Oration of the Seventh Academic Sessions

Patterns and bio-psycho-social issues of tobacco and alcohol use: implications for research and prevention

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Introduction

Substance use is as old as mankind. Humans have always used various types of substances, probably as part of their evolutionary and nutritional heritage. Alcohol and tobacco can be considered as the most dangerous substances used by people across the world and Sri Lanka is no exception (1-3), and the use of the two substances has become a serious and a growing public health issue in Sri Lanka. The poorest population groups in poor nations are found to be the most affected victims of the two habits (3, 4). The dangers of alcohol and tobacco use are not confined only to their adverse health effects, socio-economic and ecological consequences of the use of the two substances have even greater adverse effects on the humans (2-7). Clear understanding of the dangers of tobacco and alcohol use has led many countries in the world to put alcohol and tobacco use prevention and research at the top of their country development agendas (8, 9). In the recent past, the government of Sri Lanka and many other non-governmental organizations operating in Sri Lanka made numerous efforts to control the use of the two substances aiming at minimizing the harm associated with the two substances. However, many such programs were not based on baseline data and need assessments, and have not been evaluated in a scientific manner to identify strengths and weaknesses. One reason for not using baseline substance use data by program planners in developing preventive strategies is non-availability of such information in the country. Thus, there has been a long felt need to understand consumption patterns of and factors associated with tobacco and alcohol use among people in Sri Lanka to formulate effective policies and prevention strategies to curb this menace. I have been working in the field of substance use prevention and research for more than 20 years and was able to establish research links with several foreign institutions in the recent past to get their support to improve the quality of substance use research in Sri Lanka. In 2004, a research program was initiated in collaboration with

Indiana University, USA to study addictive behaviors, and in 2006, another research link was established with Duke University, USA to study behavioral patterns of people in Southern Sri Lanka. In this presentation, I will discuss briefly (a) the epidemiological aspects of alcohol and tobacco use in the world, (b) the patterns of alcohol and tobacco use in Southern Sri Lanka, (c) bio-psycho-social issues related to consumption of the two substances and finally (d) methodological issues and implications for prevention and research. My presentation is based mainly on the results of the research studies that I have conducted in collaboration with the two universities in the USA. Boards for the protection of human subjects of the universities in the United States and Sri Lanka approved the protocols of these research programs.

Epidemiological aspects of alcohol and tobacco use in the world

Alcohol

Alcohol (synonymous with ethanol, ethyl alcohol) is a colorless liquid, is completely soluble in water and is probably the oldest substance of abuse in the history of mankind (10). Alcohol, without water molecules, is called pure or absolute alcohol. To some it is a blessing from god, and to the others it is a devil's curse. Alcohol use has been an established custom in almost all societies across the world, and it has been viewed as a mood modifying social beverage (11). There is a wide social belief that alcohol promotes sociability and strengthens extroversion (11). These misconceptions have arisen among people because alcohol is a legal, readily available substance that has a long tradition of use. Additionally, at present, widespread advertising of the substance that promote the notions that alcohol is a social and a safe drink which enhances the health if consumed in moderate amounts, has largely contributed to mislead people from the gravity of the problem, and eventually make them the victims of this dangerous habit. Alcohol produces a sedative effect and has been used as a sedative hypnotic for medical purposes in the past (7, 11). Alcohol induces depression and globally, it is the most frequently used brain depressant (7). One half of the total adult population in the world uses alcohol. The proportion of users varies across countries from 18% to 90% of adult males and from 1% to 81% of adult females (12, 13).

Globally, it is estimated that there are 76.4 million people with alcohol use disorders (12). Almost all organs and systems in the human body are affected and damaged by alcohol.

Alcohol is associated with over 40 recognized disease and injury conditions (7, 12, 13). The brain and the nervous system, the liver, digestive system, cardiovascular system, the kidney, and sexual organs are some of them. Short-term effects of alcohol include anxiety, abnormalities in heart and breath rates, blurred vision and poor motor coordination. Prolonged use of alcohol may cause cardiac abnormalities, cirrhosis, anemia, memory loss, depression, ulcers and cancers in the digestive tract, color changes of the skin and hair. Alcohol use also decreases male's ability to maintain an adequate erection during sexual stimulation (14). Alcohol, depression and suicidal behaviors in adolescents are found to be closely related (15-17). Further, other addictive behaviors such as smoking and pathological gambling are also associated with alcohol use disorders (16, 17). Alcohol poisoning and accidents linked with intoxication such as drowning, or injuring oneself by falling has taken the lives of many people in the world in the past (7, 12, 13). Health care cost associated with alcohol use has become a huge obstacle to economic development of many countries across the world (10, 18). Thus, socio-economic consequences associated with alcohol use can be considered as a huge threat to the well-being of people (4, 13, 18). Unfortunately many uneducated as well as educated adults, who are not heavy alcoholics, consider their social drinking habits harmless to them, to their families and to the society. In fact, there are shocking consequences of social drinking habits of those adults on young children. Beliefs about the effects of alcohol (alcohol expectancies) appear to be formed at a very young age, very often prior to any actual experience with alcohol (16 - 19). Adults drinking behaviors and favorable attitudes about drinking have been positively associated with adolescents' initiating and continuing drinking (19). Alcohol related social and family problems are increasing in alarming proportions in many populations (13). Domestic violence issues such as alcoholic fathers battering their wives and children, and sexual abuse of female family members by intoxicated males are becoming more prevalent in many countries including Sri Lanka (7, 13). Numerous marriages have been destroyed by alcohol, both emotionally and financially. Children of heavy alcoholics are emotionally disturbed and have a greater risk of becoming persons with mental or conduct disorders in their later life (7, 16). Long term devastating consequences of such events include unwanted pregnancies, physical injuries, damages to household properties, divorces, psychological problems specially in women and children, neighborhood clashes, legal problems and financial difficulties. Further, environmental hazards related to alcohol production are well known. Although there is no reliable information available on the environmental damage caused by illegal alcohol production in the country, negative impact of illegal alcohol production on the soil and water is well known. A study conducted in Brazil on the environmental impact of sugar cane alcohol production found that alcohol industries have failed to maintain the required environmental efficiency levels (20). Thus, alcohol is a substance that has made serious impacts on health and well-being of the world population.

Tobacco

Tobacco use either by smoking, sniffing or chewing is a major global public health problem (21 -23). In 1492, Columbus discovered America and tobacco, and tobacco species were then begun to spread throughout most of the Americas and eventually tobacco became one of the oldest of the new world cultivated substances. Tobacco is considered as the single most preventable cause of death, responsible for the deaths of approximately half of long-term users (21, 23). Tobacco use causes approximately 15 different types of cancer (12, 21). In addition to cancers, a number of other diseases and ill-health conditions including cardiovascular diseases, adverse reproductive outcomes, cataracts, pneumonia and respiratory diseases are caused by tobacco use. Tobacco contains nicotine, which is a highly addictive psychoactive chemical (7). When smoked, nicotine causes physical and psychological dependency and a number of neuro-psychiatric conditions are found to be associated with tobacco use. An estimated 5 million people died from tobacco use in 2000, representing about 12% of adult deaths (21, 23). Overall, tobacco killed about 100 million people globally in the 20th century (23). Due to wide-spread smoking in the populations in the middle and lower income countries, the number of deaths attributable to tobacco use is increasing rapidly. If current smoking patterns continue, the number of tobacco related deaths will rise to 8.3 million deaths per year by 2030, with more than 70% of these deaths occurring in middle and low income countries (21, 23). South Asia, with about a quarter of the world's population, contributes substantially to these figures. The WHO estimates that there are approximately 1.3 billion smokers in the world (21, 24). This represents about one-third of the global population aged 15 and over. Globally the prevalence of daily smoking is higher for men (47%) than for women (11%) (24). There are huge social, environmental and economic costs associated with the use of the substance. In the year 2000, fires caused by smoking killed approximately 300,000 people around the world (21). Tobacco farming is linked to deforestation and depletion of soil nutrients and available data indicate that tobacco cultivation is responsible for nearly 5% of the total deforestation that is occurring in poor countries where tobacco is a cash crop (25). The devastating effects of tobacco are not uniform across the countries. This deadly habit contributes to widening the gap between the poor and the rich, and is a major obstacle to the development of many poor nations around the world including Sri Lanka (21, 22). Thus, public health burden caused by tobacco on the world population is huge and similar to alcohol, tobacco also has made serious impacts on health and well-being of the world population.

Alcohol and tobacco use patterns in Southern Sri Lanka

Alcohol

Both legally and illegally produced alcoholic beverages are available in Sri Lanka. Therefore no reliable data or estimates on the production of alcohol are available in the country. However, over the last decade, there has been an increasing trend of alcohol use in Sri Lanka. For example, in 2003, 19.3 million liters of beer was produced in the country and the corresponding figure for the year 2007 was 29.5 million liters, a 53 percent increase (26, 27). The use of alcohol is distributed unevenly throughout the Sri Lankan population and it is observed that alcohol use is predominantly a male habit in the Sri Lankan cultural context. To date no island-wide survey has been conducted to identify the prevalence rates of alcohol use in different segments of the population.

Over the last 15 years, I have conducted, in collaboration with other researchers, a number of small scale surveys to identify the prevalence and consumption patterns of alcohol in young and adult populations in the Southern province in the country. In one such study conducted in a semi-urban community (N=783) in Southern Sri Lanka, it was revealed that 52.5% of males and 5% of females aged above 10 years were current alcohol users (28). In this study, current alcohol users were defined as those who had used alcohol al least once during the last 3 months and did not have an intention to abstain from alcohol in the near future. (Table1). The highest prevalence of current alcohol users was found among Tamils (43%), followed by Sinhalese (32%) and Muslims (9%).

Table 1 : Age specific prevalence of alcohol use (N=783)

Age Group	Male % (n)	Female % (n)
11 - 20	11.1 (72)	1.1 (89)
21 - 30	45.7 (94)	4.8 (104)
31 - 40	67.1 (76)	6.7 (89)
41 - 50	77.0 (74)	10.9 (46)
51 - 60	62.9 (35)	0.0 (34)
> 60	63.6 (33)	8.1 (37)

The highest prevalence rate was found in the age group 41-50 for both males and females. Alcohol consumption patterns of 80 monthly users of alcohol in this study sample are presented in table 2 and it was observed that amount of alcohol use per month increased with increasing age, reached a maximum in the 41-50 year age category.

Table 2 : Frequency of alcohol use among male monthly drinkers (N=80)

Age Group (in years)	*Daily*	*Few days per week*	*Once a week*	*Few times per month*	*Once a month*
11 - 20	-	-	-	-	1
21 - 30	-	-	1	-	9
31 - 40	3	-	2	3	12
41 - 50	3	4	5	9	13
51 - 60	-	1	-	2	5
> 60	3	-	-	-	4
Total	**9 (11%)**	**5 (6%)**	**8 (10%)**	**14 (18%)**	**44 (55%)**

During the years 2006-2007, I conducted another community survey, sponsored by the Duke-Ruhuna collaborative research center at the Faculty of Medicine, University of Ruhuna, Galle, to explore health and health behavior patterns of adults in Southern Sri Lanka. A sample of 2077 people aged on or above 18 years participated in the survey. In men, the prevalence of monthly alcohol use was 29.64% (95% CI = 26.84, 32.44). Amongst women a negligible proportion (< 1%) reported monthly alcohol use. The prevalence of monthly alcohol use in men in our study (29.64%) is somewhat comparable to that of figure (27.8%) observed in a study conducted in Colombo and Polonnaruwa districts using a sample of 2684 men over 18 years (29). In the USA, a developed country, the percent of adults who were current regular drinkers (at least 12 drinks in the last year) was 50% (30), a much higher rate than ours, and in Tanzania a poor country in Africa, the prevalence of current alcohol use in adults was 17.2%. (31), somewhat lower than the figures observed in Sri Lanka. Cultural norms and values may have contributed to make these differences in prevalence rates.

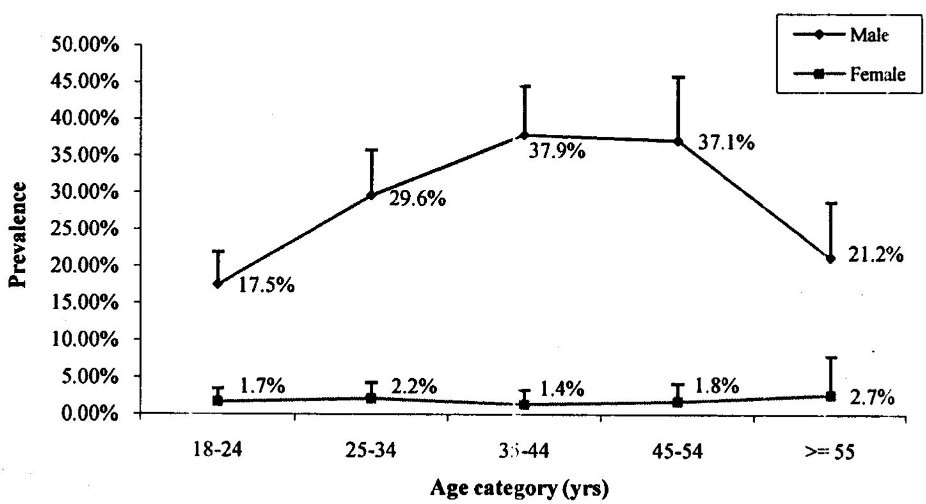
Underage drinking is a major global public health challenge (17). A study conducted by me in the Southern province (32) on alcohol use in a sample of 455 students aged between 15-19 years found that 36.4% of male students and 9.2% of female students were lifetime alcohol users and 21.2% male and 3.3% female students were current alcohol users, a significant gender difference ($p <.01$). Among male students, the Lifetime prevalence rate of alcohol use was highest among those who were living in the urban settings (63.2%) followed by those who were living in semi-urban (39.1%) and rural (25.4%) settings. Among females, the corresponding figures were 12.2% for students living in urban settings, 13.9% for students living in semi-urban settings, and 5.6% for students living in rural settings. A higher percentage of lifetime alcohol users were found in students from upper income families (57.1% of males and 20.0% of females) compared to students from middle income (39.3% of males and 11.6% of females) and lower income (30% of males and 6.1% of females) families. The prevalence of current (monthly) alcohol use in this study sample was 21.2% for male students and 3.3% for female students, and the difference was significant ($\chi^2 = 36.48, p< .01$). In the USA, in 2001, approximately 21.5% of 8th graders and almost 50% of 12th graders have consumed alcohol within the past month (33). Gender and culture seems to be the major factors that could explain the differences of prevalence rates that we observed in Sri Lanka and in the USA.

Tobacco

In Sri Lanka, chewing tobacco with betel and areca nut has long been a common habit especially amongst people living in the rural settings (1). Over the last few decades smoking has gained much popularity over other methods of tobacco use especially amongst the young and middle aged men in the country. However, at present, smoking seems to be declining among people in Sri Lanka. For example, over the last several years the number of tobacco sticks consumed by people in the country has significantly declined (1). But these figures should be interpreted cautiously because the data on cheaper and illegal tobacco products available in the country are not included in these statistics. It is also not known whether this declining trend is similar for both sexes. The Ceylon Tobacco Company (CTC), which is affiliated with the British American Tobacco (BAT) and Phillip Morris Companies, has the monopoly of producing cigarettes in Sri Lanka. CTC spends millions of rupees to promote its products among young men and women (34). A low cost indigenous tobacco product called *beedi* is widely available in many parts of the country and is consumed mainly by middle and old age, low-income males living in rural Sri Lanka (1). There is a severe shortage of reliable and valid data on smoking habits of people in Sri Lanka. Trends in smoking habits are largely unknown. Only a handful of cross-sectional surveys on smoking have been conducted in the recent past, and there are some methodological flaws in some of these investigations such as the use of inappropriate sampling techniques and estimating population parameters using un-weighted data. On the other hand, the usefulness of some well-designed surveys is limited by the parameters that they have investigated. For example, a survey conducted by World Bank in the year 2000 focused only on current smokers in Sri Lanka (35). Furthermore, a survey conducted by WHO in Sri Lanka as a part of their *Global Youth Tobacco Survey* was restricted to students aged 13-15 years (36).

In 2001, I conducted a survey to investigate smoking habits of adult males and adult females in a southern district of Sri Lanka (37). The analysis was conducted on 1565 weighted cases. The sample had a slightly higher percentage of males (58%). Ages ranged from 18-82 years with a mean of 35 years (SD=13.2). A significantly higher proportion of men (62.9%) than women (7.0%) reported lifetime smoking ($p< 0.01$). Significant gender differences were found in all categories of smokers: yearly: men 41% and women 3.4%, ($p< 0.01$), monthly: male 27.8% and women 2%, ($p< 0.01$), weekly: men 24.5% and women 1.1%, ($p< 0.01$), and daily: male 21% and women 0.6%, ($p < 0.01$). People from lower-income brackets showed the highest yearly smoking prevalence rate (30.1%) followed by Middle-income (25.2%) and then upper-income (17.9%), ($p< 0.01$). Moreover, individuals from lower-income families were two times more likely to become smokers than individuals from upper-income families (OR=1.98, 95% CI = 1.16, 3.42). Among those who had secondary level education or less, 35.2% were yearly smokers and the corresponding figure for those who had higher-secondary or university level education was 17.7%, ($p< 0.01$). Respondents who had secondary level education or less were two and half times more likely to become smokers than respondents who had higher secondary or university level education (OR=2.52, 95% CI= 1.96, 3.24). Age and gender specific prevalence rates of smoking are presented in figure 1. In men the highest age-specific prevalence (about 38%) was found among those between 35-44 years of age. The proportion of women who reported smoking monthly was too small to make any age comparisons but seemed fairly constant over the age groups.

Figurel. Proportion of monthly smokers by gender and age (N=1565)



(Note: Upper 95% confidence intervals are shown in the graph)

The prevalence of monthly smoking in men in our study (27.8%) is almost similar to that of figure (27.6%) observed in a study conducted in Colombo and Polonnaruwa districts using a sample of 2684 men over 18 years (29). The prevalence of current (monthly) smoking in males in Sri Lanka, in general, was lower than in some Asian countries such as India (32.7%) and China (57.4%) and somewhat similar to that of figures in some developed countries such as United Kingdom (27%) (38), although we cannot make direct comparisons because of the slight differences in the age distributions of the population groups targeted by these different studies. .

In the study on tobacco and alcohol use in school children (N= 455) that was discussed previously under the patterns of alcohol use (28), 34.4% of male and 2.3% of female students of the sample were lifetime smokers and this sex difference was significant (χ^2 = 89.49, p< .01). Among males, the prevalence of lifetime smoking was highest among those who were living in urban settings (42.1%) followed by those who were living in semi-urban (40.6%) and rural (25.4%) settings. Further, among males, a relatively higher percentage of lifetime smokers were found among students from middle income families (38.1%) compared to students from upper income (28.6%) and lower income (30%) families. For females, the corresponding figures were too small to make meaningful comparisons. The prevalence rates of current smoking were 10.6% for male and zero for female students and this sex difference was statistically significant (χ^2 = 30.34, p< .01).

During the years 2006-2007, I conducted a survey, sponsored by the Duke-Ruhuna collaborative research center at the Faculty of Medicine, University of Ruhuna, Galle, to explore health and health behavior patterns in advanced level students in Southern Sri Lanka (39). The target population for the survey was older adolescents in the three districts in the Southern Province. Table 3 shows some of the results of the survey.

Table 3 : Alcohol use and smoking by gender (N=1811)

Variable	*Gender*		*Significance*
	Female (n=908)*	Male (n=903)*	
Smoking			
Life time	2.2%	27.1%	$p < 0.01$
Monthly	< 1%	5.1%	$p < 0.01$
Alcohol			
Life time	12.7%	37.1%	$p < 0.01$
Monthly	1.8%	10.5%	$p < 0.01$

* Percentages were calculated by omitting non-responses.

A random study sample was drawn from advanced level students from all public schools (single sex as well as mixed schools) in the province. A cluster sampling method was used to select the participants. Results revealed a significant gender difference with respect to both alcohol use and smoking. In the USA, in 2001, approximately 12.2% of 8th graders and 29.5% 12th graders had smoked with in the last month (33). A survey conducted by WHO in Sri Lanka as a part of their *Global Youth Tobacco Survey* revealed that the prevalence of smoking cigarettes among students aged 13-15 years was 4% and it was lower than in Chongquing in China (6.3%) and South Africa (33.9%), but slightly higher than in Shandong in China (2.4%) (36).

In summery, alcohol and tobacco use is a male habit in the Sri Lankan cultural context. A significant proportion of men in the country use these substances although the prevalence rates in Sri Lanka are lower than that of figures in many countries across the world. Disparities in alcohol use and smoking by gender, ethnicity, and by the area of living exist. Thus gender, ethnicity and region remain important considerations when striving to understand the mechanisms associated with alcohol and tobacco consumption and in the development of smoking prevention and treatment programs in the country. Identification of other social stratification systems, such as social class, income and caste that could contribute to tobacco and alcohol related inequalities is a research priority.

Bio-psycho-social aspects of alcohol and tobacco use

Our understanding about bio-psycho-social issues related to alcohol and tobacco use in Sri Lanka is very limited. In 2002-3, a study conducted by me in collaboration with Indiana University, USA investigated possible associations between depressive symptoms and behavioral factors including alcohol use and smoking in a sample of 891 adolescents aged between 14 – 19 years living in the Southern province (40). The Center for Epidemiological Studies – Depression scale was used to measure depressive symptoms. This study revealed that in males, yearly alcohol use and yearly smoking were significantly associated with elevated depressive symptoms. In females, yearly alcohol use was significantly associated with elevated depressive symptoms.

I conducted another study in 2004 in collaboration with Indiana University, USA to investigate behavioral correlates of smoking among undergraduates in Sri Lanka (41). This survey (*N= 1269*) was conducted using an anonymous, self-report questionnaire. Knowledge of and attitudes towards smoking were tested using Multivariate Analysis of Variance (MANOVA). Results indicate that men (17.1%) were more likely than women (2.1%) to be yearly smokers ($p<.01$). The prevalence of yearly smoking is higher among undergraduates who were from poor income families compared to that of others (10.4% vs. 6.8%, $p<.05$). The ages between 13 -17 years were found to be the most vulnerable years for this study population to initiate smoking. When the respondents were asked to rate their perceived stress of daily life, 11.2% of smokers compared to only 5.2% of non-smokers reported that their daily life is "*very stressful.*" Even though junior females scored a higher mean value compared to junior males, this gender difference of the mean values of knowledge seem to have diminished when it comes to senior level. Females and senior undergraduates seemed to have healthy attitudes towards smoking compared to their counterparts. Perceived stress was found to be positively associated with smoking with regard to this study population.

Studies have demonstrated a higher prevalence of mental health problems in smokers compared to non-smokers in adolescents and young people (12, 14). Depression is an important risk factor for nicotine and alcohol addiction (7). Tension reduction theory in psychology posits that alcohol-seeking behavior is a result of an individual's need to reduce the discomforts of stress or tension (42). So when an individual is exposed to chronic tension, alcohol abuse may ensue. Poverty and other adverse ecological factors in the campus environment may contribute to make smokers' lives more stressful and finally to develop psychological health problems. Further research is warranted in this area. Overall, these findings strongly support the need for a comprehensive mental health program for adolescents and young people in Sri Lanka,

The social-cognitive determinants of alcohol and tobacco use, such as drinking motives, have not been clearly understood in the context of Sri Lanka. In 2006, in collaboration with researchers in Indiana University, USA, a study was conducted to identify drinking motives of a sample of alcohol users in the Southern province (43). The reasons and motives for drinking alcohol are closely associated to the drinking patterns and consequences of alcohol use (44, 45). Different age groups may develop different motivations towards alcohol use that are shaped by many factors, including culture and environment. Thus, motivation is considered a key concept in behavioral and psycho-social models of alcohol use. The main purpose of the study was to test the 3-factor structure of a scale developed to measure drinking motives and to examine the relationships between drinking motives and drinking patterns in a sample of adolescents and young adults in the Southern province. It was hypothesized that the drinking motives scale consist of 3 factors; personal enjoyment, social pressure, and tension-reduction. Cross-sectional survey design was used. An anonymous, self-administered questionnaire was employed to collect data. Purposive sampling method was used to select sample subjects. Efforts were made to obtain an equal number of adolescents (16-19 years of age) and young adults (20-30 years of age) for the sample, so that the sample would represent the young people in the study population. Data were collected for a period of 2 weeks in January 2007 and a total of 448 subjects participated in the study. The survey instrument consisted of several variables. A scale was developed to measure motives towards alcohol use and it was constructed using 20 rating items (see Table 5 for scale items). Four Personal Enjoyment (PE) items, 10 Tension-Reduction (TR) items, and 6 Social Pressure (SP) items were included in the scale. The internal consistencies of the 3 factors using Cronbach alpha methods were as follows: alpha $_{PE}$ = 0.48, alpha $_{TR}$ = 0.74, and alpha $_{SP}$ = 0.62. To assess the impact of each factor on drinking habits, each item in each of the 3 subscales were added up to obtain 3 subscale scores. Descriptive and bivariate analyses of the data set were done using SPSS 15.0. Confirmatory Factor Analysis (CFA) of the 20 item motives scale toward alcohol use was conducted using Lisrel 8.80 [46].

After cleaning and consistency checking, analysis was done using 412 sample subjects. The age of the participants ranged from 16-30 years (*M= 20.27, SD =3.63*). Forty-eight participants (11.7%) were married. Of the total, 102 (24.8%) had a job at the time of the survey and others were either students or unemployed. Means, standard deviations, and correlations among subscales and total scale are provided in Table 4.

Table 4 : Subscales and total scale of motivations towards alcohol use: Correlations, means and standard deviations

Motives	*1*	*2*	*3*	*4*	*M*	*SD*
1. Personal Enjoyment					2.10	1.99
2. Tension Reduction	0.43				4.26	4.59
3. Social Pressure	0.28	0.45			2.54	2.78
4. Total Scale	0.64	0.90	0.72		8.91	7.43

Correlations among subscales and total scale were ranged from 0.28 to 0.90 ($p < 0.01$). The strongest association was found between tension reduction and total score, and a relatively weaker association was found between personal enjoyment and social pressure. Confirmatory Factor Analysis (CFA) technique was used to test the 3-factor structure of the scale *motivations towards alcohol use* and it was tested using Lisrel 8.80. All indicators in the model had loadings above 0.40 and were significant at the $p < 0.01$ level (Table 5). Loadings greater than 0.40 are generally considered as acceptable [47]. The overall fit of the model was acceptable: χ^2 (167, N = 412) = 323.16; χ^2/df ratio = 1.93:1; CFI = 0.98; and the RMSEA = 0.048 [34]. Thus, in this sample of alcohol users, motivations towards alcohol use can be divided into 3 factors: personal enjoyment motives, social pressure motives, and tension-reduction motives.

Table 5: Scale items and factor loading of the 3-factor model of motivations towards drinking

Item	***Factor Loading****
I use alcohol because,	
Social Pressure	
My friends drink	0.61
It is difficult to refuse	0.46
Other people are drinking	0.77
It will enhance my creative ability	0.51
It is customary for men on special occasions	0.59
I want to be prominent	0.67
Personal Enjoyment	
I like the taste	0.62
It makes me feel good	0.71
I get thirsty	0.66
It goes well with the meals	0.41
Tension Reduction	
It helps me to relax	0.58
It would ease me when I get blamed	0.60
It helps me to sleep	0.61
IT helps me to forget my worries	0.70
It helps me to get rid of restlessness and tense	0.61
It helps me to cheer up when I get dull or boring	0.67
It gives me energy	0.65
It is a habit	0.45
It helps me to face difficulties with confidence	0.72
It helps me to control others	0.44

* All items were loaded significantly on their respective factors, $p < 0.01$

Associations between the 3 motivational factors and drinking frequency were examined using multiple regression. This analytical method was chosen so that the effects of the drinking motive dimensions can be mutually adjusted. The results are presented in Table 6.

Table 6: Multiple regression analysis predicting drinking frequency from 3 motives towards alcohol use

Motives	***B***	***SE B***	***β***
Constant	1.12	0.06	
Personal Enjoyment	0.04	0.02	0.097
Tension-Reduction	0.05	0.01	0.311*
Social Pressure	0.01	0.01	0.001

$R^2 = 0.13$ ($ps < 0.001$), * $p < 0.001$

As can be seen from the individual beta weights, only tension-reduction predicts drinking frequency. Thus it is reasonable to infer that young people in Sri Lanka are less likely to be motivated to use alcohol because of its enhancement effect or because of the social pressure exerted by peer or social groups to use alcohol. In studies conducted in other countries, social motives were found to be associated with moderate alcohol use, and personal enjoyment (enhancement) motives with heavy drinking [48, 49]. This may suggest that in countries like Sri Lanka, where the norm is abstinence from any type of alcoholic beverage, a relatively lower number of users consider alcohol as a pleasant drink. In fact, alcohol does not have a so called "rich, good taste," and it is only a myth constructed and propagated by the alcohol industry [18]. Studies have shown that those who use alcohol to enhance their positive affect status often use alcohol alone and in settings such as bars [50]. Results of this study are consistent with this finding because drinking at bars or in college settings by young men is very rarely seen in Sri Lanka. Results of the study suggest that drinking to reduce tension seemed to be the most emphatic motive of alcohol use in this sample of young people.

In summary, poor psychological health may associate with smoking and drinking behavior with respect to young men in Sri Lanka. Stress, suicidal ideation, and suicide in young Sri Lankan people is ranked among the highest in the world (51), and the general belief is alcohol helps to relieve distress. That climate may have motivated tension-reduction via alcohol and tobacco related diseases and disability in the country. Thus research, evaluation and prevention in the field of substance use should be encouraged and funded. Research findings should be made available for prevention workers to develop effective control measures and this would help them to make collaborative efforts to curb the alcohol and smoking problem in the country.

References

1. Perera B. Tobacco control in Sri Lanka. *Regional Health Forum* 1999; **3(1):** 28-34.
2. Murray CGL, Lopez AD. Alternative projections of mortality and disease by cause, 1990-2020: global burden of diseases study. *Lancet*, 1997; **349**: 1498-1504.
3. Rehm J, Mathers C, Popova S, Thavorncharoensan M, Teerawattananon T, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*, 2009; **373**: 2223-33.
4. Samarasinghe D, Goonaratna C. Tobacco related harm in South Asia, *British Medical Journal* 2004; **328**: 780.
5. Madeley J. Tobacco: a ruinous crop. *Ecologists* 1986; **16(2/3):** 124-129.
6. The World Bank. *Curbing the epidemic: governments and the economics of tobacco control.* The World Bank, Washington DC, USA, 1999.
7. Venturelli P, Hanson G. *Drugs and Society*. Jones and Bartlett, MA, 2001.
8. Institute of Policy Studies. *Mahinda Chinthanaya: a commentary on policy options,* Working paper series1, Institute of Policy Studies, Colombo, 2007.
9. The Office of National Drug Control Policy. *The 2009 the national drug control strategy*. The White House office of National Drug Control Policy. [on the web, http: //www.whitehousedrugpolicy.gov/publications/Policy/ndcs09/index.html]
10. Perera B. Tangirala M. *Alcohol, Factline,* Indiana Prevention Resource Center, Indiana University, Bloomington, USA, 2004.[on the web, http://www.substances.indiana.edu]
11. Fekjaer HO. *Alcohol and illicit substances – Myths and realities*, IOGT Alcohol and Drug Information Center, Colombo, Sri Lanka, 1993.
12. Jurgen REHM, Taylor B, Room R. Global burden of disease from alcohol, illicit substances and tobacco. *Drug and Alcohol Review*. 2006; **25**: 503-513.

13. World Health Organization. Global status report on alcohol, WHO/NCD/MSD/2001.2, WHO, Geneva, 2001.
14. Crowe LC, George WH. Alcohol and human sexuality: Review and integration, *Psychological Bulletin*, 1989; **105**: 374-386.
15. Wang J, Deng XJ, Wang JJ, Wang XW, Xu L. Substance use, sexual behaviors, and suicidal ideation and attempts among adolescents: findings from the 2004 Guangzhou Youth Risk Behavior Survey. *Public Health*, 2009; **123(2)**, 116-21.
16. National Institute on Alcohol Abuse and Alchoholism (NIAAA), *Youth drinking:Risk factors and consequences,* Alcohol Alert, 37, Bethesda, MD: NIAAA, 1997.
17. National Institute on Alcohol Abuse and Alchoholism (NIAAA). *Underage drinking: A major public health issue*, Alcohol Alert, No 59, Bethesda, MD: NIAAA, 2003..
18. Baklien, B, Samarasinghe D. *Alcohol and poverty in Sri Lanka*; FORUT: Colombo, Sri Lanka, 2003.
19. Kuntsche E, Knibbe R. Gmel G, Engels R. Why do young people drink? A review of drinking motives. *Clinical Psychology Review,* 2005; **25:** 841-861.
20. Borrero MAV, Pereira JTV, Miranda EE. An environmental management method for sugar cane alcohol production in Brazil. *Biomass and Bioenergy,* 2003; **25(3),** 287-299.
21. World Health Organization. The world health report: 2002: reducing risk, promoting healthy life. World Health Organization, Geneva, Switzerland 2002.
22. Abdullah ASM, Husten CG. Promotion of smoking cessation in developing countries: a framework for urgent public health interventions. *Thorax*, 2004; **59**:623-630.
23. Ezzati M, Lopez AD. Estimates of global mortality attributable to smoking in 2000. *Lancet* 2003; **362**:847-852.
24. Anderson P. Global use of alcohol, substances and tobacco, *Drug and Alcohol Review*, 2006; **25:** 489-502.
25. Helmut J. Global assessment of deforestation related to tobacco farming. *Tobacco Control,* 1999; **8**: 8-28.
26. Department of Excise Commission. *Administrative report 2004*, Excise Commission Department, Colombo, Sri Lanka, 2004.
27. Department of Excise Commission. *Administrative report 2007*, Excise Commission Department, Colombo, Sri Lanka, 2007.

28. Perera B, Fonseka P. Epidemiological aspects of alcohol use in a semi-urban community in Galle district. *Galle Medical Journal,* 1997; **1(2)**: 16-20.
29. Silva V, Samarasinghe D, Gunawardana N. Alcohol and tobacco use among males in two districts in Sri Lanka, *Ceylon Medical Journal,* 2009; **54(4)**: 119-124.
30. US department of Health and Human Services, Center for Disease Control: National HealthInterviewSurvey2008 [on the web: http://www.cdc.gov/nchs/data/series/sr_10/sr10_242.pdf].
31. Mbatia J, Jenkins R, Singleton N, White B. Prevalence of alcohol consumption and hazardous drinking, tobacco and drug use in urban Tanzania, and their associated risk factors. *International Journal of Environmental Research and Public Health,* 2009; **6(7)**:1991-2006.
32. Perera B, Torabi M. *Preliminary study of smoking and alcohol use among students in Southern Sri Lanka.* *Psychological Reports,* 2004; 94: 856-858.
33. The Indiana Prevention Resource Center. *Alcohol, tobacco and other drug use by Indian Children and adolescents,* Institute for drug abuse prevention, Prevention monograph series, N0 02-03, Indiana, USA, 2002.
34. Mehl G, Seimon T. Strategic marketing of cigarettes to young people in Sri Lanka: "Go ahead – I want to see you smoke it now". *Tobacco Control,* 1998; 7:429-433.
35. The World Bank. *Sri Lanka integrated survey 1999-2000.* The World Bank, Washington DC, USA 2000.
36. Warren CW, Riley L, Asma S *et al.* Tobacco use by youth: a surveillance report from the global youth tobacco survey project. *Bulletin of the World Health Organization,* 2000; **78(7)**:868-876.
37. Perera B, Fonseka P, Ekanayake R, Lelwala E. Smoking in Adults in Sri Lanka-Prevalence and Attitudes. *Asia-Pacific Journal of Public Health,* 2005;**17(1)**: 40-45.
38. World Health Organization. Research for International Tobacco Control: *WHO report on the global tobacco epidemic, 2008: the MPOWER package.* Geneva: World Health Organization, 2008.
39. Perera B, Østbye T, Fernando N et al. Health and health behavior among late adolescents in Southern Sri Lanka, *Galle Medical Journal*,2007; **12 (1)**: 13-17.
40. Perera B, Torabi MR, Jayawardana G, Palethanna N. Depressive symptoms among adolescents in Sri Lanka: Prevalence and behavioral correlates. *The Journal of Adolescent Health.* 2006; **39**: 144-146.

41. Perera B, Torabi MR, Jayawardana C, Perera R. Knowledge of and attitudes towards smoking, smoking patterns and perceived stress in Sri Lankan undergraduates. *International Journal of Child Health and Human Development,* 2010; **3(1)**, 00-00 (accepted).
42. Samson HH. Environmental effects on drinking patterns: stress and sensitization. (In: WA Hunt & Zakhari S Eds) *Stress, Gender, and alcohol-seeking behavior.* National Institute of Health, Bethedesta, MD, US government printing office, Washington DC, 1995, pp 277-292.
43. Perera B, Torabi MR. Motivations towards alcohol use among men aged 16-30 years in Sri Lanka, *International Journal of Environmental Research and Public Health,* 2009; **6 (9)**: 2408-2416.
44. Cox WM, Klinger E. Incentive motivation, affective change, and alcohol use: A model. In *Why People Drink. Parameters of Alcohol as a Re-Enforcer,* Cox, W.M., Ed.; Gardner Press: New York, USA, 1990, pp 291-314.
45. Engels RC, Wiers R, Lemmers L, Overbeek G. Drinking motives, alcohol expectancies, self-efficacy, and drinking patterns. *Journal of Drug Education.* 2005; **35**: 147-166.
46. Joreskog KG, Sorbom D. *LISREL [computer program]. Version 8.80;* Scientific Software International: Chicago, USA, 2006.
47. Bollen KA, Long JS. Introduction. In *Testing Structural Equation Models;* Bollen, K.A.; Long, J.S., Ed.; Sage Publications: Newbury Park, CA, USA, 1993, pp. 1-9.
48. Beseler CL, Aharonovich E, Keyes KM, Hasin DS. Adult transition from at-risk drinking to alcohol dependence: The relationship of family history and drinking motives. *Alcoholism, clinical and experimental research* 2008; ***32***: 607-616.
49. Galen LW, Henderson MJ, Coovert MD. Alcohol expectancies and motives in a substance abusing male treatment sample. *Drug and Alcohol Dependency.* 2001; **62**: 205-214.
50. Engels RC, Wiers R, Lemmers L, Overbeek G. Drinking motives, alcohol expectancies, self-efficacy, and drinking patterns. *Journal of Drug Education.* 2005; ***35***, 147-166.
51. Diekstra RFW, Gulbinat W. The epidemiology of suicidal behavior: a review of three continents. *World Health Statistics Quarterly* 1993; **46**: 52-68.

52. Rehm J, Mathers C, Popova S, Thavorncharoensan M, Teerawattananon T, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*, 2009; **373**: 2223-33.

53. Lancet. 2009 Jun 27;373(9682):2223-33.

54. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders.

55. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J.