita consumption in Ethiopia is still lower than for most other African countries for which data are available.

Smoking is strongly associated with male gender in every other population based study performed in Africa (6,9,18,19,20,21), with the strength of association as a rule diminishing with development status of the country. We detected a significant positive association between smoking and age group, consistent with findings from Tanzania (19).

Followers of Islam were twice as likely to smoke as Orthodox and other Christians after adjustment for gender, age, education, employment and income level. The association between religious affiliation and smoking was also demonstrated among students in Sierra Leone (25), and in one previous study in the rural population surrounding Butajira, in Ethiopia (26). The latter study demonstrated *khat* (*catula edulis*) use to be associated with smoking. *Khat* was said by study participants to be useful for increasing concentration during Muslim prayer, which may explain the association we found.

Although smoking was associated with education level on bivariate analysis, the association lost significance after adjustment for age, gender, religion, employment and income level. The same was reported by Strebel after logistic regression (4). Certain studies have found a positive association between giving occupation as 'student' and smoking, however, we found students to be at lower risk of smoking than those in other occupational categories, probably because all school students were included in our definition, not simply students of higher education. The association between occupation and smoking in our study disappeared when adjustment for income was performed.

Although the median income level in Butajira town was very small (10 Birr per month or about 1.2 US dollars), income level remained positively but non-significantly associated with smoking after adjustment for age, gender, religion, employment and education level. Our findings of a positive but non-significant association are in accord with results from South Africa (4) and Nigeria (7) and even within a group of Ethiopian professionals (11). One interpretation of this is that the tobacco epidemic was at a more advanced stage in the populations studied in urban Nigeria and Tanzania than it was either in South Africa at the time, or is currently in Ethiopia.

In conclusion, we have gathered data from a small-town population in Ethiopia which enables identification of groups at risk of smoking. In this small-town setting in Ethiopia, men who are older, followers of Islam, or in formal employment are the most likely to have ever smoked. Smoking prevention strategies directed at these groups are most likely to succeed in diminishing overall prevalence. The age of smoking debut is almost 10 years later than in high income countries and several middle income African countries, suggesting a sizeable opportunity for intervention. Given that ever smoking is positively associated with employment status, increasing cigarette price through taxation is likely to be the most effective prevention strategy under these circumstances.

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Reference

1. World Health Organization. Tobacco or Health: A global status report. Geneva, World Health Organization 1997.
2. World Health Organization. The World Health Report. Geneva, WHO 2002.
3. World Health Organization. The World Health Report. Geneva, WHO 1999.
4. Strebel P, Kuhn L, and Yach D. Determinants of cigarette smoking in the black township population of Cape Town. Epidemiology and Community Health. 1989; 43, 209-213.
5. Peltzer K. Smokeless tobacco and cigarette use among black secondary school students in South Africa. Substance Use and Misuse. 2003; 38, 1003-1016.
6. Steyn K, Bradshaw D, Norman R, Laubscher R, and Saloojee Y. Tobacco use in South Africans during 1998: the first demographic and health survey. Journal of Cardiovascular Risk. 2002; 9, 161-170.
7. Taylor OG, Oyediran OA, Bamgboye AE, Afolabi BM, and Osuntokun. Profile of some risk factors for coronary heart disease in a developing country: Nigeria. African Journal of Medicine and Medical Sciences. 1996; 25, 341-346.
8. Bovet P, Ross AG, Gervasoni JP, Mkamba M, Mtasiwa DM, Lengel P, et al. Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania, and associations with socio-economic status. International Journal of Epidemiology. 2002; 31, 240-247.
9. Obot IS. The use of tobacco products among Nigerian adults: a general population survey. Drug and Alcohol Dependency.1990; 26, 203-208.
10. Leonard L. Cigarette smoking and perceptions about smoking and health in Chad. East African Medical Journal.1996; 73, 509-512.
11. Kebede Y. Cigarette smoking and khat chewing among university instructors in Ethiopia. East African Medical Journal. 2002; 79, 274-278.
12. Townsend J, Roderick P, and Cooper J. Cigarette smoking by socio-economic group, sex and age: effects of price, income and health publicity. British Medical Journal. 1994; 309, 923-927.
13. Ranson MK, Jha P, Chaloupka FJ, and Nguyen SN. Global and regional estimates of the effectiveness and cost-effectiveness of price increases and other tobacco control policies. Nicotine and Tobacco Research. 2002; 4, 311-319.

14. Van Walbeek C. Recent trends in smoking prevalence in South Africa - some evidence from AMPS data. South African Medical Journal. 2002; 92, 468-472.
15. Seyoum B, Abdulkadir J, Berhanu P, Feleke F, Worku Y, and Ayana G. Profile of coronary artery risk factors in Ethiopian diabetic patients. East African Medical Journal. 1999; 76, 105-107.
16. Betre M, Kebede D, and Kassaye M. Modifiable risk factors for coronary heart disease among young people in Addis Ababa. East African Medical Journal. 1997; 74, 376-381.
17. Scrivener S, Yemaneberhan H, Zebenigus M, Tilahun D, Girma S, Ali S, et al. Independent effects of intestinal parasite infection and domestic allergen exposure on risk of wheeze in Ethiopia: a nested case-control study. Lancet. 2001;358, 1493-1499.
18. Idris AM, Ibrahim YE, Warnakulasuriya KA, Cooper DJ, Johnson P, and Nilsen R. Toombak use and cigarette smoking in the Sudan: estimates of prevalence in the Nile state. Preventive Medicine. 1998; 27, 597-603.
19. Jagoe K, Edwards R, Mugusi F, Whiting D, and Unwin N. Tobacco smoking in Tanzania, East Africa: population based smoking prevalence using expired alveolar carbon monoxide validation tool. Tobacco Control. 2002; 11, 210-214.
20. Walraven GE, Nyan OA, Van Der Sande MA, Banya WA, Ceesay S, Milligan PJ, et al. Asthma, smoking and chronic cough in rural and urban adult communities in The Gambia. Clinical and Experimental Allergy. 2001; 31, 1679-1685.
21. Watts TE and Siziya S. Education, occupation and health status of people age five years or more living in a high density urban area in Zimbabwe. Central African Journal of Medicine. 1997; 43, 260-264.
22. Gebre-Yohannes A and Rahlenbeck SI. Coronary heart disease risk factors among blood donors in northwest Ethiopia. East African Medical Journal. 1998; 75, 495-500.
23. Lore W. Smoking habits in Kenya I - A preliminary study involving University of Nairobi medical students. East African Medical Journal. 1987; 64, 248-251.
24. Ahmed Z and Abuhay M. The prevalence of cigarette smoking among secondary school children in Gondar city, Ethiopia. Ethiopian Medical Journal. 1979; 17, 41-45.
25. Abul Bangura S, Lisk RD. Tobacco and cannabis smoking in secondary school pupils in Sierra Leone. West African Journal of Medicine. 1995; 14, 157-160.
26. Alem A, Kebede D, and Kullgren G. The prevalence and socio-demographic correlates of khat chewing in Butajira, Ethiopia. Acta Psychiatria Scandanavia Supplement. 1999; 397, 84-91.