

RESEARCH ARTICLE

Lung Cancer Knowledge among Secondary School Male Teachers in Kudat, Sabah, Malaysia

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Abstract

Background: The objective of this study is to determine knowledge about lung cancer among secondary school male teachers in Kudat, Sabah, Malaysia. **Materials and Methods:** A cross-sectional study was conducted among three secondary schools located in Kudat district, Sabah, Malaysia during the period from June until September 2012. The protocol of this study was approved by ethics committee of Management and Science University, Malaysia. The aims were explained and a consent form was signed by each participant. Respondents were chosen randomly from each school with the help of the headmasters. Self-administrated questionnaires, covering socio-demographic characteristics and general knowledge of lung cancer, were distributed. Once all 150 respondents completed the questionnaire, they passed it to their head master for collecting and recording. All the data were analyzed using Statistical Package for the Social Sciences (SPSS) version 13. ANOVA and t-test were applied for univariate analysis; and multiple linear regression for multivariate analysis. **Results:** A total of 150 male secondary school teachers participated in this study. Their mean age was 35.6 ± 6.5 (SD); maximum 50 and minimum 23 years old. More than half of the participants were Malay and married (52%, 79%; respectively). Regarding the knowledge about lung cancer, 57.3% of the participants mentioned that only males are affected by lung cancer. Some 70.7% mentioned that lung cancer can be transmitted from one person to another. More than half (56.7%) reported that lung cancer is not the leading cause of death in Malaysian males. As for risk factors, the majority reported that family history of lung cancer is not involved. However, 91.3% were aware that cigarettes are the main risk factor of lung cancer and more than half (52%) believed that second-hand smoking is one of the risk factor of lung cancer. More than half (51.3%) were not aware that asbestos, ionizing radiation and other cancer causing substances are risk factors for lung cancer. Quitting smoking, avoiding second-hand smoking and avoiding unnecessary x-ray image of the chest (53.3%, 96.0%, 87.3%; respectively) are the main preventive measures mentioned by the participants. For the factors that influence the participants knowledge, univariate and multivariate analysis showed that only race was significant. **Conclusions:** Overall, the knowledge of school male teachers about lung cancer was low. However, few items were scored high: cigarettes are the main risk factor; avoiding second-hand smoking; and avoiding x-rays. Interventions to increase lung cancer awareness are needed to improve early detection behavior. Increase the price of pack of cigarettes to RM 20 and banning smoking in public places such as restaurants are highly recommended as primary preventive measures.

Keywords: Lung cancer - knowledge - school teachers - Malaysia

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Introduction

Cancer is emerging as a major health problem globally with over 10 million new cases of cancer and more than 6 million deaths due to cancer worldwide. According to World Health Organization, there is a high incidence rate of cancer throughout the world and it may reach about 20 million by 2030 (WHO, 2008). Lung cancer is the most frequent malignant disease and is also the most common cause of death from cancer, with 1.38 million deaths worldwide (Ferlay et al., 2010).

Cigarette smoking is an international public health problem that has been called the most preventable cause

of death (Pride and Soriano, 2002). Tobacco is a major risk factor for several other types of cancer including oral cavity, oesophagus, bladder, kidney, pancreas, stomach, cervix, and acute myelogenous leukemia (Sasco et al., 2004; Gandini et al., 2008). Therefore, smoking prevention and cessation are important national health policies in many countries. Studies have viewed lung cancer as a multi-factorial disease. Smoking and occupational exposure to potential carcinogenic compounds are considered as major risk factors for lung cancer (Wogan et al., 2004).

Diet and pre-existent non malignant lung disease also have been associated with the risk for developing

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lung cancer (Richard and Matthey, 2002). Evidence from studies suggests that national smoking prevention policies, such as banning smoking in public places, increasing cigarette excise taxes, and educating the public on the harmful effects of cigarette smoking, have positive effects on anti-smoking efforts (Wasserman et al., 1991; Keeler, 1993).

In Malaysia, lung cancer is, in overall, the third commonest cancer, the commonest tumour to afflict males and the most common cause of cancer deaths accounting for 19.8% of all medically certified cancer related mortality (Second report of the National Cancer Registry 2003; Vital statistics Malaysia, 2005). A Malaysian study showed that the percentage of male patients with lung cancer who were ever smokers had increased significantly from 86.2% in 1967-1976 to 92% in 1991-1999 while the percentage of female patients who were smokers did not change significantly between the two periods (Liam et al., 2006). Cigarette smoking is a major aetiological risk factor and 92% of Malaysian lung cancer male patients have a significant smoking history (Liam et al., 2006). The morbidity and therapy of smoking induced lung cancer accounts for approximately 440 million Ringgit Malaysia annually and thus a major economic burden on the personal and national healthcare finances (Aljunid et al., 2006).

Approximately 88% of cases are histologically classified as a non-small cell lung cancer (NSCLC) in keeping with global trends (Liam et al., 2006). With the exception of few cases of limited stage disease, the small cell lung cancer (SCLC) has a poor prognosis as most patients already have advanced disseminated disease due to early subclinical mediastinal or distant metastasis at initial presentation. There is no previous study which measured the knowledge and practice towards lung cancer among secondary school teachers in Malaysia. Only one study measured the knowledge among Malaysian university students (Al-Naggar, 2012). Therefore, this study aimed to fill the gap of knowledge about lung cancer among secondary school teachers. Thus the objective of this study is to determine the knowledge of lung cancer among secondary school male teachers in Malaysia.

Materials and Methods

A cross-sectional study was conducted based on self-administrated questionnaire which was distributed among the secondary school male teachers in Kudat, Sabah. Kudat is a town in Sabah, East Malaysia, on the northern tip of Borneo Island. It serves as the administrative centre for the Kudat Division, which includes the towns of Kudat, Pitas, Kota Marudu, and some offshore islands. Kudat is located on the northern part of Sabah, some 190 kilometres north of Kota Kinabalu, the state capital. On the west, it faces the South China Sea, and on the east the Sulu Sea. Kudat's population is 68,242 people. The ethnic composition is mainly Rungus, a sub-group of the indigenous Kadazan. About 10% of the population is ethnic Chinese and there are minorities of Bajau, Dusun, Murut, Bugis and Malay. This method was used to obtain information regarding awareness of lung cancer among secondary school male

teachers. The study was held at three secondary schools namely: Sekolah Menengah Kebangsaan (SMK) KUDAT, SMK KUDAT II and SMK SIKUATI II located in Kudat district. It involved 150 respondents of secondary school male teachers. Approximately, 50 respondents were chosen randomly from each school with the help of the head master of each selected school. The duration of Study was from June until September 2012. The questionnaires were in English language and distributed to the participants. The aim of the study was explained to the participants and consent form was obtained. The proposal of this study was approved by the ethical committee of Management and Science University. The questionnaire consists of two parts. The first part was about socio-demographic characteristics such as (age, monthly income, race and marital status). The second part was about the general knowledge of lung cancer, knowledge of lung cancer risk factor, knowledge of lung cancer symptom and knowledge of lung cancer prevention. Once all respondents were answered the questionnaires, they passed the completed questionnaires to their head master. All data of questionnaires were collected and recorded. Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 13. ANOVA and t-tests were used for univariate analysis; and multiple linear regression was used for multivariate analysis.

Results

A total number of 150 secondary school male teachers participated in this study. The majority of them were 31-40 years old (49.3%); mean age of the participant was 35.62±6.5 (SD) with maximum age of 50 years old; and minimum age was 23 years old. More than half of the participants were Malay and married (52%, 79%; respectively). About 45.3% of the study participants had a monthly income ranged from RM 2001-3000 (Table 1). For the factors that influence the participants knowledge, univariate analysis showed that only race significantly influenced the knowledge of the participants about lung cancer (p<0.001).

Regarding the knowledge about lung cancer among

Table 1. Socio-demographic Characteristics and Factors Influencing the Knowledge of Secondary School Teachers, Malaysia (n=150)

Variable	Categorize	Frequency	%	p-value
Age (years):	21-30	40	26.70	0.85
	31-40	74	49.3	
	41-50	36	24	
Monthly income (RM*):	<1000-2000	13	8.7	0.43
	2001-3000	68	45.3	
	3001-4000	35	23.3	
	4001-5000	21	14.0	
	>5001	13	8.7	
Race:	Malay	78	52	<0.001
	Non-Malay	72	48.05	
Marital status:	Ever married	119	79.3	0.112
	Single	31	20.7	

*1US\$=3 Ringgit Malaysia (RM)

Table 2. Knowledge about Lung Cancer among Secondary School Teachers, Malaysia (n=150)

Items	TRUE	FALSE
Only males are affected by lung cancer	86 (57.3%)	64 (42.7%)
Lung cancer can be transmitted by one person to another	106 (70.7%)	44 (29.3%)
Lung cancer is the leading cause of death in Malaysian males	65 (43.3%)	85 (56.7%)
Family history of lung cancer	43 (28.7%)	107 (71.3%)
Cigarette smoking	137 (91.3%)	13 (8.7%)
Second-hand smoke from other people cigarettes	78 (52.0%)	72 (48.0%)
Things around home or work, including asbestos, ionizing radiation and other cancer causing substances	73 (48.7%)	77 (51.3%)
Shortness of breath	127 (84.7%)	23 (15.3%)
Wheezing	64 (42.7%)	86 (57.3%)
Haemoptysis (Coughing up blood)	129 (86.0%)	21 (14.0%)
Chest pain	131 (87.3%)	19 (12.7%)
Repeated respiratory infection such as bronchitis and pneumonia	80 (53.3%)	70 (46.7%)
Quitting smoking	80 (53.3%)	70 (46.7%)
Avoiding second hand smoker	144 (96.0%)	6 (4.0%)
Avoiding unnecessary medical test that involves X-ray image of the chest	131 (87.3%)	19 (12.7%)

Table 3. Factors Influencing Knowledge of Participants using Multiple Linear Regression (n=150)

Variable	B	SE	Beta	p-value
Constant	1.48			
Race Malay (reference)	Ref.	Ref.	Ref.	
Non-Malay	-0.62	0.85	0.518	<0.001

*R²=0.26, p<0.001

school teachers, 57.3% mentioned that only males are affected by lung cancer. About 70.7% mentioned that lung cancer can be transmitted from one person to another. More than half of the participants (56.7%) reported that lung cancer is not the leading cause of death in Malaysian males. As for secondary school teachers' knowledge about risk factors of lung cancer, the majority reported that family history of lung cancer is not one of the risk factors for lung cancer. However, 91.3% were aware that cigarettes are the main risk factor of lung cancer. More than half (52%) were aware that second-hand smoking is one of the risk factor of lung cancer. More than half of the participants (51.3%) were not aware that asbestos, ionizing radiation and other cancer causing substances are risk factors for lung cancer. Regarding the knowledge of the symptoms of lung cancer, the majority of the participants reported that chest pain, haemoptysis, shortness of breath, repeated respiratory infection and wheezing are the main symptoms of lung cancer (87.3%, 86.0%, 84.7%, 53.3%, 42.7%; respectively). Quitting smoking, avoiding second-hand smoking and avoiding unnecessary x-ray image of the chest are the main preventive measures mentioned by the study participants (53.3%, 96.0%, 87.3%; respectively) (Table 2).

Multivariate analysis (Table 3) using multiple linear regression showed that race significantly influences the knowledge of the study participants (p<0.001).

Discussion

Teachers play a role model for their students. Similar study found reported that teachers are regarded as significant role models (Oetting and Donnermeyer, 1998). Teachers who smoke may therefore influence adolescents

to adopt smoking through direct modelling. Several studies suggest that the major factors predicting onset of smoking are socio-environmental, including exposure to smoker role models in family, peer and school settings, and the perception that tobacco use is the norm (Reid et al., 1995; Tyas and Pederson, 1998; Wakefield and Chaloupka, 2000).

This study found very poor knowledge about lung cancer among secondary school teachers, more than half 57.3% mentioned that only males are affected by lung cancer which is incorrect information. Lung cancer can affect both sexes: Males and females. According to the second report of the national cancer registry, Malaysia (2003) lung cancer accounts for 13.8% of all cancers in males and 3.8% of all cancers in females (Second Report of the National Cancer Registry 2003). Another indication of the poor knowledge among secondary school teachers is that about 70.7% of them mentioned that lung cancer can be transmitted from one person to another. More than half of them (56.7%) reported that lung cancer is not the leading cause of death in Malaysian males which is incorrect information. According to vital statistics Malaysia (2005), lung cancer is the leading cause of cancer deaths accounting for 19.8% of all medically certified deaths due to cancers.

Regarding the knowledge about lung cancer and smoking; about 91.3% of the study participants mentioned that cigarette smoking is a risk factor of lung cancer. A higher percentage was reported by Chawla et al. (2010) which found that the awareness of smoking as a primary risk factor for lung cancer was found to be 100% amongst males. A Malaysian study conducted among university students showed that all the study participants knew that the risk factor of lung cancer is smoking (100%) (Al-Naggar, 2012). Similar study reported that the majority of the participants (82.1%) knew that smoking is a risk factor for lung cancer (Kebede, 2002). It is well documented that all types of smoking is a risk factor of lung cancer. Salber et al. (1961) reported that smoking is the most important environmental risk factor of lung cancer. According to United States Department of Health and Human Services that 90% of all lung cancer is caused by tobacco smoking which includes all types of tobacco use such as active

cigarette smoking, shisha, cigar smoking and exposure to second-hand smoke (U.S. Department of Health and Human Services, 1982; 1989). Siahpush et al. (2006) reported that smoking causes lung cancer. Another study reported that the effect of shisha and cigar use on the risk of lung cancer is similar to that of light cigarette smoking (Shaper et al., 2003; Henley et al., 2004). Similar findings showed significant relationships between smoking habit and lung cancer (Koo et al., 1985; Gao et al., 1987).

In this study 52.0% of the secondary school teachers reported that second-hand smoking is one of the risk factors of lung cancer. A higher percentage was found among university students; 90.1% of them knew that second-hand smoking is one of the risk factors of lung cancer (Al-Naggar, 2012). However, Kofahi and Haddad (2005) reported that 58% of university students did not agree that second-hand smoke is a cancer risk. Smoking is a well-established major risk factor for lung cancer (Peto et al., 2000; Cassidy et al., 2007). Results from a meta-analysis by Hackshaw et al. (1997) and a comprehensive review by Whitrow et al. (2003) showed that the relative risk between 1.14-5.20 in people who had never smoked but who lived with a smoker. Another study showed that passive smoking during childhood increased lung cancer risk in adulthood by 3.6 fold (Vineis et al., 2005). Ten thousand Malaysians die yearly from smoking and quite a number develop health complications (MoH, 2003). Recently, the Malaysia Global Adult Tobacco Survey (GATS) involving 5112 households found that the overall prevalence of current smokers was 23.1% (MoH, 2011). This meant that there were 4.7 million smokers in Malaysia, increased by 1.7 million compared to the year 2006. Male smokers' rate (43.9%) has traditionally been higher than females. The survey also found that those exposed to second hand smoking was higher, up to 70% depending on the location. Second-hand smoking has been shown to be equally detrimental to the health. Second-hand smoke, also known as environmental tobacco smoke, has proven to cause lung cancer in nonsmoking adults (Besaratina, 2008).

In this study 48.7% of the study participants reported that asbestos, ionizing radiation and other cancer causing substances are some of the risk factors of lung cancer. A Malaysian study reported that 75.6% of the study participants mentioned that occupational exposure is one of the risk factors of lung cancer (Al-Naggar, 2012). Many work settings could have exposed workers to carcinogens, leading to an increased risk of lung and other cancers. Crystalline silica and chrysotile asbestos are well known human carcinogens; as expected, workers exposed to silica dust and asbestos fiber are at a higher risk of developing lung cancer. Uranium miners and nuclear plant workers are also known to have an increased cancer risk because of exposure to radioactive particulate mass Boffetta (2004). Many occupations, industries, and specific chemical substances have been associated with a well established or suspected excess risk of lung cancer (Dubrow and Wegman, 1983; Steenland et al., 1996).

In this study only 28.7% of the participants reported that family history of lung cancer is one of the risk factors of lung cancer. A Malaysian study conducted

among university students reported a higher percentage (51.6%) of the study participants mentioned that family history of lung cancer is one of the risk factors of lung cancer (Al-Naggar, 2012). A reported family history of any type of cancer or lung cancer increased the risk of lung cancer significantly in men and in a similar way in women. Several studies have shown a smoking adjusted increased risk of lung cancer by about 2-4 fold associated with a family history of lung cancer (Liu et al., 1991; Wu et al., 1996; Brownson et al., 1997). The issue of genetic predisposition of lung cancer is being actively investigated by several studies (Bartsch et al., 2000; Lan et al., 2000; Bouchardy et al., 2001). Evidence suggests that age, deprivation, previous diagnoses of other cancers, previous pneumonia and family history are the risk factors of lung cancer (Cassidy et al., 2007; Lubin et al., 2007).

It is very important for the public to know the symptoms of lung cancer in order to detect the cancer early. Therefore there is a need for the effort of the media and campaign for regular education materials for the general population. A study showed that lung cancers could be picked up much earlier if only the public and health professionals learnt how to recognize the critical symptoms (Mathieson, 2005). In this study, the knowledge of the school teachers about the symptoms of lung cancer is quite good. The participant's list chest pain, coughing with blood, shortness of breath, repeated respiratory infection and wheezing are the main symptoms.

Regarding lung cancer prevention; mounting of evidence indicates that more than 50% of cancer could be prevented if the current knowledge of risk factors were successfully implemented to reduce risk factor prevalence (Colditz et al., 1996). The most widely recognized successful example in US is the reduction of lung cancer as a result of declining smoking rates (Wingo et al., 1999). Quitting smoking, avoiding second-hand smoking and avoiding unnecessary x-ray image of the chest are the main preventive measures mentioned by the study participants. Lung cancer prevention can be promoted by smoking cessation (van Rens et al., 2000). Smoking avoidance and smoking cessation result in decreased incidence and mortality from cancer. Stopping smoking at 50 years of age would half the excess risk of overall cancer, whilst stopping at 30 years of age would avoid the majority of cancer (Doll et al., 2004). The effects of quitting smoking depend on the type of cancer (US DHHS, 1990; Godtfredsen et al., 2005). Tobacco consumption is a modifiable behavioral risk factor, which should be targeted by primary prevention strategies (Asaria et al., 2007). Although all cancers are a result of multiple mutations (Hahn and Weinberg, 2002), these mutations are due to interaction with the environment (Mucci et al., 2001; Czene and Hemminki, 2002). These observations indicate that most cancers are not of hereditary origin and that lifestyle factors, such as diet habits, smoking, alcohol consumption, and infections, have a profound influence on their development (Irigaray et al., 2007). For radiation, more than 10% of total cancer cases may be induced by radiation (Belpomme et al., 2007). Various phyto-chemicals have been identified in fruits, vegetables, spices, and grains that exhibit chemopreventive potential,

and numerous studies have shown that a proper diet can help protect against cancer (Greenwald, 2005; Vainio, and Weiderpass, 2006). The protective role of fruits and vegetables against cancers that occur in various anatomical sites is now well supported (Divisi et al., 2006; Vainio, and Weiderpass, 2006).

Univariate and multivariate analysis showed that only race significantly influences the knowledge of the participants about lung cancer. However, marital status did not show any significant influence over the knowledge of the participants. A similar study from Malaysia showed that marital status, type of faculty, and type of semester significantly influence the knowledge of university students (Al-Naggar, 2012).

In conclusion, overall knowledge of secondary school male teachers about lung cancer was low. Interventions to increase lung cancer awareness are needed to improve early detection behavior. Teacher training should be conceptualized as a behavior change process with explicit teacher motivation components included helping affect the intended behavior. It is important for teachers to take a personal interest in student welfare so that they influence the students' smoking habit positively. For students to realize the benefits of behavior change, curricula for disease prevention programs must be implemented effectively. It is believed that health education activities against smoking should be continued and extended to the young population in schools, universities and in the community to further reduce the prevalence of smoking and its health consequences. Providing written material for teachers could enhance health education programs aimed at smoking prevention, both in terms of current smoking and any future intent to smoke. Lectures and talks on smoking should be included in the curriculum of teachers' training courses. In addition, religious antipathy toward smoking should be emphasized in any local antismoking campaigns as religious belief and care for health attitudes discourages non-smokers from taking up smoking. Increasing the price of pack of cigarettes to RM 20 and banning smoking in public places such as restaurants is highly recommended as primary preventive measures.

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References

Aljunid SM, Rizal AM, Abrizah A, et al (2006). Cost of Smoking Among Patients with Lung Cancer. Malaysian Council for Tobacco Control 2006 portal [online data].
 Al-Naggar RA (2012) Knowledge and Practice towards lung cancer among university students. *J Community Med Health Edu*, **2**, 134.
 American Cancer Society (1995). Cancer Facts and Figures.

Atlanta: American Cancer Society.
 Asaria P, Chisholm D, Mathers C, et al (2007). Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. *Lancet*, **370**, 2044-53.
 Bartsch H, Nair U, Risch A et al (2000). Genetic polymorphism of CYP genes, alone or in combination, as a risk modifier of tobacco-related cancers. *Cancer Epidemiol Biomarkers Prev*, **9**, 3-28.
 Belpomme D, Irigaray P, Hardell L (2007). The multitude and diversity of environmental carcinogens. *Environ Res*, **105**, 414-29.
 Besaratinia A (2008). Second-hand smoke and human lung cancer. *Lancet Oncol*, **9**, 657-66.
 Boffetta P (2004). Epidemiology of environmental and occupational cancer. *Oncogene*, **23**, 6392-403.
 Bouchardy C, Benhamou S, Jourenkova N, et al (2001). Metabolic genetic polymorphisms and susceptibility to lung cancer. *Lung Cancer*, **32**, 109-12.
 Brennan P, Bogillot O, Cordier S, et al (2000). Cigarette smoking and bladder cancer in men: a pooledanalysis of 11 case-control studies. *Int J Cancer*, **86**, 289-94.
 Brownson RC, Alavanja MC, Caporaso N, et al (1997). Family history of cancer and risk of lung cancer in lifetime non-smokers and long-term ex-smokers. *Int J Epidemiol*, **26**, 256-63.
 Cassidy A, Myles JP, van Tongeren M, et al (2007). The LLP risk model: an individual risk prediction model for lung cancer. *Br J Cancer*, **98**, 270-6.
 Chawla R, Sathian B, Mehra A, et al (2010). Awareness and assessment of risk factors for lung cancer in residents of pokhara valley. *Asian Pac J Cancer Prev*, **11**, 1789-93.
 Colditz GA, DeJong W, Hunter DJ, et al (1996). Harvard report on cancer prevention. *Cancer Causes Control*, **7**, 1-55.
 Czene K, Hemminki K (2002). Kidney cancer in the Swedish family cancer database: familial risks and second primary malignancies. *Kidney Int*, **61**, 1806-13.
 Denissenko MF, Pao A, Tang M, et al (1996). Preferential formation of benzo[a]pyrene adducts at lung cancer mutational hotspots in P53. *Science*, **274**, 430-2.
 Divisi D, Di Tommaso S, Salvemini S, et al (2006). Diet and cancer. *Acta Biomed*, **77**, 118-23.
 Doll R, Petro R, Borelian J, et al (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ*, **328**, 1519.
 Dubrow R, Wegman DH (1983). Setting priorities for occupational cancer research and control: synthesis of the results of occupational disease surveillance studies. *J Natl Cancer Inst*, **71**, 1123-42.
 Ferlay J, Shin HR, Bray F, et al (2010). Cancer incidence and mortality worldwide. GLOBOCAN 2008: IARC cancer Base. Lyon, France: International agency for research on cancer.
 Gandini S, Botteri E, Iodice S, et al (2008). Tobacco smoking and cancer: a meta-analysis. *Int J Cancer*, **122**, 155-64.
 Gao YT, Blot WJ, Zheng W, et al (1987). Lung cancer among Chinese women. *Int J Cancer*, **40**, 604-9.
 Ghaffar A, Reddy KS, Singhi M (2004). Burden of noncommunicable diseases in South Asia. *BMJ*, **328**, 807-10.
 Godtfredsen NS, Prescott E, Osler M (2005). Effect of smoking reduction on lung cancer risk. *JAMA*, **294**, 1505-10.
 Greenwald P (2005). Lifestyle and medical approaches to cancer prevention. *Recent Results Cancer Res*, **166**, 1-15.
 Hackshaw AK, Law MR, Wald NJ (1997). The accumulated evidence on lung cancer and environmental tobacco smoke. *BMJ*, **315**, 980-8.
 Hahn WC, Weinberg RA (2002). Modelling the molecular

- circuitry of cancer. *Nat Rev Cancer*, **2**, 331-41.
- Henley SJ, Thun MJ, Chao A, Calle EE (2004) Association between exclusive pipe smoking and mortality from cancer and other diseases. *J Natl Cancer Inst*, **96**, 853-61.
- Hopland DR (1995). Tobacco use and its contribution to early cancer mortality with a special emphasis on cigarette smoking. *Environ Hlth Perspect*, **103**, 131-42.
- Irigaray P, Newby JA, Clapp R, et al (2007). Lifestyle-related factors and environmental agents causing cancer: an overview. *Biomed Pharmacother*, **61**, 640-58.
- Kebede Y (2002). Cigarette smoking and khat chewing among college students in North West Ethiopia. *Ethiop J Health Dev*, **16**, 9-17.
- Keeler TE, Hu TW, Barnett PG, et al (1993). Taxation, regulation, and addiction: a demand function for cigarettes based on time-series evidence. *J Health Econ*, **12**, 1-18.
- Kofahi MM, Haddad LG (2005). Perceptions of lung cancer and smoking among college students in Jordan. *J Transcult Nurs*, **16**, 245-54.
- Koo LC, Ho JH, Lee N (1985). An analysis of some risk factors for lung cancer in Hong Kong. *Int J Cancer*, **35**, 149-55.
- Lan Q, He X, Costa DJ, et al (2000). Indoor coal combustion emissions, GSTM1 and GSTT1 genotypes, and lung cancer risk: a case-control study in Xuan Wei, China. *Cancer Epidemiol Biomarkers Prev*, **9**, 605-8.
- Liam CK, Pang YK, Leow CH, et al (2006). Changes in the distribution of lung cancer cell types and patient demography in a developing multiracial Asian country. *Lung Cancer*, **53**, 23-30.
- Liu ZY, He XZ, Chapman RS (1991). Smoking and other risk factors for lung cancer in Xuanwei, China. *Int J Epidemiol*, **20**, 26-31.
- Lubin JH, Alavanja MCR, Caporaso N, et al (2007). Cigarette smoking and cancer risk: modeling total exposure and intensity. *Am J Epidemiol*, **166**, 479-89.
- Mathieson A (2005). Lung cancer: spotting the symptoms. *CANCER WORLD*, 42-43.
- Mattson ME, Pollack ES, Cullan JW (1987). What are the odds that smoking will kill you? *Am J Public Health*, **77**, 425-31.
- Ministry of Health (2003). Clinical Practice Guideline of Tobacco Use and Dependence 2003, Ministry of Health Malaysia.
- Ministry of Health (2011). Global Adult Tobacco Survey (GATS) Malaysia. Global Tobacco Surveillance System Data (GTSSData). Atlanta, Centre for Disease Control.
- Mucci LA, Wedren S, Tamimi RM, et al (2001). The role of gene-environment interaction in the aetiology of human cancer: examples from cancers of the large bowel, lung and breast. *J Intern Med*, **249**, 477-93.
- Oetting ER, Donnermeyer JF (1998). Primary socialization theory: the etiology of drug use and deviance. *Substance Use and Misuse*, **33**, 995-1026.
- Parkin DM, Bray FI, Devesa SS (2001). Cancer burden in the year 2000: the global picture. *Eur J Cancer*, **37**, 4-66.
- Parkin DM, Pisani P, Lopez AD, et al (1994). At least one in seven cases of cancer is caused by smoking. Global estimates for 1985. *Int J Cancer*, **59**, 494-504.
- Peto R, Darby S, Deo H, et al (2000). Smoking, smoking cessation, and lung cancer in the UK since 1950: combination of national statistics with two case-control studies. *BMJ*, **321**, 323-9.
- Peto R, Lopez AD, Boreham J, et al. (1996). Mortality from smoking worldwide. *Br Med Bull*, **52**, 12-21.
- Pride NB, Soriano JB (2002). Chronic obstructive pulmonary disease in the United Kingdom: trends in mortality, morbidity, and smoking. *Curr Opin Pulm Med*, **8**, 95-101.
- Reid DJ, McNeill AD, Glynn TJ (1995). Reducing the prevalences of smoking in youth in Western countries: an international review. *Tobacco Control*, **4**, 266-77.
- Report of the Second National Health and Morbidity Survey (1997). Public Health Institute, Ministry of Health, Malaysia.
- Richard A, Matthay MD (2002). Clinics in chest medicine. *Lung Cancer*, 23.
- Ries LAG, Eisner MP, Kosary CL, et al. (2004). SEER Cancer Statistics review, 1975-2001. Bethesda MD: National Cancer Institute;. Available from <http://seer.cancer.gov/csr/1975-2001>.
- Salber EJ, Macmahon B (1961) Cigarette smoking among high school students related to social class and parental smoking habits. *Am J Public Hlth*, **51**, 1780-9.
- Sasco A (2004). Secretan MB, Straif K. tobacco smoking and cancer: a brief review of the epidemiological evidence. *Lung Cancer*, **45**, 3-9.
- Second Report of the National Cancer Registry (2003). Cancer incidence in Malaysia, National Cancer Registry, Malaysia (<http://www.crc.gov.my/ncr>).
- Shaper AG, Wannamethee SG, Walker M (2003). Pipe and cigar smoking and major cardiovascular events, cancer incidence and all-cause mortality in middle-aged British men. *Int J Epidemiol*, **32**, 802-8.
- Siahpush M, McNeill A, Hammond D, Fong GT (2006). Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: results from the 2002 international tobacco control (itc) four country survey. *Tob Control*, **15**, 65-70.
- Steenland K, Loomis D, Shy C, et al (1996). Review of occupational lung carcinogens. *Am J Ind Med*, **29**, 474-90.
- Surgeon General (1994). Preventing Tobacco use among Young People. US Department of Health and Human Services, Washington, DC.
- Tyas SL, Pederson LL (1998). Psychosocial factors related to adolescent smoking: a critical review of the literature. *Tobacco Control*, **7**, 409-20.
- US Department of Health and Human Services (1989). Reducing the health consequences of smoking: 25 years of progress. A report of the surgeon general. Rockville (MD): U.S. Department of health and human services, public healthservice, centers for disease control, center for chronic disease prevention and health promotion, office on smoking and health. *DHHS Publ*, **89**, 8411.
- US Department of Health and Human Services (1999). USA. Best Practices for Comprehensive Tobacco Control Programs. Atlanta: US Department of Health and Human Services.
- US Department of Health and Human Services, USA (1982) The Health Consequences of Smoking: Cancer. A Report of the Surgeon General. Bethesda, Maryland: Public Health Service, Office on Smoking and Health.
- US Department of Health and Human Services, USA (1983). The Health Consequences of Smoking: Cardiovascular Disease. A Report of the Surgeon General. Rockville, Maryland: Public Health Service, Office on Smoking and Health.
- US DHHS. The Health Benefits of Smoking Cessation: A report of the Surgeon General. 1990.
- Vainio H, Weiderpass E (2006) Fruit and vegetables in cancer prevention. *Nutr Cancer*, **54**, 111-42.
- van Rens MT, de la Rivière AB, Elbers HR, van Den Bosch JM (2000). Prognostic assessment of 2361 patients who underwent pulmonary resection for non-small cell lung cancer, stage I, II, and IIIA. *Chest*, **117**, 374-9.
- Vineis P, Airoidi L, Veglia F, et al. (2005) Environmental tobacco smoke and risk of respiratory cancer and chronic obstructive pulmonary disease in former smokers and never smokers in the EPIC prospective study. *BMJ*, **330**, 277.

- Vital statistics Malaysia 2005. Department of statistics, Malaysia.
- Wakefield, M. and Chaloupka, F. (2000) Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA. *Tobacco Control*, **9**, 177-86.
- Wasserman J, Manning WG, Newhouse JP, Winkler JD (1991). The effects of excise taxes and regulations on cigarette smoking. *J Health Econ*, **10**, 43-64.
- Whitrow MJ, Smith BJ, Pilotto LS, Pisaniello D, Nitschke M (2003). Environmental exposure to carcinogens causing lung cancer: epidemiological evidence from the medical literature. *Respirology*, **8**, 513-21.
- WHO (2008). International Agency for Research on Cancer. World Cancer Report.
- Wogan GN, Hecht SS, Felton JS, Conney AH, Loeb LA (2004). Environmental and chemical carcinogenesis. *Semin Cancer Biol*, **14**, 473-86.
- Wright GS, Gruidl ME (2000). Early detection and prevention of lung cancer. *Curr Opin Oncol*, **12**, 143-8.
- Wu AH, Fontham ET, Reynolds P, et al (1996). Family history of cancer and risk of lung cancer among lifetime nonsmoking women in the United States. *Am J Epidemiol*, **143**, 535-42.
- Wingo PA, Ries LAG, Giovino GA, et al (1999). Annual report to the nation on the status of the cancer, 1973-1996, with special section on lung cancer and tobacco smoking. *J Natl Cancer Inst*, **91**, 675-90.