

Cigarette smoking and Khat chewing among college students in North West Ethiopia

Yigzaw Kebede,

Abstract

Background: Although the percentage of the population that smokes has declined in the United States and some other countries, it is increasing in less developed countries. In Ethiopia khat (*Catha edulis*) is commonly used for social and religious purposes.

Objective: To assess the prevalence and risk factors of cigarette smoking and khat chewing among college students

Methods: A cross sectional study was conducted in January 2001 in the four colleges found in North West Ethiopia. Students in each year of study were selected by systematic sampling technique. Self-administered questionnaire was used for data collection.

Results: The study revealed 13.1 % life time prevalence rate of cigarette smoking and 26.7 % life time prevalence rate of khat chewing. The current prevalence of cigarette smoking was found to be 8.1 % and that of khat chewing 17.5 %. Forty six (31.7 %) of the life time smokers and 134 (45.6 %) of the life time chewers started smoking and chewing while they were senior secondary school students. Lung diseases including lung cancer were mentioned as health risk of cigarette smoking by 904 students.

Conclusion: The prevalence of cigarette smoking seemed to decrease among university students but the decrease in the prevalence of khat chewing is not remarkable. Students knew the commonest health risks associated with cigarette smoking. Teachers in the high schools and colleges, parents, mass media and other concerned people should teach students about the health and social problems associated with cigarette smoking and khat chewing. [*Ethiop. J. Health Dev.* 2002;16(1):9-17]

Introduction

Tobacco and khat are two of the many drugs to which people can become addicted. The nicotine in cigarette smoke is known to have an addictive effect. Compulsive use, psychoactive effects, and drug-reinforced behavior are the primary criteria for defining drug addiction (1,2,3). When khat (*Catha Edulis*) leaves, which are known to contain psychoactive ingredients, cathinone, are chewed and ingested, they produce loquacity of thought, euphoria, removal of fatigue and suppression of hunger (2,4,5).

Cigarette smoking causes lung cancer, athero-

sclerotic cardiovascular diseases, intrauterine growth retardation, spontaneous abortion, antepartum haemorrhage, female infertility, peptic ulcer disease, chronic obstructive lung disease, sexual dysfunction in men, and many other diseases. Passive smokers can also acquire diseases associated with cigarette smoking (1,3,6-15). Habits of khat chewing and smoking are major contributors to gross dental staining. Khat chewing delays gastric emptying of semi-solid food. Dental caries and psychosis are reported increased among khat chewers. Khat chewing some times leads to libido (2,16,17,18).

Department of Community Health, Gondar College of Medical Sciences, P.O. Box 196, Gondar, Ethiopia

Although the percentage of the population that smokes has declined in the United States and some other countries, it is increasing in less developed countries. Worldwide the number of

people who smoke is projected to rise from 1.1 billion in the late 1990s to more than 1.6 billion by 2025. Tobacco attributable mortality is expected to increase from 14 % of total mortality worldwide in 1990 to 23 % in 2020 (15). In Ethiopia in 1983 life time prevalence rate of cigarette smoking among college students was reported, to be 31.9 % (19). There is a wide spread practice among people living in Eastern Africa and Southern Arabia of chewing the leaves of khat (2,5). In Ethiopia khat is commonly used for social and religious purposes. In 1983 the prevalence of khat chewing among college students was 22.3 % (2).

Numerous daily activities, thoughts, and emotions serve as powerful cues to smoke. Personal characteristics such as educational level, belief in one's ability to change, and coping skills are determinants of tobacco use. The level of acceptance of smoking in the home, peer group, workplace, and community norms influence smoking behavior (1). Certain occupational groups like long distance truck drivers and students during time of stress resort to khat chewing as a means of keeping alert and reducing stress(2).

Restriction on tobacco production and sales, protecting children and non-smokers from exposure to tobacco smoke, and informing adult smokers about the health risks of smoking are key to improving public health in the future (15). Similar strategies could be used to reduce the prevalence of khat chewing.

Studies on cigarette smoking and khat chewing among college students in Northwest Ethiopia were done 17 years ago. This study is thus timely to detect changes in the smoking and khat chewing habit of college students. The general objective of this study is to assess the prevalence and risk factors of cigarette smoking and khat chewing.

Methods

This college based cross-sectional study was conducted in January 2001 in the colleges of

North west Ethiopia namely Gondar College of Medical Sciences (GCMS), Gondar College of Teacher Education (GCTE), Bahr Dar University Engineering Faculty (BUENGF), Bahr Dar University Education Faculty (BUEDUCF). GCMS train medical students, health officers, nurses (different categories), environmental health technicians, medical laboratory technicians and pharmacy technicians. The GCTE train diploma level students. The BUENGF train students in different disciplines of engineering. The BUEDUCF give 4 years training for education students and 2 years training for business students. The total number of students enrolled in the 4 colleges in 2000-2001 academic year was 4544 (970 in GCMS, 735 in GCTE, 1122 in BUENGF and 1717 in BUEDUCF).

The required sample size was calculated to be 1258. Systematic sampling technique was applied to select students in each year of study. Students from each year of study were selected proportionally to their class size. A pre-tested self-administered questionnaire, which was prepared in English, was used for data collection. The independent variables included were faculty, year of study, place students come from, sex, age, religion, marital status, family history of smoking and khat chewing. The main dependent variables were history of cigarette smoking and khat chewing. The questionnaire was distributed to the selected students in the classroom and collected in 3 consecutive days. When the instructors were willing to allow the students to complete the questionnaire in the classroom, then the filled questionnaires were collected immediately. The following operational definitions are appropriate to this study.

1. Life time prevalence of smoking: the proportion of students who had ever smoked cigarettes in their life time
2. Life time prevalence of khat chewing: the proportion of students who had ever chewed khat in their life time
3. Current prevalence of cigarette smoking: the proportion of students who are smoking cigarettes within 30 days preceding the study

4. Current prevalence of Khat chewing: the proportion of students who are chewing khat within 30 days preceding the study
5. Ever smoker: An individual is considered as ever smoker even if he/she had smoked only once in his/her life time
6. Ever khat chewer: An individual is considered as ever khat chewer even if he/she had chewed khat only once in his/her life time

Ethical clearance and permission was obtained from the Research and Publication Office of the Gondar College of Medical Sciences. Before the data collection was started permission was also obtained from the deans of the respective colleges. During distribution of the questionnaire, students were informed that the information collected would be kept anonymous and participation was totally voluntary.

Data was processed and analyzed using the statistical package EPI INFO VERSION 6. Chi-square test was used to test the association between different variables.

Results

Out of the total 1258 questionnaires distributed, 1103 were returned making the response rate 87.7 %. A large proportion (61.4 %) of the respondents are from Bahr Dar University. Four hundred and fifty (40.8 %) were first year students. Nine hundred thirty two (84.5 %) were males. Five hundred and six (45.9 %) came from the Amhara region followed by Oromia region (24.0 %). About 93 % of the students were in the age group 17-24 years. The mean age of the respondents was 20.9 years (SD=3.08). The minimum age was 17 years and the maximum 42 years. Seven hundred sixty eight (71.3 %) were Orthodox Christians followed by Protestants (13.1 %). One thousand and fifty three (95.5 %) were single.

The lifetime prevalence of smoking was 13.1 % and that of khat chewing was 26.7 %. One hundred twenty students (10.9 %) were both lifetime smokers and chewers. Overall, 313

students (28.4 %) were either lifetime smokers or chewers or both. The life time prevalence rate of cigarette smoking in the 4 colleges was: 12.9 % in GCMS, 5.9 % in GCTE, 16.8 % in BUENGF, and 14.2 % in BUEDUCF. The life time prevalence rate of khat chewing in GCMS, GCTE, BUENGF, and BUEDUCF was 27.4 %, 23.2 %, 27.5 % and 27.2 %, respectively. There were 5 female lifetime smokers and 18 life time chewers. The current prevalence rate of smoking was 8.1 % and that of khat chewing was 17.5 %. Seventy-five (6.8 %) were both current smokers and chewers. Table 1 shows the prevalence of cigarette smoking and khat chewing.

Table 1: Prevalence of cigarette smoking and khat chewing among college students in Northwest Ethiopia, January 2001.

Smoking/Khat chewing status	No (total n=1103)	Percent*
Neither smoker nor chewer	790	71.6
Life time smoker	145	13.1
Life time khat chewer	294	26.7
Both life time smoker and chewer	120	10.9
Life time smoker or chewer	313	28.4
Current smoker	89	8.1
Current chewer	193	17.5
Both current smoker and chewer	75	6.8
Current smoker or chewer	207	18.8

*The percentages do not add up to 100% because one category can be included in the other

Fifty-six (38.6 %) lifetime smokers and 101(34.4 %) lifetime chewers claimed that they have stopped smoking and chewing, respectively. Of 120 ever smokers and chewers, 28 (23.3 %) first started smoking, 72 (60.0 %) first started chewing, and 20 (16.7 %) started both at the same time.

Forty six (31.7 %) of the lifetime smokers and 134 (45.6 %) of the lifetime chewers started smoking and chewing when they were senior

secondary school students. Thirty seven (25.5 %) of the ever smokers and 52 (17.7 %) of the lifetime chewers started smoking and chewing during their first year at college (table 2).

Table 2: The year college students in North West Ethiopia started smoking or chewing, January 2001

Time	Cigarette ever smokers (n = 145) No (%)	ever khat chewers (n = 294) No (%)
Elementary school	7(4.8)	28(9.5)
Junior high school ^a	15(10.3)	25(8.5)
Senior secondary school	46(31.7)	134(45.6)
1 st year college	37(25.5)	52(17.7)
2 nd year college	22(15.2)	32(10.9)
3 rd year college	7(4.8)	12(4.1)
4 th year college	6(4.1)	4(1.4)
5 th year college	0(0.0)	2(0.7)
other time	5(3.4)	5(1.7)

The main reason given for smoking was for relaxation with friends (43.4 % of the ever smokers) followed by for relieving stress (24.8 %). To keep alert while reading and for relaxation with friends were the main reasons for starting chewing, 40.5 % and 33 %, respectively. Table 3 shows the reasons for starting smoking and chewing.

The minimum ages for starting cigarette smoking and khat chewing were 9 and 7 years, respectively. The mean age for starting smoking was 18.2 years (SD=2.53) and the mean age for starting khat chewing was 17.3 years (SD=3.02). On the average each smoker smokes 3.2 cigarettes per day (SD=2.489). Each smoker spent an average of 0.9 cents per day for cigarettes. The average amount of khat chewed each day by one individual was 52.4 gm and the average money spent per day by one chewer was 2.9 birr. Two hundred and thirty one (79.7 %) lifetime chewers reported that the khat is brought from Bahir Dar. One hundred ninety seven (17.9 %) of the students

had family members who smoke and 264 (23.9 %) had family members who chew khat.

Table 3: Reasons given by college students in North West Ethiopia for starting cigarette smoking and khat chewing, January 2001.

Reason	Cigarette smoking (n = 145) No (%) [*]	Khat chewing (n = 294) No (%)
Relieve stress	36(24.8)	18(6.1)
To keep alert while reading	10(6.9)	119(40.5)
For relaxation with friends	63(43.4)	97(33.0)
Peer pressure	29(20.0)	41(13.9)
Family members chew khat		26(8.8)
I saw teachers chewing khat		4(1.4)
Religious reasons		5(1.7)
Other reason	12(8.3)	15(5.1)

^{*}The percentages do not add up to 100.0% because one respondent can give more than one answer

Twenty-eight students (2.5 %) believe that cigarette smoking is important to keep alert while reading and for relaxation with friends. Similarly 159 (14.4 %) students believe that khat is important for the same reasons. On the contrary, many students believe that cigarette smoking and khat chewing have health risks, 94.1 % (n=1038) and 81.1 % (n=895), respectively. Nine hundred and four (87.1 %) knew that cigarette smoking is a risk factor for lung diseases including lung cancer. Addiction and GI- problems like constipation were mentioned as the main health problems of chewing khat, 47.3 % (n=423) and 33.4 % (n=299), respectively. Table 4 and 5 show the main health problems associated with cigarette smoking and khat chewing as perceived by the study group.

One thousand and two (90.8 %) of the respondents believe that smoking has socio-economic problem. Disagreement with the family members, rejection by the society, and

economic problems were mentioned by 787 (71.4 %) of the students. The other social problems mentioned were addiction (2.4 %), other problems such as criminal activity when the addict has a shortage of money (1.6%). Eight hundred eighty seven (80.4 %) students believe that chewing khat has socioeconomic problem. The problems mentioned were believed to be similar to those of cigarette smoking.

Table 4: Health risks of cigarette smoking mentioned by college students in North West Ethiopia, January 2001

Health risk	No (%)
Lung diseases including lung cancer	904(87.1)
Heart diseases	134(12.9)
Stained teeth	34(3.3)
Liver diseases	7(0.7)
Addiction	41(3.9)
Gastro-intestinal problem	41(3.9)
Cancer in other parts of the body	75(7.2)
Affects fetus	22(2.1)
Increased susceptibility to many diseases	18(1.7)
Weak physical fitness	8(0.8)
Other diseases	2(0.2)
No response	62(6.0)

NB: 1) The percentages are calculated from the total number of students who reported that cigarette smoking has health risk i.e. 1038

2) The percentages do not add up to 100.0% because one person can mention more than 1 health problem

Table 6 shows the results of the bivariate analysis between the out come variable "ever smoke of cigarettes or ever chewing of khat or both" and different independent variables. Statistical significant association was seen between the out come variable and the independent variables year of study, sex, age, religion, family history of smoking, and family history of khat chewing. The risk of smoking or chewing increases with increasing year of study and age. Males were at higher risk (OR=3.69) compared to female students.

Table 5: Health risks of khat chewing mentioned by college student in North West Ethiopia, January 2001

Health risk	No(%)
Addiction	423(47.3)
Gastrointestinal problem like constipation	299(33.4)
Affect teeth	138(15.4)
Decreases sexual feeling	18(2.0)
Health problem	31(3.5)
Affect liver	8(0.9)
Increase susceptibility to many diseases	11(1.2)
Cancer	17(1.9)
Other Problems	20(2.2)
Didn't mention any health problems	175(19.6)

NB. 1) The percentages are calculated from the total number of students who reported that cigarette smoking has a health risk i.e. 895

2) The percentages do not add up to 100.0% because one person can mention more than 1 health problem

Compared to Christians (Orthodox, Protestant and Catholic) and Muslims other religious groups were at higher risk of smoking or chewing (OR=6.0). The presence of family members who smoke or chew khat is also a risk factor for smoking or chewing khat, OR=3.02 and 4.87, respectively. There was no statistically significant difference in smoking or chewing habit between the different faculties and regions.

Discussion

The lifetime and current prevalence rates of cigarette smoking among medical and paramedical students of the Gondar College of Medical Sciences in 1983 were 31.9 % and 26.3 %, respectively (19). This study revealed 13.1 % lifetime and 8.1 % current prevalence rates of cigarette smoking. Both lifetime and current prevalence rates in this study are lower compared to the pprevious findings. The possible explanations for this difference could be: 1) the disadvantages of cigarette smoking are widely disseminated by the media and 2) the previous study* was done only in one college (GCMS). In this study the current pre-

Table 6: Factors associated with ever smoking of cigarettes or ever chewing of khat among college students in North West Ethiopia, January 2001.

Factor	Ever smoke or chew		OR (95% CI)
	Yes	No	
Year of study			
1 st *	95	355	
2 nd	85	229	1.39(0.98-1.97)
3 rd	57	99	2.15(1.42-3.26)
4 th	53	82	2.42(1.56-3.73)
5 th	17	22	2.89(1.4-5.94)
6 th (intern)	6	3	7.47(1.61-38.47)
Sex			
Female*	19	152	
Male	294	638	3.69(2.10-6.26)
Age			
15-19*	66	296	
20-24	215	450	2.14(1.55-2.97)
25-29	20	21	4.27(2.08-8.77)
30-44	12	23	2.34(1.04-5.22)
Religion			
Protestant*	29	116	
Orthodox Christian	206	580	1.42(0.9-2.25)
Catholic	3	6	2.00(0.37-9.8)
Muslim	54	74	2.92(1.65-5.18)
Other	21	14	6.0(2.55-14.28)
Family history of smoking			
Yes	96	101	3.02(2.17-4.2)
No*	217	689	
Family History of chewing			
Yes	145	119	4.87(3.58-6.64)
No*	168	671	

*Referent category

valence rate of khat chewing was found to be 17.5 % which is 4.8% lower than the prevalence in 1983. The reduction in the prevalence rate of current khat chewing is not remarkable compared to cigarette smoking. From this finding it can be said that the health risks of khat chewing are not well disseminated in the colleges and the general public. Seventy-five (6.8 %) of the students were both smokers and chewers. On average one smoker and chewer was found to spend 3.80 birr a day for cigarettes and khat. This indicates that the money spent by students for cigarettes and khat is high. Very few families can afford for this expense. When these students have no money

to buy cigarettes and khat, they could be engaged in criminal activities. Even after graduation these people will spend much amount of money for cigarettes and khat which can affect the economy of the family. In addition, as was mentioned by students, the khat chewers will have less interest to work and are usually absent from their work place. The khat, for 78.6 % of the ever chewers, is cultivated and transported from Bahir Dar. This is an indication that large area of the land in Bahir Dar and the surrounding area is used for khat cultivation. This may in the future increase the number of people who chew khat including the farmers.

In this study 31.7 % of the lifetime smokers and 45.6 % of the lifetime chewers started smoking and chewing when they were senior secondary school students. The next critical time to start these practices is 1st year college, 25.5 % of the ever smokers and 17.7 % of the ever chewers. The mean ages for starting khat chewing and cigarette smoking were 17.3 and 18.2 years, respectively. This is similar with what was reported in 1983(19). In agreement with this statement is that the main reasons mentioned for starting smoking and chewing were "peer pressure" and "for relieving stress". This is an important indication to direct interventions towards decreasing the prevalence of these habits. As it was shown by the average age of starting smoking and chewing, most of these smokers and chewers were adolescents where peer pressure has a significant role for such behaviors (20). Since 1st year students are new for the university environment in that the style of teaching is different and the contents to learn are many compared to the high schools, these students may start to smoke and chew as a means of escape from stress.

Many students believe that cigarette smoking and khat chewing has health risks, 94.1 % and 81.1 %, respectively. About 87 % of them knew that cigarette smoking is a risk factor for lung diseases including lung cancer. This indicates that students are knowledgeable on the health risks of cigarette smoking. This might have contributed for observing low prevalence of smoking. Fifty six (38.6 %) of the ever smokers and 101(34.4 %) of the ever chewers reported that they have stopped smoking and chewing. These students are good examples for the smokers and chewers that stopping these habits is possible.

As in previous studies (19) this study revealed that the prevalence of cigarette smoking or khat chewing increases with age and year of study. Additionally in this study it was revealed that the presence of family members who smoke or chew khat predisposes students to smoke or chew. This is a social factor since

adolescents can start to exercise what the elders are doing (21). Males were also at higher risk of smoking or chewing (OR = 3.69). This difference can be observed since there is cultural influence on females not to smoke or chew khat.

One limitation of this study is that 100 % response was not obtained. Of course this is one of the limitations of self-administered questionnaires (22). The other limitation could be that all students might not give genuine answer to the questions they were asked. This might underestimate the prevalence of cigarette smoking and khat chewing.

In general the prevalence of cigarette smoking seemed to decrease among university students but the decrease in the prevalence of khat chewing is not remarkable. Students knew the commonest health risks associated with cigarette smoking.

Based on the findings of the study the following recommendations are made:

1. Colleges should inform their students, especially freshman students, about the health and socioeconomic problems associated with cigarette smoking and khat chewing
2. Colleges should teach and counsel their students on ways of coping with the problems rather than starting to smoke and chew khat
3. The mass media should also give emphasis to problems of khat chewing.
4. People in the agriculture sector need to promote cultivation of crops other than khat
5. High schools need to teach their students about the dangers of cigarette smoking and khat chewing
6. Teachers in the high schools and colleges, and parents should be role models to their students and children by not smoking or chewing.

Acknowledgement

I would like to thank the Research and Publication Office of the Gondar College of Medical Sciences for funding this study. The deans of the Gondar College Of Medical

Sciences, Gondar College of Teacher Education, Bahir Dar University Engineering Faculty, and Bahir Dar University Education Faculty deserve special thanks for giving permission to do this research in their respective colleges. I also thank Dr. Ovnair Sepai for carefully revising this manuscript. Finally this research would not have been realized without the participation of the students and academic staff.

Reference

1. John HH. Nicotine addiction. In: Anthony SF, Eugene B, Kurt JI, Jean DW, Joseph BM, Dennis LK et al, editors. *Harrison's Principle of Internal Medicine*. 1998;14(2):2516-2519.
2. Adugna F, Jira C, Molla T. Khat chewing among Agaro Secondary School students, Agaro, South Western Ethiopia. *Eth Med J*. 1994;32(3):161-166.
3. Kassay M, Sherif T, Fissehaye G, Teklu T. "Drug " use among high school students in Addis Ababa, *Ethiopian Journal of Health Development*. 1994;13(2):101-106.
4. Giannini AJ, Miller NS, Turner CE. Treatment of khat addiction. *J-Subst-Abuse-Treat*. 1992;9(4):379-82.
5. Calcagnetti DJ, Schechter MD. Increases in locomotor activity of rats after intracerebral administration of cathinone. *Brain-Res-Bull*. 1992;29(6):843-6.
6. Wong PP, Bauman A. How well does epidemiological evidence hold for the relationship between smoking and adverse obstetric outcomes in New South Wales? *Aust-N-Z-J-Obstet-Gynaecol*. 1997;37(2):168-73.
7. Kasantikul V, Keelawat S, Maneesri S, Panichabhongse-V. Moderately differentiated neuroendocrine carcinoma (atypical carcinoid) of the larynx. *J-Med-Assoc-Thai*. 1997;80(6):396-401.
8. Buck GM, Sever LE, Batt-RE, Mendola P. Lifestyle factors and female infertility. *Epidemiology*. 1997;8(4):435-41.
9. Ashley MJ. Smoking and disease of the gastrointestinal system: An Epidemiological review with special references to sex differences. *Can J Gastroenterol*. 1997;11(4):345-52.
10. Stellman SD, Muscat JE, Thompson S, Hoffman D, Wynder EL. Risk of squamous cell carcinoma and adenocarcinoma of the lung in relation to life time filter cigarette smoking. *Cancer*. 1997;80(3):382-8.
11. Goldenberg RL, Cliver SP, Neggers Y, Copper RL, Dubard MD, Devis RO, Hoffman HJ. The relationship between maternal characteristics and fetal and neonatal anthropometric measurements in women delivering at term: a summary. *Acta - Obstet-Gynecol - Scand - Suppl*. 1997;165:8-13.
12. Guslandi M, Sorghi M, Foppa L, Tittobello A. Brief communication: Smoking and duodenal blood flow. *J-Gastroenterol-Hepatol*. 1997;12(4):347-8.
13. Eanes DB Pereira, Luiza Torres, Joao Macedoe Marta Mc Medeiros. Effects of environmental tobacco smoke on lower respiratory system of children under five years old. *Journal of Public Health*. 2000;34(1):39-43.
14. Jee SH, Ohrr H and Kim IS. Effects of husbands' smoking on the incidence of lung cancer in Korean women. *International Journal of Epidemiology*. 1999;28(5):824-828.
15. Population Reference Bureau. *Attaining Global Health: Challenges and Opportunities*. Population Bulletin March 2000;55(1):34-35.
16. Faunce F. Management of discolored teeth. *Dent.Clin.N. Amer* 1985;27:373-391.
17. Fejerskov O, Manji F, Baelum V, and Moller IJ. *Dental fluorosis: Handbook of health workers*. First edn, 1988, ISBN:87-16-06740-1.
18. Heymann TD, Bhupulan A, Zureikat NE, Bomanji J, Drinkwater C, Giles P, Murray Lyon IM. Khat chewing delays gastric emptying of a semi-solid meal. *Aliment-Pharmacol-Ther*. 1995;9(1):81-3.
19. Ahmed Z, Admassu M, Tadesse M, Laeke N, Olango P, Rassu T and Asfaw T. Patterns of Cigarette smoking among Ethiopian medical and paramedical students. *Ethiopian Medical Journal*. 1984;22(4):165-171.
20. Laurence S. Neinstein. *Psychosocial Development in Normal Adolescents*. In: *Adolescent Health Care*, 2nd edn. Urban and Schwarzenberg; 1991:39-44.

21. Laurence S. Neinstein. Drug use and abuse. In: Adolescent Health Care, A practical guide, 2nd edn. Urban and Schwanzenberg; 1991:833-916.
22. Carter V. Good and Douglas E.Scates. Organized forms of Descriptive Survey and Normative Research: Questionnaire and Interview Techniques. In: Methods of Research. Appleton-Century-Crpfits, Inc; USA; 1954:604-645