AMERICAN UNIVERSITY OF BEIRUT

BURDEN OF SMOKING AND ITS ASSOCIATION WITH HOSPITALIZATION IN A LARGE NATIONALLY REPRESENTATIVE SAMPLE OF THE LEBANESE ADULT POPULATION

by
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AN ABSTRACT OF THE THESIS OF

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Title: Burden of Smoking and its Association with Hospitalization in a Large Nationally Representative Sample of the Lebanese Adult Population.

Background: The international literature has consistently shown a relationship between smoking and increased hospitalization. This facet of smoking research contributes to the widely debated costs of smoking on healthcare systems. Studies originating from Lebanon have revealed that smoking prevalence rates are as high as one-third of the population, which means that this relationship might represent a substantial burden on the Lebanese healthcare system. The purpose of this study is to examine the prevalence of smoking in Lebanon and its association with hospitalization.

Methods: Secondary data analysis of the Nutrition and Non-Communicable Disease Risk Factor (NNCD-RF) survey conducted in Lebanon between 2008 and 2009. A nationally representative sample of Lebanese adults aged 18 years and above of 1,332 men and 1,504 women was drawn from randomly selected households based on area probability multi-stage sampling: the strata were the Lebanese Governorates and the clusters were selected at the level of districts, urban and rural areas. Housing units constituted the primary sampling units in the different districts. Using WHO-stepwise approach where the first step consisted of interviews conducted using a comprehensive questionnaire, the study covered information on socio-demographic characteristics, tobacco and alcohol use, dietary intake, physical activity patterns, general health status and health seeking behavior, including hospitalization use. The survey team then measured participants blood pressure and anthropometric measurements (weight and height,) using standardized techniques and calibrated equipment. The study's main outcome was hospitalization status reported as ever been hospitalized. Descriptive statistics and regression analysis were used to evaluate prevalence of smoking and its association hospitalization.

Results: The overall prevalence rate of smoking was around 34%, where males' prevalence rate was around 42% compared to 27% of females. Nearly 60% of the study subjects were non-smokers and 6% ex-smokers. Bi-variate analysis showed that current smokers (69.2%) and ex-smokers (86.6%) were more likely to be hospitalized compared to non-smokers (56.8%). Multivariate analysis adjusted for all potential confounders showed that smokers (OR=1.34, 95% CI 1.11-1.61) and ex-smokers (1.66, 95% CI 1.20-3.33) had higher odds of hospitalization compared to non-smokers. Furthermore, a regression model was built measuring the number of pack-years for participants showed increased odds of hospitalization with escalating pack-years. The odds of hospitalization

among participants consuming 1-20, 20-40, 40-60, and >60, respectively, 1.38*, 1.28, 1.72* and 1.95* compared to non-smokers,

Conclusion: Compared to other countries in the region and few others worldwide Lebanese smoking rates are considerably high. The significant association shown between smoking and the use of hospital services highlights the burden that smoking has on health services use and the financial cost of smoking. Policymakers and health professionals must take a more proactive approach toward reducing smoking rates.

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To
My Beloved Family

CHAPTER I

INTRODUCTION

Earlier on, the focus of epidemiology and global health was on communicable diseases. Nowadays, epidemiology and global health have turned the spotlight onto non-communicable diseases (NCDs). Non-communicable diseases encompass chronic diseases, cancer and other behavior-related conditions.

Smoking is a risk factor for many NCDs such as cardiovascular diseases, respiratory diseases, cancers and others. Smoking is considered one of the main causes of premature death and preventable morbidity in the USA (Robbins *et al.* 2000). Moreover, smoking is a risk factor for six of the eight leading causes of death and accounts for 1 in every 10 deaths globally WHO added, in a recent report, that smoking ends 6 million lives annually globally (The WHO Report on the Global Tobacco Epidemic 2008). Tobacco-attributable death is expected to rise from 5.4 million deaths to 9.7 million deaths by 2030 worldwide, and is expected to kill around 8 million persons in that time frame (Mathers *et al*. 2006). Low- and middle-income countries will suffer from the bigger share of deaths while high income countries' tobacco-attributable deaths will decline by 9% and this disparity is expected to amplify in coming decades (Mathers *et al*. 2006). Smoking harmful effects goes beyond health effects to reach a drastic economic impact, For example, in China, current smokers spend around 17% of their income on tobacco, and the money spent on tobacco in Bangladesh is estimated to feed around 10 million poverty-stricken individuals (Chaaya *et al*. 2006). The impact of smoking on the economic burden of disease is considered colossal with direct medical costs estimated at around 50 billion dollars and indirect

medical costs estimated at around 47 billion dollars in the USA (Robbins *et al*. 2000). Moreover, WHO stated that tobacco use costs more than hundreds of billions of dollars annually. As mentioned earlier, the increase in tobacco use is tremendous in developing countries making the burden of smoking in a developing country such as Lebanon a crucial area of study. Little research has been done on smoking patterns and its effect on hospitalization in the Middle East and especially in the Lebanese population. This study aims to assess the impact of smoking on the use of hospital services among the adult Lebanese population.

CHAPTER II

LITERATURE REVIEW

A. Introduction

Smoking morbidity and mortality measures have been a focus of epidemiological and health care research for several decades. Studies have assessed smoking behaviors and their cumulative effects on individual health and cost on healthcare systems in general. Who labeled tobacco use as the biggest public health threat human race has faced. Around a billion people reported smoking worldwide. This epidemic is shifting to the developing world where tobacco use is expected to increase in low and middle income countries; however it will decline in the high income countries (The World Health Organization on the internet 2013).

Smoking is an established risk factor for many diseases and reduces the overall health of individuals. It plays an important role in the development of several respiratory diseases, such as bronchitis and emphysema (U.S. Department of Health and Human Services 2004). Smoking increases the risk of many cardiovascular diseases, including stroke and myocardial infarctions, and is associated with high risk of hip fractures, low infant birth weight and decreased bone density in post-menopausal women (U.S. Department of Health and Human Services 2004; Miller *et al*. 1998). Research has also demonstrated its relationship with cancers like oro-pharyngeal carcinomas, leukemia, bladder and other (U.S. Department of Health and Human Services 2004).

According to the WHO global tobacco smoking prevalence rates are around 22.2% (The WHO Report on the Global Tobacco Epidemic 2008). Most western

European countries and the United States reported rates in the low- to mid-20s, while a national study from China revealed an alarming 30% cigarette use. Research from the Mediterranean showed high prevalence rates in Turkey (34%), Spain (33%), and Egypt (30%), while a national survey from Iran revealed a surprisingly low 14% total smoker ((The WHO Report on the Global Tobacco Epidemic 2008). The literature in Lebanon has assessed smoking prevalence and determinants in a variety of population groups, though not nationally. Chaaya *et al*. (2006) have found current smoking rates around 28% among elderly Lebanese (Chaaya *et al.* 2006). Another study of pregnant women aged 14-43 showed a prevalence rate of 28% (Chaaya *et al*. 2003); while a study including university students found that 18% of students smoked cigarettes (Tamim *et al.* 2003).

B. Economic Burden of Smoking

The convergence of high smoking prevalence and its deleterious effects on health have had serious consequences for most economies. Studies have evaluated this economic burden through measurements of direct and indirect medical costs. Miller *et al*. (1993) have estimated smoking-attributable medical expenditures in the US for 1993 to be around $72,000,000, accounting for 11% of personal health expenditures (Miller *et al*. 1998). A 30-month prospective study conducted in Japan bared an 11% increase in medical costs among male ever-smokers as compared to male non-smokers (Izumi *et al.* 2001). Welte *et al*. (1993) found that the direct costs of smoking were around 9,265 million DEMs compared to 24,000 DEMs in Germany in 1993 (Welte *et al*. 2000). Ruff and colleagues estimated German smoking–related expenditures in 1996 to be around 16.6 billion euros, 51% attributed to direct medical costs and the remainder to indirect costs (Ruff *et al*. 2000).

Little research has tackled smoking-related costs in low- to middle-income countries, where the money spent on tobacco products alone could worsen poverty levels among people with low-incomes. Nationally Chaaban et al have estimated that smoking-related costs were around 326 million dollars accounting for 1% of the national GDP, in the year 2009 and of which direct smoking-related diseases costs were around 146 million dollars (Chaaban *et al*. 2010). Moreover the authors added that the poorest of families spend more on tobacco use than recreation and yet very close to expenditures on education (Chaaban *et al*. 2010). Efroymson *et al*. (2000) estimated that money spent on tobacco in Bangladesh could guarantee an adequate food supply for 10.5 million individual (Efroymson *et al.* 2001). Meanwhile, smoking expenditures in China represent 60% of personal income and 17% of household income (You Long Gong *et al* 1995). Reduction of smoking prevalence would have tremendous economic benefits on individual smokers, healthcare systems, and economies.

C. Smoking and Hospitalization

Hospital service use is one of the most costly direct smoking-attributable expenses; yet most studies have assessed this relationship between smoking and hospitalization in developed countries. Vu *et al.* (2001) conducted a longitudinal study among Busselton population in Western Australia, finding that current-smokers were admitted more frequently and used more bed-days as compared to non-smokers. Former-smokers used more hospital services compared to non-smokers but to a lesser extent than current-smokers (Vu *et al*. 2001). Another study of a cohort U.S. navy female recruits revealed that smoking is a predictor of hospitalization, where daily smokers had higher rates of hospitalization than never- and other-smokers, but only reaching statistical significance for the difference with other-smokers. Relative risks for

hospitalization rates showed that never-smoker (0.90) and other-smokers (0.87) were significantly lower compared to daily-smokers (Robbins *et al*. 2000). Moreover Baumiester *et al*. (2006) have shown that former elderly smokers are at increased risk of hospitalization (Baumiester *et al.* 2006).

Gender appears to play a role in the relationship between hospitalization rates and smoking. A study of young health military service members assessed the short term effects of cigarette smoking on hospitalization, showing a significant increase in the ratio of hospitalization rates not related to injury or pregnancy among current smokers (1.30 for males, 1.25 for females) and former smokers (1.20 males, 1.13 females) (Robbins *et al*. 2000; Chaaya *et al*. 2003). The study also revealed a 7% increase risk in lost work days among male current-smokers and 54% of female current-smokers as compared to non-smokers. Meanwhile, Jee and colleagues found that female current-smokers are 2.5 times more likely to be admitted to a hospital and smoking (current or ex-smokers) has also been associated with increased outpatient visits (Jee *et al*. 1993). Another study from Finland found that male smokers spent 70% (CI: 49%-95%) more days in the hospital compared to male non-smokers, while female smokers had 49% (CI: 29%-71%) more hospital days compared to female non-smokers (Haapanen-Niemi *et al*. 1999). Notably, Rodriguez and colleagues al didn't show any association or increased rates between smoking and hospitalization among a Spanish sample. (Rodriguez *et al*. 2000), Moreover Kaplan and colleagues found out that smoking wasn't associated with increased nursing home utilization (Kaplan *et al*. 1992).

Few studies in the Middle East or within Lebanon have assessed the impact of smoking on hospital use. Chaaya *et al*. (2006) have studied smoking patterns, predictors of smoking cessation and, the relation of smoking and other risk factors to hospitalization among an elderly Lebanese population. They found that former-smokers

have twice the odds of hospitalization compared to current-smokers (Chaaya *et al*. 2006).

D. Significance

Very little of studies have assessed the prevalence of smoking in Lebanon, some of the studies have estimated prevalence of smoking among a group of the total population, for instance Chaaya *et al*. (2003) have estimated smoking prevalence rates among a group of pregnant women while Tamim *et al.* (2000) have evaluated smoking prevalence among university students, similarly El-Roueiheb *et al.* (2006) have also levied the prevalence rates of smoking among public and private schools during the year 2003 to 2004 (Chaaya *et al.* 2006; Tamim *et al*. 2003; El-Roueiheb *et al*. 2006). Salameh *et al.* (2010) have estimated percentage of smokers whether current cigarette and water pipe smoking among Lebanese residents aged above 40 years old(Salameh *et al*. 2010). Lebanese smoking prevalence rates have been estimated by gender in the WHO Tobacco epidemic report in 2008; however the estimated prevalence might be somehow old and of a varying quality regarding smoking-related data collected. To our knowledge the only local study tackling the association between smoking and hospitalization was done by Chaaya *et al*. (2006) on a sample of elderly Lebanese population. So very little of Lebanese data have tackled prevalence and the relation between hospitalization and smoking, yet these available resources are not generalizable and were mainly done on specific population groups, so this recommends the need of a national representative population based survey assessing smoking prevalence and its relationship with hospitalization such as our study.

E. Purpose of the Study

Our study's purpose is to appraise smoking's prevalence and its relationship with hospital service use, in particular hospitalization, among a nationally representative sample of Lebanese adults.

CHAPTER III

METHODS

A. Aim and Objectives

The aim of this study is to assess the burden of tobacco consumption in Lebanon and its association with hospital services use.

The specific study objectives are:

- To assess the prevalence of tobacco use (cigarette and water pipe) among a national Lebanese sample aged above 18 years.
- To evaluate the relationship between cigarette smoking and hospitalization while controlling for classic risk factors.
- To assess the association between water pipe smoking and hospitalization
- To examine whether a dose-response relationship exists between cigarette smoking, measured in pack year, and hospital service utilization.

B. Study Design and Sample

Data for this study was drawn from secondary analysis of the Nutrition and Non- communicable disease Risk Factor (NNCD-RF) survey conducted on a nationally representative Lebanese sample between the year of 2008 and 2009. This cross-sectional population-based survey was designed using WHO-Stepwise guidelines. Random area probability multi-stage sampling method was used. Lebanese governorates were the strata, while clusters were selected at the level of districts, rural and urban areas. Moreover, the household constituted the primary sampling unit selected from the assorted districts. One adult aged above 18 was randomly selected

from each housing unit as a participant, excluding pregnant, lactating and the mentally challenged individuals. The total number of the subjects in the sample was 2,836 participants, with 1,332 males and 1,504 females.

Initially face to face Interviews were conducted using comprehensive questionnaires that incorporated information on basic socio-economic characteristics, health-seeking behaviors, and smoking as well as diet, physical activity, history of non-communicable disease such as hypertension and diabetes. The interviews were conducted by specially trained dietitians and research assistants on study methodology. Each interview lasted about an hour. In the second step blood pressure and anthropometric measurements were recorded using standardized techniques and calibrated equipment.

C. Variables and Measures

1. Demographic Characteristics

Basic demographic characteristics included age (categorized as 18-34.9, 35-49.9, 50-64.9, and ≥65), sex, and governorates. Moreover it included education, martial status and insurance coverage.

2. Socio-economic Characteristics

Socio-economic characteristics included education level (categorized into three levels elementary, secondary and university, ,work status was categorized as working or non-working, economic status reported as self-perceived status, availability of house hold items and assets (such as cars, TV, Fridge, Etc...),and income. Income was categorized into three categories, first category included those with income less than 1million LBP, and the second category included those with income between

1millionLBP and 6million LBP, while the third category included those with income above 6million LBP.

3. Behavioral Characteristics

These included smoking habits, alcohol use, and physical activity. Smoking was assessed by smoking habits, quitting time, age of smoking, and number of cigarettes smoked. Cigarette smoking habit was categorized into three categories, non-smoker, current smoker or ex-smoker. Also pack-year was calculated for both current smokers and ex-smokers. Pack-year is calculated as packs smoked x years smoked. Initially current smokers, years smoked was estimated by subtracting smoking age from age, then packs smoked were calculated by dividing number of cigarettes by 20. Pack-year was further calculated by multiplying number of packs smoked with estimated years smoked variable. However for ex-smokers, years smoked was estimated by subtracting years of quitting smoking and smoking age from age. Then it was multiplied with the packs smoked variable to finally obtain pack-year variable. Smoking habits also included water pipe smoking, where it was reported as currently smoking water pipe or not. Additionally to assess physical activity, the International Physical Activity Questionnaire, IPAQ short version was used. Moreover alcohol habits were reported as either drinking or not drinking; and alcohol drinkers reported further alcohol frequency.

4. Health-Related Characteristics

Included co-morbid conditions, such as myocardial infraction, hyperlipidemia, diabetes mellitus, hypertension and stroke. Additionally the outcome variable, health-service utilization in particular hospitalization as also reported, it was reported as, ever been hospitalized for at least one night (except delivery admissions). Also

hospitalization frequency, past year hospitalization and reasons of hospitalization were reported.

D. Plan of Analysis

Data were coded and analyzed using statistical Software Package for Social Sciences (SPSS version 18) and STATA version 10. Means and frequencies of socio-economic, behavioral, health-related and smoking related factors were calculated using uni-variate analysis. Bi-variate analysis and cross-tabulation were used to determine the unadjusted odds of hospitalization with socio-economic, behavioral, health-related, and smoking-related characteristics. Then age and gender adjusted logistic regression of hospitalization with lifestyle, behavioral, socio-economic ,smoking-related characteristics was done to estimate adjusted odds and eliminate possible confounding effects by age and gender. Multivariable logistic regressions of hospitalization with socio-economic factors, health-related characteristics, smoking-related factors, co-morbidities, alcohol intake were done to assess their correlation with the main outcome and calculate the odds ratio and its 95% confidence interval. Three models were routed: first model included above mentioned variables. The second model included pack-year variable instead of smoking status, in an attempt to establish a dose-response relationship between smoking and hospitalization. Third model included all previous factors except the fact that water pipe smoking status variable replaced pack-year in the previous model.

E. Ethical Considerations

The study received ethical approval from the Institutional Review Board at the American University of Beirut. All participants had to sign a written consent form

throughout all three stages of the study. All questionnaires were coded after the completion of the survey in order to ensure confidentiality and anonymity while entering the data.

CHAPTER IV

RESULTS

The baseline demographic characteristics of survey participants are demonstrated in Table A1. Socio-economic and health related characteristics of the whole survey participants are presented in Table A2 and A3, respectively for the entire sample. Moreover, Table A4 illustrates smoking related variables including smoking prevalence and cross tabulation of hospitalization and smoking.

A. Basic Demographic Characteristics

The mean age of the sample was 40.12 years (standard deviation 16.43), females comprising the larger proportion (53%) compared to males (47%). Around 57.2% of the respondents were married while 35.11% reported themselves as single while 7.7% reported being divorced or separated. Majority of respondents (90%) resided outside Beirut while only 10 % took Beirut as their governorate of residence.

B. Socio-Economic Characteristics

Most of the study respondents had acquired a secondary education or higher. An estimated 51% of them reported non-working at the time of study; however non-working may have included volunteers, students and housewives. The majority of the participants reported themselves as having middle socio-economic status (73%). Around 59% of the participants had insurance, with the majority (45.4%) insured in National Security Social Fund.

C. Health-Related Characteristics

The majority of the participants reported never consuming alcohol during the past 12 months (59.1%) and around 25.2% have been found obese; whereas 39.5% were found to be normal or underweight. Moreover most of the survey participants (73.1%) reported having good self-rated health, while only 8.1% reported having weak self-rated health. Hypertension was found to be the most prevalent health-related condition with 27% of the survey respondents was identified to have combined hypertension (self-reported and measured). The second rampant condition was found to be hypercholestermia having 15.7% as a prevalence rate. Around 7.1% of the survey participants reported having diabetes and around 6.1% reported having some form of heart disease.

D. Smoking-Related Variables

Approximately 59% of the study respondents have reported never smoking cigarettes; while 34.7% reported being current smokers and 5.8% declared quitting smoking. However there was a slight gender difference among smokers where 58% of smokers being males and around 61.3% of non-smokers were found to be females, with a p value <0.001, The majority of current smokers (69.2%) p-value<0.0001 were hospitalized, most importantly more than two thirds (86.6%) p value<0.0001of ex-smokers reported hospitalization. Assessing pack-year and hospitalization status, an increasing trend is noticeable among study participants, where hospitalization prevalence increased with escalating pack-year level, in particular 86% of participants, consuming >60 pack-year reported hospitalization; whereas it decreases for 40-60 pack-year consumers to 81.1%, moreover around 61.1% with 1-20 pack-year level subjects have reported hospitalization with a p value <0.001. More than half of water pipe

smokers (57.8%), were hospitalized compared to 64.5% of non-water pipe smokers reported hospitalization with a p-value <0.002.

E. Bi-Variate Analysis

Initially bi-variate analysis was performed of hospitalization vs. different variables. (Table A5).

- *Demographic variables:* First comparing males to females, the odds of males being hospitalized is significantly higher than females (1.44 95% CI=1.23-1.68), increased age group was significantly associated with hospitalization where the odds of hospitalization was significantly higher among different age groups (≥65 age group OR=9.69 95% CI 6.42-14.6, 50-64.9 age group OR=3.47 95% CI OR=2.71-4.44, age group 35-49.9 OR=1.67 95% CI=1.39-2.00) compared to the reference category (age group 18-34.9). Being single (OR=0.54 95% CI 0.46-0.63) has showed a decreased odds of hospitalization compared to married participants; while being divorced (OR 2.27 95% CI=1.58-3.26) have higher odds of hospitalization compared to married respondents.

- *Socio-economic variables:* Higher education level significantly decreased the odds of hospitalization, where individuals who completed secondary or technical education (OR=0.61 95% CI=0.51-0.74), university education or higher (OR=0.49 95% CI=0.41-0.59) are less likely to have been hospitalized compared to complementary education. Having middle (OR= 0.65 95% CI=0.54-0.88) and high (OR=0.55 95% CI=0.37-0.80) self-rated socio-economic status had a decreased odds of hospitalization. Moreover the odds of hospitalization was significantly lower in respondents whose income is between 1millionL.L-6millionL.L (OR=0.77 95%CI=0.64-0.91) and income above 6million L.L (OR=0.72 95% CI=0.31-0.83) weighed against respondents whose

income is less than 1 million L.L.

- *Health-related variables:* Non-alcohol consumers (OR=0.65 95% CI=0.7-0.95) have decreased odds of hospitalization. Whereas most co-morbidities including hypertension(OR =4.16 95%CI=3.10-5.49), diabetes(OR= 3.90 95%CI=2.57-5.90) myocardial infarction(OR=26.05 95%CI=3.58-189.50), atherosclerosis(OR= 16.6 95%CI=5.25-52.90),hyperlipidemia(OR=3.02 95%CI=2.33-3.91), heart disease(OR=21.6 95% CI=8.88-52.69) have shown an increased odds of hospitalization. The odds of hospitalization was significantly lower among overweight (OR=1.38 95% CI=1.16-1.65) and obese subjects (OR=3.66 95%CI=1.38-2.05) compared to underweight or normal subjects.

- *Smoking-related variables:* Considering smoking status, Ex-smokers (OR= 1.58 95% CI=1.12-2.04) were more likely to be hospitalized while current smokers (OR=0.53 95% CI=0.36-0.69) had lower odds of hospitalization as compared to non-smokers. The odds of hospitalization was significantly higher among individuals having pack year of 1-20 (OR= 1.40 95% CI=1.15-1.71) 20-40 (OR= 1.79 95% CI=1.35-2.36), 40-60 (OR= 3.23 95% CI=2.19-4.78), and >60 (OR= 4.62 95% CI=2.88-7.40) compared to 0 pack years (nonsmokers).

F. Multi-Variable Logistic Regression

Multi-variable logistic regression was performed in two steps, the first model adjusting for age and sex was executed, then three models were performed controlling for all potential confounders. For the first model (Table A6), adjusting for age and sex, the odds for hospitalization was significantly increased among smokers (OR=1.36 95% CI=1.14-1.63) and ex-smokers (2.47 OR=95% CI=1.52-4.00) compared to non-smokers, most pack year levels have significantly increased the odds of hospitalization

1-20 (OR= 1.38 95% CI=1.12-1.69) 40-60 (OR= 1.72 95%CI=1.13-2.61), and >60(OR= 1.95 95% CI=1.18-3.23) compared to non-smokers however individuals consuming 20-40 pack years have slightly increased the odds of hospitalization (OR=1.28 95% CI 0.94-1.72) compared to non-smokers. Additionally the odds of hospitalization among single participants (OR= 0.79 95% CI=0.64-0.96) was significantly lower than married while divorced or widowed respondents (OR= 1.31 95% CI=0.88-1.94) had a slightly higher odds but with no significance compared to married individuals. Moreover individuals who completed university (OR=0.81 95%CI=0.66-0.99) or above had a significantly inverse association with hospitalization compared to participants only completing complementary education. Non-insured (OR= 1.29 95% CI=1.10-1.52) participants had a significantly higher odds of hospitalization compared to insured respondents, and most of the co-morbidities including hypertension(OR =2.05 95% CI=1.51-2.79), diabetes(OR= 1.81 95%CI=1.18-2.8) Myocardial infarction(OR=11.01 95% CI=6.01-13.74), Atherosclerosis(OR= 6.3 95% CI=1.95-20.50) have shown an increased odds of hospitalization.

In the second step (Table A7), the first model was performed adjusting for all potential confounders. Males were 1.66 times more likely to be hospitalized than females (p value <0.0001).Those in the age group of 50-64.9 were 1.96 times likely to be hospitalized compared to participants in the age group of 18-34.9. The odds of hospitalization increased significantly among current and ex-smokers, where smokers were 1.34 times more likely to have been hospitalized (p-value <0.008) and ex-smokers were 1.99 times more likely to have been hospitalized (p-value<0.002). The odds of hospitalization was higher in non-insured participants (OR=1.53, p-value<0.001). Furthermore participants residing in governorates outside Beirut had higher odds of hospitalization (OR=1.35, p value=0.014). Hypertensive patients were 1.59 times more

likely to be hospitalized than normotensive respondents (p value<0.05). Respondents having good –self-rated health were 1.46 times more likely to be hospitalized, while those having appropriate self-rated health were 1.67 times more likely to be hospitalized, moreover having weak self-rated health increased the odds of hospitalization (OR=3.07, p value<0.0001).

The second model included the same variables, included in the first model, with the exception of including pack-year variable instead of smoking status. Similar to the previous model males were 1.66 more likely to have been hospitalized (p value<0.001 age was a significant predictor of increased hospitalization, in particular participants in the age group of 35-49.9 were 1.21 (p value=0.008) more likely to be hospitalized and those in the age group of 50-64.9 years 1.74 times (p value<0.001) more likely to be hospitalized compared to the reference age group, moreover the odds of hospitalization significantly increased (OR=3.36 p value<0.0001) among elderly aged above 65years compared to those in the age group of 18-34.9 years. Pack-year was included in this model instead of smoking status, and respondents consuming 1-20 pack years were 1.35 times more likely to be hospitalized(p-value<0.006) and those consuming in the range 40-60 were 1.54 more likely to be hospitalized (p-value<0.05), similarly smokers consuming more than 60 pack-years were 1.85 times more likely to be hospitalized(p-value<0.022) , however the odds of hospitalization was slightly increased but with no significance among smokers consuming in the range 20-40 pack-years (OR=1.22 , p-value<0.206). Same as the previous model residents outside Beirut had an increased odds of hospitalization (OR=1.38, p-value<0.015), additionally non-insured participants were 1.55 (p-value<0.0001) times more likely to be hospitalized than insured respondents. The odds of hospitalization was significantly increased among hypertensive participants (OR=1.61, p-value=0.04). Respondents having good –self-

rated health were 1.46 (p value<0.00) times more likely to be hospitalized, while those having appropriate were 1.67(p-value<0.00) times more likely to be hospitalized. Moreover having weak self-rated health increased the odds of hospitalization (OR=3.07, p value=0.00).

The third model (Table A8) included water pipe and all potential confounding variables. Water pipe smoking was not associated with hospitalization (OR=0.92, p-value=0.403). Being a male increased the odds of hospitalization (OR=1.50, p-value<0.00), and being non-insured also increased the odds of hospitalization (OR=1.40 p-value<0.00). Additionally participants in the age range 35-49.9 were 1.45 times more likely to be hospitalized (p-value<0.001), and those in the age range 50-64.9 were more likely to be hospitalized (p-value<0.00) while elderly participants above 65 were 7.00 (p-value=0.00) times more likely to be hospitalized compared to participants in the age range 18-34.9. The odds of hospitalization were significantly lower among respondents who completed university education or higher (OR=0.73, p-value=0.006).

CHAPTER V

DISCUSSION

A. General View

The reported overall smoking rates in Lebanon were high with results being larger than most of developing and Mediterranean countries. These findings echo the WHO warnings that tobacco use is a global epidemic, especially in low- and middle-income countries, with recent studies estimating that smoking will result in nearly 8 million deaths by the year 2030 (2). Tobacco-attributable deaths are projected to increase by 200% from 3.4 million to 6.8 million in low and middle income countries in the next two decades. This is clearly an issue of global health equity as international tobacco companies pour money into developing countries to secure and grow market share in economies where health regulations are still weak.

Research strongly implicates that smoking is a risk factor for six of the eight leading causes of death globally (Mathers *et al.* 2006), and 1 in every 10 deaths is directly attributed to this behavior. If Lebanese smoking prevalence rates continue at the current levels or increase, population health and healthcare costs will deteriorate even further.

The literature has found an association between smoking and increased health burden (Hvidtfeldt *et al.* 2010), yet few studies have assessed the impact of smoking on hospital service usage. To our knowledge, this study is the first population based survey to assess national prevalence rates of smoking among adults and the first to evaluate the impact of smoking on hospitalization in Lebanon among a nationally representative sample.

B. Smoking Prevalence in Lebanon and Comparison with Other Countries

The prevalence of cigarette smoking reported in this study was around 35 % (43% male prevalence and 27% female prevalence) which is consistent with available estimates for the country where WHO reported a smoking prevalence rate of 37% (42).Globally, men's smoking prevalence was around 40% compared to 9% of female smoking prevalence in 2006 as reported by WHO (2010). Prevalence rates in our study are overall higher than those obtained USA and Europe. For example WHO reported in the year 2008 a 23% smoking prevalence in the U.S. (males 27.5% and Females 19%). A 2005 national survey conducted in Germany on people aged 15 and older showed a lower smoking prevalence of 27.2% (males 33.2%, females 22.4%) compared to our study findings. Similarly smoking prevalence rates in France were around 30% (males 33.2%, females 29.9%) which is comparable to German prevalence rates but still lower than our findings. Likewise the General Household Survey-Great Britain conducted in 2002 revealed a current cigarette smoking prevalence rate of 26% (The WHO Report on the Global Tobacco Epidemic 2008) (Figure A1).

The World Health Survey conducted in the year 2002 among Turkish people older than 18 showed comparable prevalence rates (34.6%) to our study (35%) though their survey's findings reported much higher male smoking prevalence (57%) compared to our data (47%) (The WHO Report on the Global Tobacco Epidemic 2008). Correspondingly, a national Bangladesh survey in conducted in the year 2004 showed 20% smoking prevalence which is lower as compared to our study (The WHO Report on the Global Tobacco Epidemic 2008).

Prevalence rates in some countries of the Arab region are relatively similar. In Kuwaiti, a cross-sectional survey in 1996 showed a similar smoking prevalence of 34.4% (Memon *et al.* 2000).Comparing our data findings to some of Eastern

Mediterranean countries, Tunisia showed a relatively comparable rate of 31% while most of the countries revealed a lower smoking prevalence rate, for example Jordan's smoking prevalence rate was estimated to be 26 %, Bahrain's prevalence rate of 21%, and Egypt experienced a 20% smoking prevalence rate (The WHO Report on the Global Tobacco Epidemic 2011; World Health Organization, The Work of WHO in the Eastern Mediterranean Region 2011). (Figure 2)

Varying prevalence rates among different populations may be accounted to real and artifact factors, some of the artifact factors include differences in the definition of smoking habit (tobacco use such as smoking vs. chewing and type of tobacco smoked) and the variations in the age distribution of the selected study sample.

C. Prevalence of Smoking by Gender

Consistent with the international literature, male smoking rates (43%) in our study exceeded female rates (27%). Male prevalence rates in our study are overall higher than those obtained from the U.S or Europe, for example U.S. male prevalence rates were estimated to be 27.5%, additionally certain European countries like Germany and Great Britain revealed higher male smoking rates of 33.2% and 27% respectively. (Figure A4)

Certain Arab countries reported higher male smoking rates, with Jordan's reporting around 61%, Syria 42%, Egypt 59.3% and Tunisia 61% (The WHO Report on the Global Tobacco Epidemic 2008). Nonetheless other Arab countries had lower prevalence rates, for example Saudi Arabia reported a male smoking prevalence rate approximately 25% and UAE about 19% (The WHO Report on the Global Tobacco Epidemic 2008). According to WHO Report On the Global Tobacco Epidemic 2008 most of male smoking prevalence rate obtained from African countries were lower

compared to Lebanon (e.g. Cameroon 12% and Mali 19.2% male prevalence rate), (The WHO Report on the Global Tobacco Epidemic 2008). Some of variation magnitude may be attributable to different factors, such as variation in age inclusion criteria, smoking definition and population representativeness (Figure A5).

The higher prevalence in the smoking rates among males in certain Arab population than our study estimates offers interesting perspectives. This may be explained that these countries are passing through a different stage of tobacco epidemic. In particular data suggest that Lebanon is passing through stage 3, characterized by steady male prevalence with increasing female prevalence and the knowledge of smoking hazards are wide spread, while the previously mentioned populations are passing through stage 2 which is portrayed by a rapid increase in male prevalence while female prevalence is lagging largely behind along where tobacco control activities are not yet well developed (Lopez *et al*. 1994). Furthermore the difference in smoking prevalence could be essentially attributed to more basic differentials between Lebanon and other Arab countries. Galea *et al*. (2004) have argued that higher social economic status and level of education have a negative effect on smoking prevalence, and low employment rate is associated with higher smoking prevalence (Galea *et al*. 2004). For instance, Libya (11%) Egypt (9%) and Jordan (13%) have higher level of unemployment (Lebanon 6.4%), lower education levels, and lower income per household, and have higher male smoking prevalence compared to our data (World Health Organization. The Work of WHO in the Eastern Mediterranean Region 2011).

Our study also revealed another important finding, where a relatively high female smoking prevalence (27%) was noted as compared to some developed countries, for example U.S. Germany, Sweden and Russian federation showing lower prevalence rate of 20.3%, 22%, 22.7%, 23.2%, 23.2% respectively ((The WHO Report on the

Global Tobacco Epidemic 2008). Yet some developed countries showed comparable or by some means higher prevalence rates compared to our study data (31% in the UK and Denmark) (The WHO Report on the Global Tobacco Epidemic 2008) (Figure A5)

In Arab countries, estimates of female smoking rates were noted lower compared to our study data. In Jordan, Egypt, and Tunisia, rates were a meager 6%, 0.4% and 5% respectively (43) (Figure A6). There is a drastic increase in female smoking rate thus going in line with projected increase in smoking prevalence in developing countries, but compared to our study findings the 20% increase is not likely to be attributed to increase female smokers rate only, however this may be explained many factors. First there is an issue of underreporting where smoking is not socially accepted in most Arab Countries, additionally smoking definition used by the diverse studies may have varied from our study variable's definition, finally the study done may not have targeted all age groups such as our study.

Data from industrialized and developing countries have suggested that male's smoking prevalence have reached its climax and may have started to decline, however female's smoking rate have been suggested to be increasing broadly (WHO 2010: Gender, Women and the Tobacco Epidemic: A Gender Equality Framework for Tobacco Control).WHO reported that developing countries had higher female smoking rates than developed countries (WHO 2010: Gender, Women and the Tobacco Epidemic: A Gender Equality Framework for Tobacco Control). Reasons for differences in female prevalence between Lebanon and regional countries may be due to its ‘westernization’, where females are generally more liberal and actively involved in daily social, cultural, and economical activity. WHO argued factors that might have played a role in the increasing trend in middle and high-income countries, Tobacco companies have marketed the phony idea of smoking's link to females' freedom and

empowerment, additionally these companies have marketed smoking as an icon of "elegant" fashion influencing many women to turn their heads to smoking as a sign of freedom, and as an approach for appetite control (WHO 2010: Gender, Women and the Tobacco Epidemic: A Gender Equality Framework for Tobacco Control). Second peer pressure, parental smoking and low self-esteem also might increase the likelihood of smoking among females as stated by the WHO report (2010) (WHO 2010: Gender, Women and the Tobacco Epidemic: A Gender Equality Framework for Tobacco Control). High Female prevalence rate in our study may be attributed to the factors mentioned earlier that are widely applicable to the Lebanese social, economic and cultural context of the population.

Lower Arab female smoking prevalence rate may be further explained by some religious constraints in these countries where women may be less socially active and with lower spending power than men to buy cigarettes, moreover smoking by Middle Eastern women is often viewed as reprehensible and vulgar and sometimes even dissipate. However female smoking prevalence is still low but it is increasing significantly especially among educated and professional work force in the MENA (Middle East and North Africa) region (Mackay *et al*. 1996). Yet the drastic difference between Arab data and our study findings may not only have to be attributed the real increase, but underreporting of smoking might contribute to an artifact amplification of the rate's differences , since in most if not all Arab and gulf countries cigarette smoking among females is viewed as socially unacceptable.

D. Water Pipe and Hospitalization

Lebanese smoking habit is mainly considered as cigarette smoking and water pipe smoking. Limited data are present regarding water pipe smoking in the region or

globally, however a Syrian cross-sectional study have reported a low Water pipe daily smoking rate in the region of 7%. Little research has considered water pipe smoking, especially in Lebanon. For example Tamim *et al*. reported water pipe (also known as Hookah) smoking prevalence around 21%, very close to our study findings of 24 % (Tamim *et al*. 2003). Other studies counted water pipe smoking prevalence around 14% in young adults, 25% among pregnant women and 32% among university students (El-Roueiheb *et al*. 2004, Salameh *et al*. 2012). The alarming rate among Lebanese university students might be attributed to low social stigma of water pipe smoking and perceptions of the health effects may be less devastating compared to cigarette smoking (Knishkowy *et al*. 2005). Bi-variate analysis have shown a significant association between hospitalization and water pipe ($p<0.002$), it lost significance after controlling for all classic factors in the final model. However our study wasn't able to identify the association between water pipe use and increased hospitalization in view of the fact that water pipe smoking habit started to grow widely only in the past 5 to 10 years, For instance Chaaban *et al*. reported an alarming 60% water pipe prevalence rate among youth aged between 13-15 years in 2005 (Chaaban *et al*. 2010) and we will not be able to detect the harmful effects on health and subsequently hospitalization in the near future due to the long latency period of smoking-related diseases.

E. Correlates with Hospitalization

Findings of the multivariate analysis showed that age and sex were significant predictors of increased odds of hospitalization. The older age groups and men were at greater risk of hospitalization. University level education was also a significant protective factor in the model adjusting for age and sex, but lost significance in the multivariate analysis. Single marital status also resulted in lower odds of hospitalization

but lost significance after adjusting for confounding variables. This study suggested higher odds of hospitalization among non-insured participants compared to insured, which might be explained by that insured individuals are more likely to have better access to primary medical care thus improving quality of life and general health status leading to decreased hospitalizations. Those residing outside Beirut had increased odds of being hospitalized compared to Beirut's residence and these findings were consistent with previous literature for instance Galea and colleagues have stated that deprived area of residence remained a significant predictor of smoking status even after controlling for socio-economic status (Galea *et al*. 2004). Overall, study findings concur with previous literature where low socio-economic status, area of residence and education level have been shown to be a significant predictor of smoking status (*Galea et al*. 2004).

Comparing hospitalization among different smoking statuses, our study estimated 69.2% of current smokers and an alarming 86.6% of ex-smokers were hospitalized compared to 56.8% among non-smokers (p-value<0.0001). This finding came as expected and mirrored trends found in other studies (Robbins *et al.* 2000; Woodruff *et al*. 2010; English *et al.* 2002). Results indicating ex-smokers as the greatest users of hospital services may be due to the fact that smokers who have serious illnesses may be pressured to quit by consulting health professionals and close relatives (Baumiester *et al*. 2007) which is an issue of "reverse causality" in cross-sectional studies. There was a similar trend observed of high hospital use for ex-smokers following cessation but this risk decreased over time to levels below those of current smokers (Baumiester *et al*. 2007).

Our study is one of few studies to assess associations between smoking dose-response and hospitalization. Around 86% of smokers reporting greater than 60 pack

years were hospitalized, while this figure generally decreased with a reduced pack-year. In particular the odds of hospitalization in the participant consuming 1-20, 20-40, 40-60, and >60 was 1.38*, 1.28, 1.72* and 1.95* respectively compared to non-smokers, consistent with a study by Chaaya and Colleagues (2006) (Chaaya *et al*. 2006). These findings support previous literature showing increased negative health effects with higher cigarette consumption (Chaaya *et al*. 2006). The data also show that current-smokers and ex-smokers had much higher odds of hospitalization in all models, but ex-smokers had a significantly higher risk (1.99*) than current smokers (1.34*), which supports findings in the literature (Baumiester *et al*. 2007; Chaaya *et al*. 2006). This increase may be ascribed to sicker smokers quitting at a faster rate than healthy smokers (Chaaya *et al*. 2006). Conclusive data showing smokers, ex-smokers, and heavier smokers as having higher rates of hospitalization are important for public health policymakers to consider. Increased rates of hospitalization impact the cost and quality of care in the Lebanese health system and reducing the impact of smoking should be a public call to action.

In addition to the above, and as expected, co-morbid conditions including myocardial Infarction, diabetes, atherosclerosis, and participants who had any form of heart diseases had increased odds of hospitalization, controlling for age and sex. However, in the final model (adjusting for all co-variates as well as for smoking), associations of co-morbid conditions with hospitalization lost their significance, except for hypertension. In an attempt to evaluate whether to keep or remove co-morbid variables in the final model, a likely-hood ratio test statistics (χ^2 =29.7 p-value<0.001) was done revealing that co-morbid conditions should be included in the final model. The above mentioned co-morbid conditions all sit in the causality pathway between smoking and hospitalization, and after controlling for these co-morbid conditions

smoking retained its significant association, it may be explained that smoking might have other causality pathways that might have led to increased odds of hospitalization. For instance smoking is associated with an increased risk of hip fractures and decreased bone density in post-menopausal women which will consequently lead to hospitalization. However smoking also plays a role in the causative process of COPD and cancers and they should have been included in the final model but our data didn't report any of these chronic conditions.

Further analysis of the data stratified by sex (Table A11 and A12) revealed that only ex-smokers among males had significantly higher odds of hospitalization compared to non-smokers while only current smokers among females had significantly higher odds of hospitalization compared to non-smokers. This may indicate that males are more likely to quit smoking after having disease while females are more likely to quit before the occurrence of diseases and subsequently hospitalizations.

F. Limitations

Despite this study being one of the largest representative population based surveys, some limitations do subsist. First, this study is cross-sectional by nature, so we may have an issue with temporality where it is not possible to conclude which preceded the other: hospitalization or smoking. Nevertheless, it is unlikely that hospitalization would tend to lead to smoking, although it might be the case of ex-smokers. Furthermore, cross-sectional studies do not establish causational relationship between exposure and outcome but originate hypothesis to be confirmed by stronger study designs. Our findings reinforce the magnitude of association between smoking and hospitalization but this causation should be further investigated by more powerful study designs. Moreover, hospitalization, smoking–related variables, co-morbidities and other

socio-demographic variables were all self-reported and introduce information bias. Some of our subgroup analysis might have included a small subsample thus explaining the lack of significance and wide confidence intervals. The questionnaire didn't include any question tackling COPD which might be considered as an important variable to be included in the final logistic regression model.

G. Strengths

This study is one of the largest population based surveys done on smoking and hospitalization where prevalence of smoking and predictors of hospitalization were estimated for the first time for adult participants. The large sample (n=2538) was drawn from the six governorates hence permitting generalizibility of the results. Moreover our study was designed using WHO-Stepwise multi-stage sampling skeleton, hence improving our data consistency.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

Smoking is a well-established risk factor for many diseases, including CVD, respiratory diseases, and cancers. An estimated 8 million people will die due to smoking in the year 2030 (Mathers *et al*. 2006) with the majority residing in low- and middle-income countries. Smoking's deleterious effects on health and economy will also escalate with the expected increasing trends; hence smoking's health burden will have impact on economies and societies, living standards and health care system financial abilities. Smoking is draining the Lebanese economy and the health care system where it was estimated that smoking-related costs accounted for approximately 1.1% of the GDP (Chaaban *et al*. 2010), in the light of this situation scrupulous actions and control measures must be considered and implemented rapidly.

Recently the Lebanese Government has passed a law banning smoking in public places. The Impact of this on the population will not be evident in the near future owing the long latent period for smoking-related morbidities. Price taxation may be considered as one additional intervention to decrease smoking behavior. Price taxation above the rates of inflation has been rendered as an effective way to daunt smoking (Mackay *et al*. 1996). Mackay and colleagues (1996) argue that price taxation have greater benefit on teenagers and poor people; for instance in the USA a 10% increase in tobacco prices has decreased youth smoking by 14% and an overall 4% in smokers (Mackay *et al*. 1996). Thus price taxation might be an amended mean for tobacco control since Lebanon leads the race with the most affordable cigarette packs in developing countries. The money received out of taxation would be invested in smoking

cessation programs or pharmacological interventions. In the light of these promising health benefits of reducing smoking prevalence rates in the country, finance ministers and decision makers should be harked back about the increased revenue of taxation to the treasury situation (Blecher *et al.* 2004; McAlister *et al*. 2004).

Lebanon became a party of WHO Framework Convention on Tobacco Control on December 7, 2005. The Lebanese Society have fought for many years for a law that will set a roadmap for tobacco control and on September 3,2011 the law(174) was published in the official newspaper. Law no.174 prohibits smoking in enclosed public areas, workplaces and public transport. Moreover this law forces a comprehensive ban on tobacco advertising and promotion but doesn't prohibit financial sponsoring by tobacco companies. Effective October 13 the law will require health warning texts covering 40% of the widest sides. With the passing of this law many have thought that Lebanon is on the right track in controlling Tobacco epidemic but it's worth noting that Law no.174 is far being enforced. The Government and the tourism police must take action and warrant complete implementation of the Law. This could be warranted by employing an appropriate infrastructure and budget that are considered crucial for law enforcements. Moreover reactions to non-compliance must be rapid and the public should be empowered to report and file complaints.

WHO notes that the increase of smoking prevalence among female and girls will eventually lead to elevated medical costs, and it will further deplete available funds for social improvement hence urging the need of gender equality in health involvement of decision-policy makers, especially that gender is defined as a social, economic and social factor in tobacco marketing, consumption and even its control. So it is recommended to guide a comprehensive tobacco control based on gender equality framework in various sectors (Mackay *et al*. 1996). The before-mentioned looms may

be considered as initial attempts to decrease the smoking and its impact on the financial and population health of Lebanon especially in the wake of tremendous epidemiological shift to non-communicable chronic diseases.

APPENDIX I

TABLES

A. Distribution of Baseline Characteristics among Lebanese adults in the Total Population, National Representative Sample 2009

Table A1. Baseline demographic characteristics

Variables	N	%
Total Sample	2836	
Gender		
Male	1332	47.0
Female	1504	53.0
Age		
18-34.9	1264	44.6
35-49.9	816	28.8
50-64.9	461	16.3
≥65	295	10.3
Marital Status		
Single	995	35.1
Married	1621	57.2
Divorced or other	218	7.7
Governorate		
Beirut	309	10.9
Other	2525	89.1

Table A2. Baseline socio-economic characteristics

Variables	Total	%
Education		
Elementary or less	1260	44.4
Secondary or technical	736	26.0
University	840	29.6
Working Status		
Not Working	1457	51.4
Working	1378	48.6
Self-rated SES		
Low	620	23.0
Middle	2060	72.6
High	134	4.4
Insurance coverage		
No	1133	40.1
Yes	1699	59.9
Insurance type*		
NSSF	770	45.4
COOP	141	8.3
Military	253	14.9
Private Insurance	499	29.4
others	34	2.0

* Individuals may have multiple sources of insurance coverage, so the total may exceed the number of those insured.

Table A3. Baseline health-related conditions and characteristics

	Number	%
Alcohol in the past 12 months		
No	1676	59.1
Yes	1159	40.9
Self-rated Health		
Excellent or very good	937	33.2
Good	1130	73.1
Fair	529	18.7
Weak	230	8.1
BMI		
Normal	1014	39.5
Overweight	987	35.3
Obese	704	25.2
Hypertension(combined)*		
No	2038	72.8
Yes	763	27.3
Hyperlipidemia		
No	2406	84.3
Yes	430	15.7
Heart Disease		
No	2028	93.9
Yes	167	6.1
Diabetes		
No	2642	92.9
Yes	684	7.1
Hospitalized		
No	1053	37.1
Yes	1781	62.84

*Hypertension as reported and diagnosed in the field.

B. Results of the Bi-variate analysis of smoking-related variables and Hospitalization

Table A4. Smoking related variables

	Total		Hospitalized		Not hospitalized		P-value
Cigarette							
Never	1688	59.5	959	56.8	728	43.2	<0.001
Past	164	5.8	142	86.6	22	37.2	
Current	984	34.7	680	69.2	303	13.4	
Pack year							
0	1694	59.8	966	57.1	727	42.9	<0.001
1-20	545	19.2	355	65.1	190	34.9	
20-40	267	9.4	188	70.4	79	29.6	
40-60	175	6.2	142	81.1	33	18.9	
>60	151	5.3	129	86.0	21	14.0	
Arghile							
No	2142	75.5	1380	64.5	760	35.5	<0.002
Yes	694	24.5	401	57.8	293	42.2	

C. Unadjusted Odds Ratios of hospitalization by all Baseline, Behavioral and Smoking-related variables

Table A5. Unadjusted odds of being hospitalized

Variables (reference category)	OR	CI	P-value
A. Demographics			
Gender (Female)			
Male	1.44*	1.23-1.68	<0.04
Age(18-34.9)			
35-49.9	1.67*	1.39-2.00	<0.00
50-64.9	3.47*	2.71-4.44	<0.00
≥65	9.69*	6.42-14.60	<0.00
Marital status (married)			
Single	0.54*	0.46-0.63	<0.00
Divorced or Other	2.27*	1.58-3.26	<0.00
Governorate (Beirut)			
Others	1.39	1.10-1.77	<0.48
B. Socio-Economic			
Education (elementary)			
Secondary or Technical	0.61*	0.51-0.74	<0.00
University	0.49*	0.41-0.59	<0.00
Working Status			
Not Working	0.94	0.81-1.10	<0.47

"Table A5 - *Continued*"

Variables (reference category)	OR	CI	P-value
Self-rated SES (Low)			
Middle	0.65*	0.54-0.88	<0.00
High	0.55*	0.37-0.80	<0.002
Monthly income in L.L. (< 1 million)			
1 million-6million	0.77*	0.64-0.91	<0.02
>6million	0.72*	0.31-0.83	<0.01
Insurance coverage (Yes)			
No	0.99	0.66-1.22	<0.50
Insurance type (NSSF)			
COOP	1.47	0.98-2.16	<0.06
Military	1.39*	1.01-1.90	<0.04
Private Insurance	0.68	0.34-1.37	<0.30
Others	0.81	0.64-1.02	<0.08
C. Health-Related Characteristics			
Alcohol (past 12 months)			
No	0.65*	0.70-0.95	<0.01
Physical Activity (Low)			
Moderate	1.00	0.84-1.19	<0.98
High	0.86	0.70-1.04	<0.13
BMI (Underweight or normal)			
Overweight	1.38*	1.16-1.65	<0.00
Obese	3.66*	1.38-2.05	<0.00
Diabetes (No)			
Yes	3.90*	2.57-5.90	<0.00
Hypertension (No)			
Yes	4.16*	3.10-5.49	<0.00
Heart Disease (No)			
Yes	21.60*	8.88-52.69	<0.00
MI (No)			
Yes	26.05*	3.58-189.50	<0.001
Atherosclerosis (No) NACHEF			
Yes	16.60*	5.25-52.90	<0.00
Hyperlipidemia (No)			
Yes	3.02*	2.33-3.91	<0.00

Table A6. Unadjusted Odds of hospitalization (smoking-related variable)

Variables (reference category)	Unadjusted OR	95% CI	P-value
Smoking (No)			
Current	0.53	0.36-0.67	<0.00
Ex-Smoker	1.58	1.12-2.04	<0.00
Pack-Year (0)			
1-20	1.40	1.15-1.71	<0.001
20-40	1.79	1.35-2.36	<0.00
40-60	3.23	2.19-4.78	<0.00
>60	4.62	2.88-7.40	<0.00

D. Age and Gender Odds Ratios of hospitalization by all Baseline, Behavioral and Smoking-related Variables

Table A7. OR ratio Adjusted for Age and sex

Variables (reference category)	Unadjusted OR	95% CI	P-value
A. Demographics			
Marital status (married)			
Single	0.79	0.64-0.96	<0.02
Divorced or Other	1.31	0.88-1.94	<0.18
Governorate (Beirut)			
Others	1.35	1.05-1.74	<0.018
B. Socio-Economic			
Education (complementary)			
Secondary or Technical	0.87	0.71-1.07	<0.21
University	0.81	0.66-0.99	<0.04
Occupation (Working)			
Not Working	0.99	0.82-1.18	<0.89
Self-rated SES (Low)			
Middle	0.89	0.71-1.09	<0.26
High	0.70	0.46-1.04	<0.08
Monthly income in L.L. (< 1 million)			
1 million-6million	0.97	0.77-1.22	<0.78
6.1million-8million	1.27	0.23-7.06	<0.27
>8 million	1.17	0.28-4.95	<0.21
Insurance coverage (Yes)			
No	1.29	1.10-1.52	<0.002
Insurance type (NSSF)			
COOP	1.06	0.69-1.64	<0.765
Military	1.23	0.89-1.71	<0.204
Private Insurance	0.45	0.23-1.05	<0.069
others	0.81	0.63-1.03	<0.098

"Table A7 - *Continued*"

Variables (reference category)	Unadjusted OR	95% CI	P-value
C. Life style			
Alcohol (past 12 months)			
No	0.88	0.74-1.03	<0.12
Physical Activity (Low)			
Moderate	0.93	0.77-1.12	<0.446
High	0.85	0.69-1.03	<0.110
BMI (Underweight or normal)			
Overweight	0.98	0.81-1.19	<0.891
Obese	0.99	0.78-1.20	<0.944
Diabetes (No)			
Yes	1.81	1.18-2.80	<0.008
Hypertension (No)			
Yes	2.05	1.51-2.79	<0.00
Heart Disease (No)			
Yes	9.30	3.70-23.05	<0.00
MI (No)			
Yes	11.00	6.01-13.74	<0.019
Atherosclerosis(No) NACHEF			
Yes	6.30	1.95-20.5	<0.002
D. Smoking-related variables			
Smoking (No)			
Current	1.36	1.14-1.63	<0.001
Ex-Smoker	2.47	1.52-4.00	<0.00
Pack-Year (0)			
1-20	1.38	1.12-1.69	<0.002
20-40	1.28	0.94-1.72	<0.106
40-60	1.72	1.13-2.61	<0.010
>60	1.95	1.18-3.23	<0.009

E. Results of the Multivariate Logistic Regression of hospitalization among Lebanese Adults

Table A8. Odds Ratio of hospitalization adjusted for all (Model 1)

Variables (reference category)	Adjusted OR	95% CI	P-value
A. Demographics			
Gender (Female)			
Male	1.66*	1.38-2.00	<0.00
Marital status (married)			
Single	0.85	0.69-0.06	<0.15
Divorced or Other	1.28	0.84-1.95	<0.24
Age(18-34.9)			
35-49.9	1.23	0.99-1.54	<0.062
50-64.9	1.96*	1.45-2.66	<0.00
≥65	3.98*	2.46-6.46	<0.00
B. Socio-economic variables			
Education (complementary)			
Secondary or Technical	0.93	0.75-1.15	<0.52
University	0.85	0.68-1.07	<0.18
Insurance coverage (Yes)			
No	1.53*	1.28-1.84	<0.00
Governorates (Beirut)			
Others	1.35*	1.06-1.79	<0.01
C. Life style–related variables			
BMI(underweight or normal)			
Overweight	0.94	0.77-1.15	<0.57
Obese	0.83	0.65-1.05	<0.12
D. Health-related Variables			
Diabetes (No)			
Yes	1.43	0.90-2.27	<0.12
Hypertension (No)			
Yes	1.59	1.15-2.21	<0.05
Heart Disease(No)			
Yes	5.79	0.49-68.23	<0.16
CVD (No)			
Yes	0.84	0.18-21.25	<0.58
MI (No)			
Yes	1.93	0.18-21.25	<0.58
Atherosclerosis (No) NACHEF			
Yes	2.65	0.21-32.30	<0.44
Self-related Health (Very good)			
Good	1.46*	1.21-1.77	<0.00
Fair	1.67*	1.29-2.16	<0.00
Weak	3.05*	2.04-4.57	<0.00
E. Smoking-related variables			
Current	1.34*	1.11-1.61	<0.002
Ex-Smoker	1.99*	1.20-3.33	<0.008

Table A9. Odds ratio of hospitalization adjusted for all (Model 2)

Variables (reference category)	Adjusted OR	95% CI	P-value
A. Demographics			
Gender (Female)			
Male	1.66*	1.38-2.01	<0.00
Marital status (married)			
Single	0.85	0.69-1.06	<0.16
Divorced or Other	1.29	0.84-1.97	<0.23
Age(18-34.9)			
35-49.9	1.21	0.97-1.53	<0.08
50-64.9	1.74*	1.27-2.40	<0.001
≥65	3.36*	2.04-5.55	<0.00
B. Socio-economic variables			
Education (complementary)			
Secondary or Technical	0.94	0.75-1.16	<0.57
University	0.85	0.69-1.07	<0.18
Insurance coverage (Yes)			
No	1.55*	1.29-1.86	<0.000
Governorates (Beirut)			
Others	1.38*	1.06-1.79	<0.015
C. Life style–related variables			
BMI(underweight or normal)			
Overweight	0.94	0.77-1.15	<0.57
Obese	0.83	0.60-1.05	<0.13
D. Health-related Variables			
Heart Disease (No)			
Yes	5.78	0.47-70.00	<0.168
Myocardial Infarction (No)			
Yes	1.96	0.18-21.35	
Atherosclerosis (No)			
Yes	2.68	0.21-33.71	<0.445
Diabetes (No)			
Yes	1.42	0.06-2.26	<0.129
Hypertension (No)			
Yes	1.61*	1.16-2.24	<0.04
Self-related Health (Very good)			
Good	1.46*	1.20-1.77	<0.00
Fair	1.67 *	1.29-2.15	<0.00
Weak	3.05*	2.03-4.57	<0.00
E. Smoking-related variables			
Pack-Year (0)			
1-20	1.35*	1.09-1.67	<0.006
20-40	1.22	0.89-1.67	<0.206
40-60	1.54*	1.00-2.37	<0.05
>60	1.85*	1.09-3.15	<0.022

Table A10. Odds of Hospitalization adjusted for all in the model (Model 3)

Variables (reference category)	Adjusted OR	95% CI	P-value
A. Demographics			
Gender (Female)			
Male	1.50*	1.26-1.79	<0.00
Marital status (married)			
Single	0.82	0.66-1.01	<0.07
Divorced or Other	1.40	0.94-2.11	<0.097
Age(18-34.9)			
35-49.9	1.45*	1.17-1.81	<0.001
50-64.9	2.75*	2.05-3.69	<0.00
≥65	7.00*	4.40-11.14	<0.00
B. Socio-economic variables			
Education (complementary)			
Secondary or Technical	0.83	0.67-1.02	<0.089
University	0.73*	0.58-0.91	<0.006
Insurance coverage (Yes)			
No	1.40*	1.17-1.67	<0.00
C. Life style–related variables			
BMI(underweight or normal)			
Overweight	0.95	0.78-1.15	<0.62
Obese	0.87	0.74-1.17	<0.57
Drink Alcohol (No)			
Yes	0.92	0.73-1.04	<0.133
D. Smoking-related variables			
Arghile (No)			
Yes	0.92	0.76-1.11	<0.403

F. Results of the Multivariate Logistic Regression of hospitalization among Females

Table A11. Odds Ratio of hospitalization adjusted for all among females

Variables (reference category)	Adjusted OR	95% CI	P-value
A. Demographics			
Marital status (married)			
Single	0.85	0.63-1.14	<0.28
Divorced or Other	1.19	0.72-1.95	<0.48
Age(18-34.9)			
35-49.9	1.22	0.89-1.61	<0.216
50-64.9	1.99*	1.31-3.03	<0.001
≥65	3.82*	1.90-7.67	<0.001
B. Socio-economic variables			
Education (complementary)			
Secondary or Technical	1.01	0.75-1.37	<0.90
University	0.94	0.68-1.31	<0.75
Insurance coverage (Yes)			
No	1.66*	1.29-2.14	<0.00
Governorates (Beirut)			
Others	1.13	0.77-1.67	<0.51
C. Life style–related variables			
BMI (underweight or normal)			
Overweight	1.08	0.82-1.43	<0.56
Obese	0.82	0.59-1.14	<0.25
D. Health-related Variables			
Hypertension (No)			
Yes	2.11	1.34-3.30	<0.001
Heart Disease (No)			
Yes	3.55	0.40-30.93	<0.16
CVD (No)			
Yes	1.21	0.12-11.95	<0.87
MI (No)			
Yes	0.96	0.083-11.13	<0.97
Atherosclerosis (No) NACHEF			
Yes	1.27	0.13-11.78	<0.83
Self-related Health (Very good)			
Good	1.81*	1.36-2.40	<0.00
Fair	1.88*	1.35-2.62	<0.00
Weak	3.49*	2.14-5.70	<0.00
E. Smoking-related variables			
Current	1.44*	1.10-1.90	<0.008
Ex-Smoker	1.31	0.619-2.80	<0.472

G. Results of the Multivariate Logistic Regression of hospitalization among males

Table A12. Odds Ratio of hospitalization adjusted for all among males

Variables (reference category)	Adjusted OR	95% CI	P-value
A. Demographics			
Marital status (married)			
Single	0.88	0.62-1.25	<0.49
Divorced or Other	1.47	0.577-3.77	<0.41
Age(18-34.9)			
35-49.9	1.21	0.84-1.74	<0.284
50-64.9	1.82	1.14-2.91	<0.011
≥65	4.02*	1.97-8.21	<0.00
B. Socio-economic variables			
Education (complementary)			
Secondary or Technical	0.83	0.60-1.14	<0.27
University	0.76	0.55-1.07	<0.12
Insurance coverage (Yes)			
No	1.46*	1.12-1.90	<0.005
Governorates (Beirut)			
Others	1.18	1.07-1.30	<0.001
C. Life style–related variables			
BMI(underweight or normal)			
Overweight	0.85	0.63-1.14	<0.28
Obese	0.84	0.59-1.19	<0.34
D. Health-related Variables			
Hypertension(No)			
Yes	1.34	0.84-2.16	<0.21
Self-related Health (Very good)			
Good	1.24	0.95-1.61	<0.108
Fair	1.70*	1.09-2.66	<0.019
Weak	3.26*	1.47-7.22	<0.003
E. Smoking-related variables			
Current	1.22	0.94-1.59	<0.120
Ex-Smoker	2.73*	1.34-5.57	<0.006

APPENDIX II

FIGURES

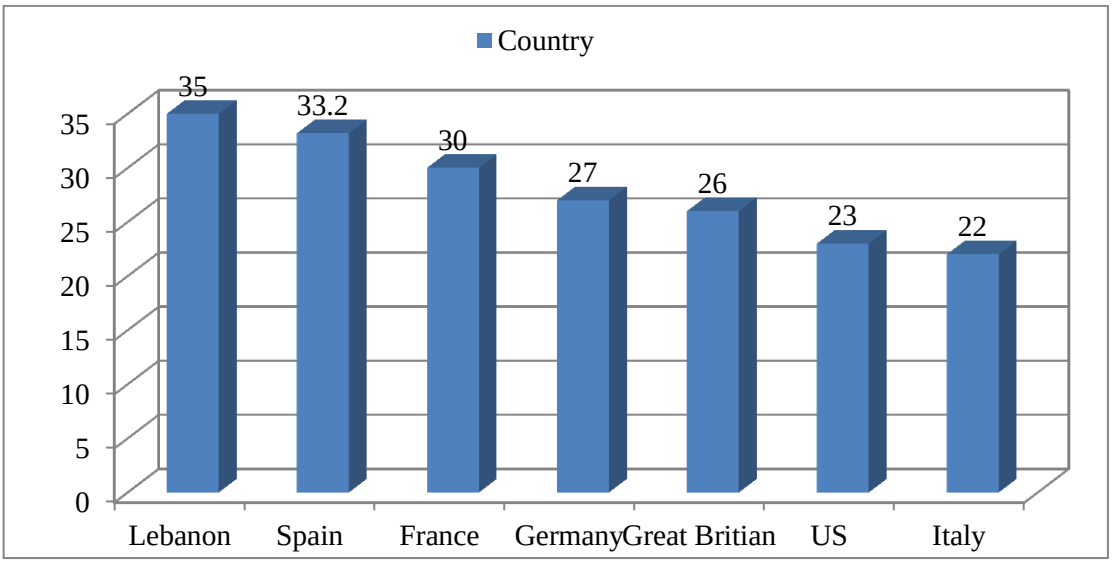

Fig. A1. Smoking prevalence rates of selected developed countries, compared with the rates found in Lebanon, by this study

Source: World Health Organization, the WHO Report on the Global Tobacco Epidemic 2008.

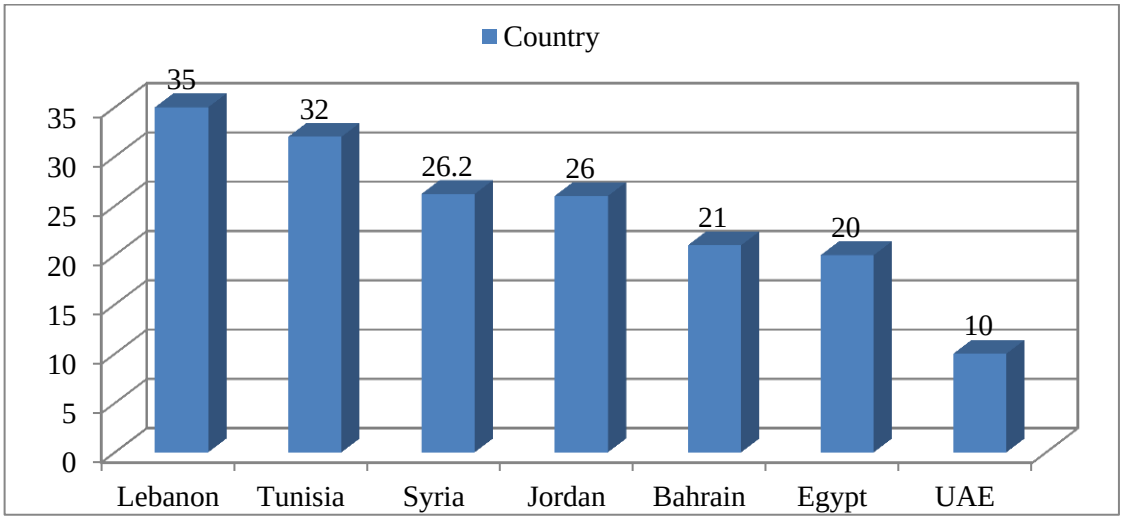

Fig. A2. Smoking prevalence rates of selected Arab countries, compared with the rates found in Lebanon, by this study

Source: World Health Organization. The Work of WHO in the Eastern Mediterranean Region: Annual Report of the Regional Director 1 January-31 December 2011. World Health Organization, Regional office for the Eastern Mediterranean 2012.

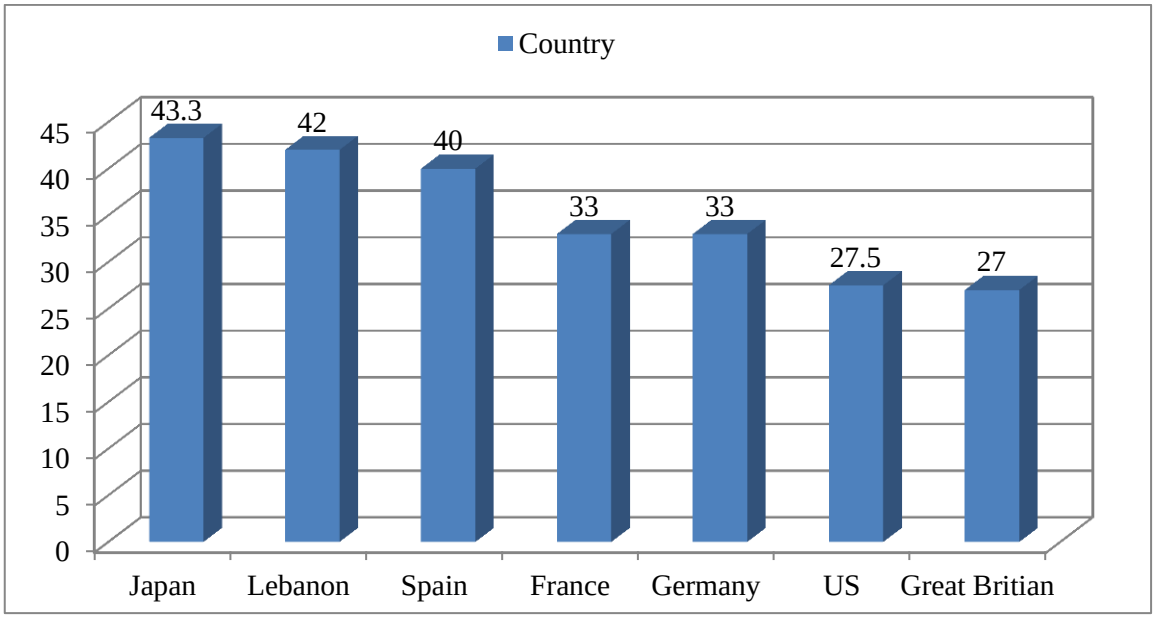

Fig. A3. Male smoking prevalence rates of selected developed countries, compared with the rates found in Lebanon, by this study

Source: World Health Organization, the WHO Report on the Global Tobacco Epidemic 2008.

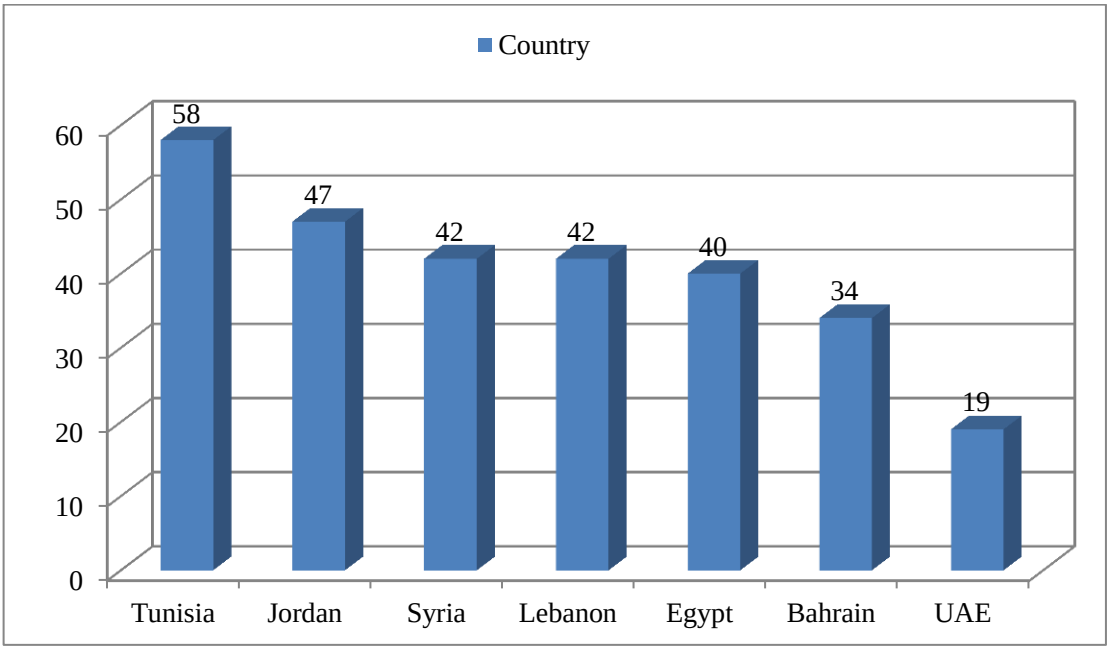

Fig. A4. Male smoking prevalence rates of selected Arab countries, compared with the rates found in Lebanon, by this study

Source: World Health Organization. *The Work of WHO in the Eastern Mediterranean Region: Annual Report of the Regional Director 1 January-31 December 2011*. World Health Organization, Regional office for the Eastern Mediterranean 2011.

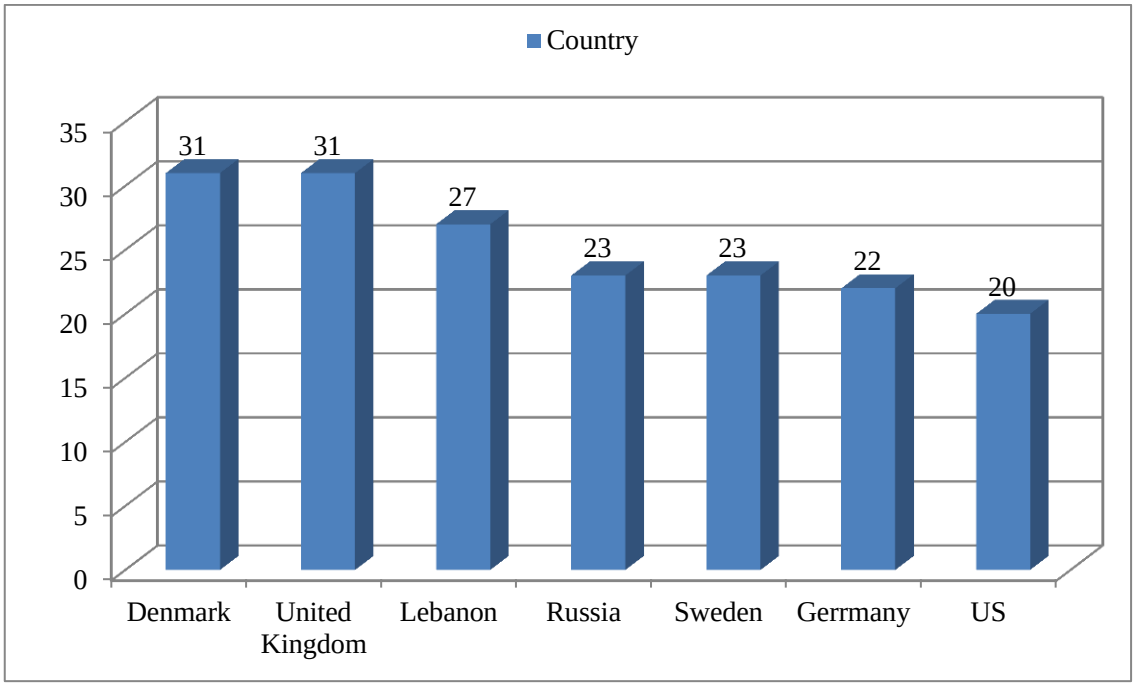

Fig. A5. Female smoking prevalence rates of selected developed countries, compared with the rates found in Lebanon, by this study
Source: World Health Organization ,The WHO Report on the Global Tobacco Epidemic 2008.

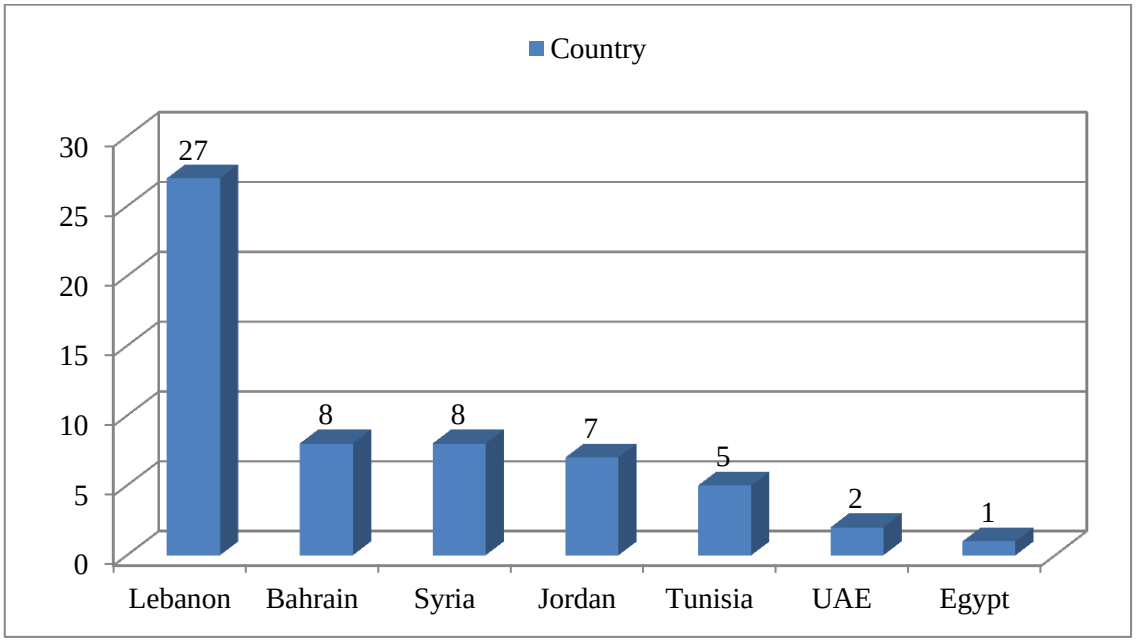

Fig. A6. Female smoking prevalence rates of selected Arab countries, compared with the rates found in Lebanon, by this study.
Source: World Health Organization. *The Work of WHO in the Eastern Mediterranean Region: Annual Report of the Regional Director 1 January-31 December 2011*. World Health Organization, Regional office for the Eastern Mediterranean 2012.

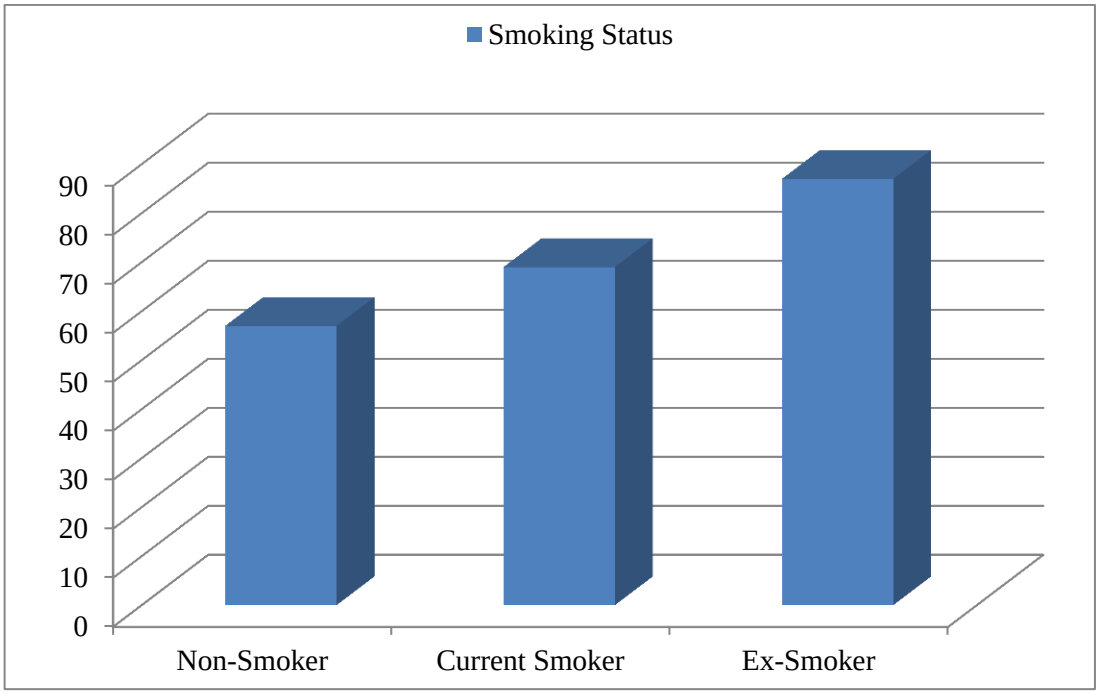

Fig. A7. Percentage of hospitalization among subjects with different smoking statuses (p-value<0.001)

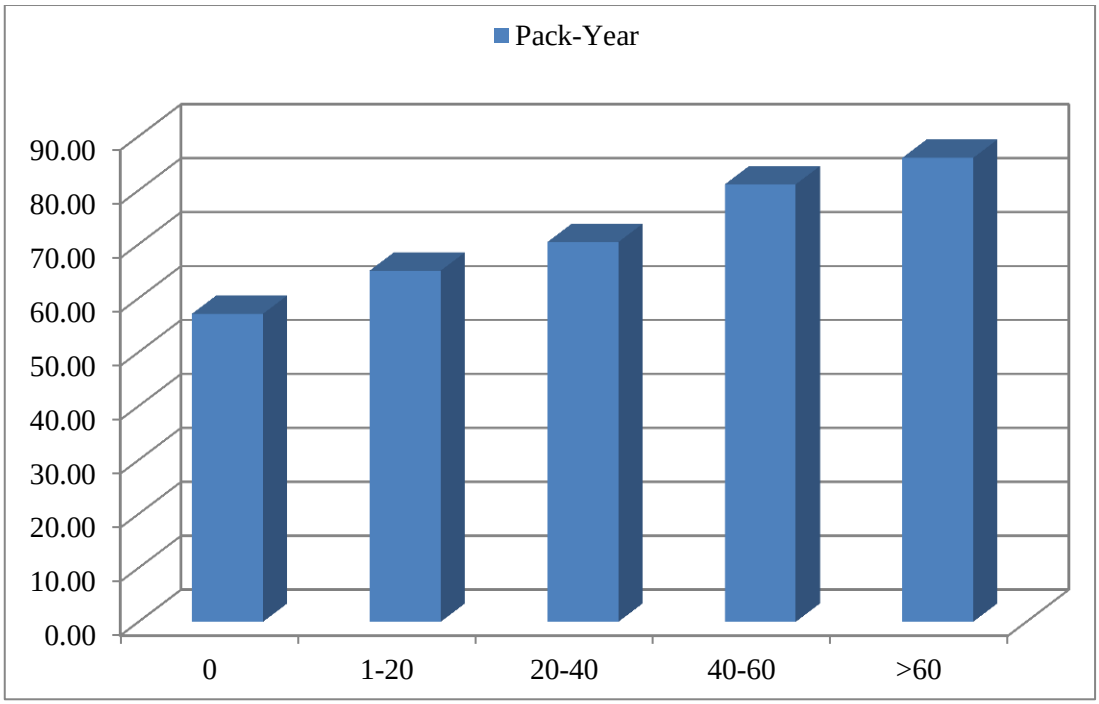

Fig. A8. Percenatage of hospitalization among subjects with different pack-year levels (p-value<0.002)

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