

# Precursors of atherosclerotic and hypertensive diseases among adolescents in Addis Ababa, Ethiopia

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*The present study measured the prevalence of the precursors of atherosclerosis among 519 adolescents selected from high-school students in Addis Ababa. Also assessed was their knowledge about these precursors and about the hazards of smoking and of heavy alcohol consumption. A total of 13.8% of the adolescents smoked, 11.6% had a sedentary lifestyle, 9.2% consumed alcohol heavily, 14.1% were obese, 30.3% had one risk factor, and 4.4% had two risk factors for atherosclerosis. Altogether, 58% had inadequate knowledge about the precursors of atherosclerosis, and 62% and 51.4%, respectively, had inadequate knowledge about the hazards of smoking and of consuming alcohol. High-risk behaviours were positively associated with upper-income families and inadequate knowledge about the precursors of atherosclerosis.*

*A substantial proportion of adolescents in Addis Ababa therefore exhibit the precursors of atherosclerotic and hypertensive diseases. Further, similar studies should be carried out in other Ethiopian cities, and the Ministries of Health and Education should give due attention to the primary prevention of these diseases and formulate plans for appropriate actions.*

## Introduction

Recently a WHO Expert Committee concluded that cardiovascular diseases will emerge or be established as a substantial health problem in virtually every country in the world by the year 2000 (1). Although the major health problems in developing countries are malnutrition and communicable diseases, and the majority of their populations live in poverty, there have been marked changes in the living standards of the urban populations in these countries.

It has been estimated that when life-expectancy reaches 50–60 years mortality from cardiovascular diseases accounts for 15–25% of all deaths (1). Among the urban communities of developing countries life-expectancy at birth is currently over 50 years. In Addis Ababa, for example, life-expectancy is 63.3 years and about 12% of the Ethiopian population live in urban areas (2). As is the case in all developing countries, in Ethiopia national statistics grossly underestimate the effect of cardiovascular diseases on urban communities.

Extensive research conducted in developed countries on atherosclerotic diseases (coronary heart disease, atherosclerosis of the aorta and main arteries supplying the brain, the trunk, and lower extremities) and hypertensive diseases have shown that the major but potentially preventable precursors are smoking, obesity, a sedentary lifestyle, heavy alcohol consumption, diabetes, and hypertension (3). Trend analyses in these countries have revealed that the 1950–60 epidemic of cardiovascular mortality has been decreasing since 1970 (4) because of primary prevention activities. Secondary preventive strategies (begun after the onset of clinical disease) have not yet proved to be effective because of the short time between the first manifestation of these diseases and death, and the relatively high frequency of recurrence, disability, and mortality among survivors (3).

The precursors of atherosclerotic and hypertensive diseases start in childhood, and autopsies have shown early atherosclerotic changes in children and adolescents. Behavioural risk factors for these diseases are initiated in childhood and adolescence before they become established in adults. Preventive activities, if they are to be effective should, therefore, begin among children and adolescents (5).

If current projections of a major epidemic of cardiovascular diseases among the urban populations of developing countries by the year 2000 are correct, the health services of these countries, which are

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already overburdened, will be overwhelmed by demands to deal with diseases that require tertiary level diagnostic and management resources. A consensus is now emerging that national health policies should be examined to address this problem, in order to institute preventive strategies among children and adolescents for the prevention of adult atherosclerotic and hypertensive diseases (6).

Adolescents in Addis Ababa constitute about 25% of the population (2); the magnitude of the behavioural and other risk factors for atherosclerotic and hypertensive diseases among them is, however, not known. The present study was carried out to measure the proportion of adolescents in Addis Ababa who smoked, were obese, had a sedentary lifestyle, drank alcohol heavily, had diabetes, and were hypertensive, as well as to identify the social factors associated with these factors. The study also assessed the knowledge that adolescents had on the precursors of atherosclerosis, and on the hazards of smoking and of heavy alcohol consumption.

## Materials and methods

### Study sample

The study was conducted among high-school students in Addis Ababa (current population: 1.8 million, of whom 27.6% are aged 10–19 years) (2). There are 37 high-schools in the city that are attended by 116 704 students (Ministry of Education, unpublished statistics, 1988).

The study population consisted of a random sample of students from grades 9, 10, and 11 who were attending government-owned high-schools in the city in the 1989–90 academic year. There are 20 such schools in Addis Ababa that are attended by 110 790 students (95% of the total high-school students in the city). Excluded from the study were four special (prison and vocational) schools (total population, 2479 students (2.1%)) and 13 private schools (3435 students (2.9%)).

A cluster sampling method, proportionate to size, was employed to select the study population. The procedure was as follows. A list of schools and sections within the schools and their numbers of students was obtained from the Addis Ababa regional branch of the Ministry of Education. This was used as the first-level sampling frame. Since the sections differed in size, we calculated the cumulative population and a sampling interval (cumulative total population/number of clusters). After identifying one section using a table of random numbers, we systematically selected 28 clusters (sections). These sections (classes) were located in 17 high schools. At the next level we used a systematic random sam-

pling procedure to select 20 students from each of the 28 clusters. This procedure gives an unbiased sample estimate (7) and is widely used in health surveys.<sup>a</sup>

### Questionnaires

A total of 519 (92.6%) out of the 560 students selected filled out the study questionnaires, which were in Amharic and self-administered. In order to increase the validity of the response, the questionnaires were administered anonymously (8). The questionnaires were first pretested among a group of high-school students in Addis Ababa (who did not participate in the study) before being used in the survey.

Closed items were used in the questionnaires to collect the following information: data on demographic, social, and medical characteristics of the students; their knowledge about the dietary and behavioural factors known to be precursors of atherosclerotic and hypertensive diseases; and their knowledge about the precursors of atherosclerosis, the hazards of smoking and of excessive alcohol consumption.

### Analysis of the results

Students were classified as “smokers” if they reported currently smoking one or more cigarettes a day, and “hypertensive” or “diabetic” if they reported having been told by a doctor to have the condition. A physical activity index was used to classify students as “sedentary” by scoring their response to a 13-item physical activity questionnaire. Students were asked to state whether they engaged in one or more of the following activities and if so, for how many hours per week: leisure time physical activities (walking, tennis, gymnastics, running, and cycling) and household activities (washing clothes or floor, chopping logs, grinding grain, digging, and climbing stairs). The physical activity items varied between those that required 5 kcal/min (moderate) to 14 kcal/min (strenuous) energy expenditure. The number of hours per week spent on the various activities were summed. Students were classified as sedentary if they did not regularly engage in at least 2 hours of moderate or 1 hour of strenuous physical activity per week, an approach that has been used in other studies (9, 10).

Self-reported height and weight data were used in the study; the validity and reliability of such data have been established in several studies (11, 12).

<sup>a</sup> *Diarrhoea morbidity, mortality, and treatment procedures: household survey manual*. Unpublished WHO document CDD/SER/86.1 Rev. 1.

There is no universal consensus on the definition of obesity in adolescents (13). In the survey, we therefore used two definitions of obesity. Following the recommendations of a WHO meeting, we defined obesity using the body mass index (BMI) ( $\text{kg}/\text{m}^2$ ), with BMIs of 20, 25, and 28, respectively, as cut-off points for classifying  $\leq 14$ -year-olds, 15-year-olds, and  $\geq 16$ -year-olds as obese (5). On the other hand, a report on obesity by the Royal College of Physicians of London (14), recommended that BMI should not be used and that instead a reference weight-for-height value derived from studies performed on U.S. children in the 1920s (15) should be employed. Because only median weight-for-height values are reported, 95% cut-off points cannot be used. Using this approach we classified students as obese if they exceeded 100% of the median values. These are close to the 120% cut-off point recommended by the Royal College of Physicians and, we feel, are appropriate for Ethiopia.

Comparison of our results on obesity obtained using these two approaches indicated that the agreement was 76.7% ( $\kappa = 0.25$ ). The proportions of students classified as obese according to the method used are shown in Table 2.

A semi-quantitative food-frequency questionnaire (FFQ) was used to assess the students' dietary fat intake and alcohol consumption. The validity and usefulness of FFQs for classifying people according to their level of nutrient intake have been established in several studies (16, 17). Ethiopian food composition tables were used to calculate the nutritional composition of each food item (18) and these were summed to obtain an individual's usual nutrient intake level. The dietary fat intake as a proportion of the total caloric intake was used to categorize adolescents into quartiles of fat intake. Proportions were used instead of absolute values in order to control for body size and physical activity differences between adolescents.

The frequency of intake and amount of the various types of alcoholic beverages consumed were scored and summed using the FFQs. We defined heavy intake to be regular consumption of 20 ml of ethanol per day, which corresponds to 50% of the cut-off value used by the Centers for Disease Control for classifying adults as chronic heavy drinkers (19).

To assess the students' knowledge about precursors of atherosclerosis, we used a 10-item questionnaire on the role of smoking, hypertension, diabetes, obesity, physical exercise, high dietary intake of fat (including animal fat), salt, and sugar; and blood cholesterol levels. Students who correctly responded to  $\geq 75\%$  of the items were classified as having adequate knowledge. To assess the students' knowledge about the hazards of smoking cigarettes, we used a

six-item questionnaire on the role of cigarette smoking on lung cancer, chronic lung disease, bladder cancer, cancer of the pharynx/larynx, low birth weight, and pregnancy wastage. To assess students' knowledge on the hazards of heavy alcohol intake, we used an eight-item questionnaire on the role of alcohol in liver disease, cancer of the liver, bladder cancer, diseases of the joints, pregnancy wastage, congenital malformation, mental retardation, and low birth weight. Students who responded correctly to  $\geq 75\%$  of each of the groups of items on smoking and alcohol were categorized as having adequate knowledge.

Data were processed using SAS software on a microcomputer (20). The significance of associations was examined using  $\chi^2$  and Fisher's exact tests (21).

## Results

The response rate for the study was 92.6% (519/560). Of the students who replied, 46.8% ( $n = 243$ ), 37.4% ( $n = 194$ ), and 15.8% ( $n = 82$ ), respectively, were from the ninth, tenth, and eleventh grade.

The sociodemographic characteristics of the study population are shown in Table 1. The age of

Table 1: Sociodemographic characteristics of the study participants, Addis Ababa, 1990

	Total	No. of males	No. of females
<i>Age (years)<sup>a</sup></i>			
10-14	144 (27.7) <sup>b</sup>	75 (26.1)	69 (29.7)
15-19	375 (72.3)	212 (73.9)	163 (70.3)
<i>Ethnicity</i>			
Oromo	84 (16.2)	48 (16.7)	36 (15.5)
Amhara	261 (50.3)	139 (48.4)	122 (52.6)
Gurage	64 (12.3)	35 (12.2)	29 (12.5)
Tigray	74 (14.3)	43 (14.9)	31 (13.4)
Other	30 (5.8)	17 (5.9)	13 (5.6)
<i>Parental income<sup>c</sup></i>			
<200	247 (47.6)	149 (51.9)	98 (42.7)
200-700	200 (38.5)	101 (35.2)	99 (42.7)
>700	53 (10.2)	30 (10.4)	23 (9.9)
<i>School grade</i>			
Nine	243 (46.8)	124 (43.2)	119 (51.3)
Ten	194 (37.4)	114 (39.7)	80 (34.5)
Eleven	82 (15.8)	49 (17.1)	33 (14.2)
Total	519 (100.0)	287 (100.0)	232 (100.0)

<sup>a</sup> Only 7 students (5 of them female) were aged < 13 years.

<sup>b</sup> Figures in parentheses are percentages.

<sup>c</sup> Per month in *birr* (1 *birr* = US\$ 0.48).

the students lay in the range 10–19 years, 72.3% ( $n = 375$ ) being 15–19 years of age. A total of 55.3% ( $n = 287$ ) were males, and 50.3%, 16.2%, 14.3%, and 12.3%, respectively, were from the Amhara, Oromo, Tigray, and Gurage ethnic groups. The parents of 47.6% ( $n = 3247$ ) of the students had a combined monthly income of less than 200 *birr* (1 *birr* = US\$ 0.48), while only 10.2% ( $n = 53$ ) had parents whose income exceeded 700 *birr*.

A total of 13.8% ( $n = 72$ ) of the students reported that they currently smoked one or more cigarettes a day, 11.6% ( $n = 60$ ) were sedentary, and 9.2% ( $n = 48$ ) consumed alcohol heavily (Table 2). In terms of their BMI, 25% ( $n = 130$ ) were obese; however, in terms of their reference weight-for-height values only 14.1% ( $n = 73$ ) were obese. Altogether, 30.3% ( $n = 157$ ) had one risk factor, while 4.4% ( $n = 23$ ) had two risk factors of atherosclerosis. A higher proportion of males than females smoked and drank heavily (14.6% versus 12.9% and 9.7% versus 8.6%, resp.), but these differences were not statistically significant. Females, on the other hand, were more sedentary (12.5% versus 10.8%) and obese

(24.6% versus 5.5%) than males, and for obesity the difference was highly statistically significant ( $P < 0.001$ ). Furthermore, the prevalence of having one risk factor or two risk factors was higher for females (38.4% and 6.9%, resp.) than males (23.7% and 2.4%, resp.) Both these differences were statistically significant ( $P < 0.001$  and  $P = 0.025$ , resp.).

Hypertension and diabetes that had been diagnosed by a doctor were reported by 1.7% ( $n = 9$ ) and 1.0% ( $n = 5$ ), respectively, of the students. Most of the students (64% ( $n = 334$ )), however, had never had their blood pressure measured.

A total of 58.0% ( $n = 301$ ), 62.0% ( $n = 322$ ) and 51.4% ( $n = 267$ ) of the students, respectively, had inadequate knowledge about the precursors of atherosclerosis, the hazards of smoking, and of heavy alcohol consumption. The differences between males and females in this respect were small and not statistically significant ( $P > 0.05$ ).

As shown in Table 3, the proportion of students who smoked was highest (20.7%) among those from the wealthiest background and lowest (14.2%) among the poorest. This was also true for students

Table 2: Precursors of atherosclerosis and hypertensive diseases, and knowledge about them among the study participants, Addis Ababa, 1990

	Total	No. of males	No. of females	P-value
Smoked	72 (13.8) <sup>a</sup>	42 (14.6)	30 (12.9)	
Sedentary lifestyle	60 (11.6)	31 (10.8)	29 (12.5)	
<i>Obese by:</i>				
BMI <sup>b</sup>	130 (25.0)	58 (20.2)	72 (31.0)	
Weight-for-height	73 (14.1)	16 (5.5)	57 (24.6)	<0.001
Heavy alcohol consumption	48 (9.2)	28 (9.7)	20 (8.6)	
<i>No. of risk factors</i>				
One <sup>c</sup>	157 (30.3)	68 (23.7)	89 (38.4)	<0.001
Two <sup>c</sup>	23 (4.4)	7 (2.4)	16 (6.9)	0.025
Hypertension	9 (1.73)	6 (2.1)	3 (1.3)	
Diabetes	5 (1.0)	4 (1.4)	1 (0.4)	
<i>Inadequate knowledge on:</i>				
Precursors of atherosclerosis	301 (58.0)	168 (58.5)	133 (57.3)	
Hazards of smoking	322 (62.0)	175 (60.9)	147 (63.3)	
Hazards of alcohol	267 (51.4)	140 (48.7)	127 (54.7)	
Total	519	287	232	

<sup>a</sup> Figures in parentheses are percentages.

<sup>b</sup> BMI = body mass index.

<sup>c</sup> Any one of the following behavioural precursors: smoking, sedentary lifestyle, obese, and heavy alcohol consumption.

Table 3: High-risk behaviours, by sociodemographic status, level of dietary fat intake, and knowledge of the precursors of atherosclerosis among the study participants, Addis Ababa, 1990<sup>a</sup>

	No. of smokers	No. sedentary	No. obese	No. who drank alcohol heavily	No. with:	
					One risk factor	Two risk factors
<i>Parental income<sup>b</sup></i>						
<200	35 (14.2) <sup>c</sup>	34 (13.7)	33 (13.3)	20 (8.1)	77 (31.2)	10 (4.0)
200–700	25 (12.5)	15 (7.5)	28 (14.0)	22 (11.0)	56 (28.0)	9 (4.5)
>700	11 (20.7)	8 (15.1)	8 (15.1)	5 (9.4)	18 (33.9)	2 (3.7)
<i>Dietary fat intake (quartile)</i>						
Upper	22 (15.9)	13 (9.4)	21 (15.2)	14 (10.1)	40 (28.9)	7 (5.1)
Medium	36 (12.8)	38 (13.5)	39 (13.8)	28 (9.9)	91 (32.4)	14 (4.9)
Lower	14 (14.0)	9 (9.0)	13 (13.0)	6 (6.0)	26 (26.0)	2 (2.0)
<i>Knowledge</i>						
Inadequate	43 (14.3)	38 (12.6)	43 (14.3)	19 (6.3) <sup>d</sup>	91 (30.2)	9 (2.9)
Adequate	29 (13.3)	22 (10.0)	30 (13.8)	29 (13.3)	66 (30.2)	14 (6.4)
Total	72	60	73	48	157	23

<sup>a</sup> Missing values are not shown; this accounts for the differences in totals for the various groups defined by risk variables.

<sup>b</sup> Per month in *birr* (1 *birr* = US\$ 0.48).

<sup>c</sup> Figures in parentheses are percentages.

<sup>d</sup>  $P < 0.01$ .

with a sedentary lifestyle (15.1% versus 13.7%), who consumed alcohol heavily (9.4% versus 8.1%), who were obese (15.1% versus 13.3%), and who had one risk factor (33.9% versus 31.2%). These differences were not, however, statistically significant. Although the differences between the highest and lowest income groups were consistent for all the high-risk subgroups, the values for the middle income group were not intermediate between those of the highest and lowest income groups.

The proportion of the study population who smoked was higher among those in the upper quartile for fat intake than the lower quartile (Table 3). Similarly, the proportions of students who were sedentary (9.4% versus 9.0%), obese (15.2% versus 13.0%), heavy alcohol consumers (10.0% versus 6.0%), had one risk factor (28.9% versus 26.0%), and had two risk factors (5.1% versus 2.0%) were greater among those whose dietary fat intake was in the upper quartile than the lower. The differences were not, however, statistically significant ( $P > 0.05$ ). Here also, although there was a consistency in the differences between the upper and lower quartiles of intake, the values for the medium intake group were not between those of the upper and lower income groups.

The proportion of adolescents who smoked was higher among those whose knowledge of the precursors

of atherosclerosis was inadequate rather than adequate (14.3% versus 13.3%). This was also the case for those who were sedentary and obese. On the other hand, the proportions who were heavy consumers of alcohol and had two risk factors were greater among students whose knowledge was adequate rather than inadequate. For alcohol consumption the difference (13.3% versus 6.3%) was statistically significant ( $P < 0.01$ ).

The proportion of smokers was higher among those whose knowledge about the hazards of smoking was adequate rather than inadequate (17.3% versus 11.8%), but the difference was not statistically significant. Similarly, the proportion of students who consumed alcohol heavily was higher among those with adequate knowledge of the associated hazards than among those whose knowledge was inadequate (10.7% versus 7.8%).

## Discussion

A substantial proportion of the adolescents in the study exhibited precursors of atherosclerotic and hypertensive diseases; these were associated with high socioeconomic status and inadequate knowledge about the precursors.

The age-specific school-enrolment ratio (number of students: population of a specific age, expressed

as a percent) for adolescents in Addis Ababa is high. In 1984, it was 92.8%, 87.4%, 84.8%, 79.6%, 72.2%, and 65.5%, respectively, for those aged 13, 14, 15, 16, 17, 18, and 19 years (2). There were hardly any differences in this respect between males and females and our findings can, therefore, be generalized to the adolescent population of the city.

The results also compare favourably with reports of previous studies carried out in developing countries. In 1978–80 the proportion of male adolescents who smoked on a daily basis was 38% in Gondar, Ethiopia (6), 71% in Senegal, and 17% in Nigeria (22). In industrialized countries the proportions of adolescents who smoke are higher; for example, in Finland in 1985, 30% of 18-year-olds smoked daily (23) and in the USA 26% of tenth-graders were reported to be smokers in 1987 (24).

For females the proportion of smokers in our study (12.9%) is higher than the proportion in the above-mentioned Gondar (3%) and Nigerian (5%) studies, but less than that from Senegal (52%). Our findings for both males and females may be underestimates because some adolescents may not have been willing to volunteer information about whether they smoked. If this is the case, the results indicate that females are now increasingly taking up smoking, a phenomenon that occurred in developed countries between 1965 and 1985 (25). Female teenagers in Addis Ababa could regard smoking to be a sign of equality with their male peers or with females in industrialized countries.

Several studies on adults in both developing and developed countries have reported that the prevalence of obesity among males ranges from 3.1% in Nicaragua to 12% in USA and among females from 1.5% in El Salvador to 32.0% in Trinidad (26). These studies used a value of BMI  $\geq 30$  as a cut-off point for obesity. In contrast, there have been few studies on the prevalence of obesity among adolescents; this is partly due to the lack of consensus on the definition of obesity for this age group. A recent study in Taipei, China (Province of Taiwan), reported that 2.9% of males and 1.7% of females in the age group 15–29 years were obese (19), which was defined as those who were  $\geq 120\%$  of their ideal weight using the mid-value of the Metropolitan Life Insurance tables. A 1985 study in Finland reported a mean BMI in the range 19.9–21.7 for those aged 15–18 years (27). Our finding that 5.5% of the males were obese, which is considerably less than the value for females (24.6%), compares favourably with the results of other studies.

A recent study in the USA reported that 29% of the adolescents surveyed were sedentary (24). In Finland 29% of 18-year-olds were reported to be sedentary (28), as were 85% of males and 82.1% of

females aged 15–29 years in China (Province of Taiwan) (19). In our study only 11.6% of the adolescents had a sedentary lifestyle, although we included household activities in addition to leisure time physical activity in our definition. Most of the studies in developed countries have included leisure time physical activity only.

In some countries up to 30% of adolescents regularly consume alcohol (6). Although moderate alcohol intake has not been shown to be associated with atherosclerotic disease, adolescents who drink alcohol even moderately may become heavy drinkers in adulthood and heavy consumption does cause atherosclerotic and hypertensive diseases (3).

Population surveys on hypertension carried out in developing countries have reported prevalences in the range 1–34%; for example, among Zulu men in 1976 the prevalence was 1%, among urban Bantu men it was 33% in 1983–84 (29), and among Ethiopian males it was 3–11% and among females, 2–3% (30). The nine cases of hypertension among our study subjects are difficult to interpret because 64% of the students had never had their blood pressure measured. It is, however, unlikely that the study students erroneously reported having the condition since in Amharic the term is fairly specific and we enquired for a diagnosis made by a doctor. Individuals who are diagnosed as hypertensive in adulthood have relatively higher blood pressure also as adolescents (6).

Over 30% of the adolescents had one risk factor and 4.4% had two risk factors for atherosclerosis. These proportions are comparable to the findings of the above-mentioned study, in China (Province of Taiwan), in which 22% had one risk factor (19).

The risk factors tended to be more prevalent among the higher income than the lower income groups. This is to be expected, since the adolescents whose parents were wealthy were usually able to afford a more affluent lifestyle. In Ethiopia obesity usually connotes a state of well-being, and adolescents from upper-income families do not usually perform household chores. Also, economic reasons may discourage adolescents from lower-income families from starting to smoke or consuming large amounts of alcohol regularly. No firm conclusions can be drawn, however, since the findings for the middle income group did not lie between those for the upper and lower income groups.

Our results also show a positive (albeit small) association between an inadequate knowledge about the precursors of atherosclerosis and smoking, and between a sedentary lifestyle and obesity. More importantly, over half the adolescents had inadequate knowledge about the precursors of atherosclerosis, or about the hazards of smoking and of drinking alco-

hol, on the one hand, and alcohol consumption and smoking, on the other. This could indicate that health education may be effective in the study area if instituted early enough. The negative association between inadequate knowledge about the precursors of atherosclerosis, the hazards of smoking, and of drinking alcohol, on the one hand, and alcohol consumption and smoking, on the other, could indicate that although those who smoked and drank knew about the hazards they were unable to stop practising these habits.

Although the inherent limitations of the FFQ method preclude precise quantification of dietary fat intake, our findings indicate a positive association between a relatively high intake and the other high-risk behaviours. Dietary fat intake is an important determinant of atherosclerotic changes in blood vessel (1). Thus, our results indicate the importance of an early dietary intervention programme.

A possible limitation of our study is its use of self-reported data. For logistical reasons, population-based studies usually rely on such data. Methodological studies conducted to evaluate the validity of self-reported information on smoking (5), weight and height (11, 12) and diet (16, 17) have shown, nevertheless, that valid data can be obtained using such an approach. In our study the use of pre-tested and anonymous questionnaires makes it unlikely that the students volunteered inaccurate information. Also, non-response was minimal (7.4%). Although students with high-risk behaviours may have tended not to respond, this would imply that the true prevalences of such behaviours were greater than those we have reported here, underscoring the gravity of the situation.

With increasing economic development, the importance of commercial sectors in smaller towns and of wealthy farmers in rural areas will increase. It is thus reasonable also to search for the emergence of the precursors of atherosclerotic and hypertensive diseases in smaller towns and rural areas in Ethiopia.

A substantial proportion of adolescents in Addis Ababa therefore exhibited the precursors of atherosclerotic and hypertensive diseases and possessed inadequate knowledge about the precursors of atherosclerosis. Our findings indicate that unless health interventions are undertaken among this adolescent population to control the emergence and establishment of these precursors, the predicted epidemic of atherosclerotic and hypertensive diseases will be realized by the end of the century (1). We, therefore, recommend that similar, larger studies be carried out among adolescents in other urban areas and semiurban areas of Ethiopia and that the Ministry of Health and the Ministry of Education give due attention to the primary prevention of these diseases and formulate plans for appropriate actions.

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## Résumé

### Précurseurs de l'athérosclérose et des maladies hypertensives chez les adolescents à Addis-Abeba, Ethiopie

Un comité OMS d'experts a estimé que, d'ici l'an 2000, les pays en développement connaîtraient des épidémies de maladies cardio-vasculaires. Comme les précurseurs de l'athérosclérose et des maladies hypertensives apparaissent dès l'enfance et l'adolescence, les pays en développement doivent agir dès maintenant pour empêcher la survenue de telles épidémies.

La présente étude a été consacrée à la mesure des précurseurs de l'athérosclérose chez les adolescents à Addis-Abeba, et à l'évaluation des connaissances de ces adolescents sur ces précurseurs ainsi que sur les risques du tabagisme et de la consommation de quantités importantes d'alcool.

Les données ont été recueillies au moyen d'autoquestionnaires prétestés chez 519 jeunes sélectionnés parmi l'ensemble des élèves du secondaire d'Addis-Abeba au moyen d'une méthode d'échantillonnage proportionnelle à la taille des grappes. Au total, 13,8% des adolescents étaient actuellement fumeurs, 11,6% avaient un mode de vie sédentaire, 9,2% consommaient des quantités importantes d'alcool, 14,1% étaient obèses, 30,3% avaient un facteur de risque pour l'athérosclérose et 4,4% avaient deux facteurs de risque. Dans l'ensemble, 58% d'entre eux avaient des connaissances insuffisantes sur les précurseurs de l'athérosclérose, et 62% et 51,4% avaient respectivement des connaissances insuffisantes sur les risques associés au tabac et à l'alcool.

Nos résultats indiquent qu'une proportion notable des adolescents d'Addis-Abeba présentent des précurseurs de l'athérosclérose et des maladies hypertensives. Des études analogues devraient être effectuées dans d'autres villes d'Ethiopie et les Ministères de la Santé et de l'Education devraient être attentifs à la prévention primaire de ces maladies et élaborer des plans d'action appropriés.

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