ORIGINAL ARTICLE

Determinants of Voluntary Smoke- Free Home Among Non-Smoking Women in Alor Gajah, Melaka

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ABSTRACT

Introduction: Second hand smoke exposure to cigarette smoke leads to many medical conditions including asthma and lung cancer. Women are the most vulnerable adults of passive smoking at home. Even though Malaysia had its own smoke- free policy, the smoke- free home is voluntary in nature. Thus, this study was aimed to explore the practice of voluntary smoke- free- home among women in Alor Gajah and its determinants. **Methods:** A cross-sectional study based on multistage sampling was conducted among 180 non- smoking women in areas implemented Community Intervention Program (KOSPEN), which emphasized on healthy lifestyle, in Alor Gajah, Melaka from April 2018 to May 2018. Data on sociodemographic characteristic, characteristic of second hand smoke (SHS) exposure at home, knowledge, attitude and avoidance behaviour from SHS were collected using questionnaires. The data were then analysed using IBM Statistical Package for Social Science (SPSS) version 24.0 involving descriptive and inferential statistics. **Results:** Majority of the respondents practised smoke- free home (72.8%). The predictors of smoke- free home were those who attained higher education (AOR= 11.939, 95% CI 1.175- 121.277), did not live with any children (AOR= 3.546, 95% CI 0.985- 12.765) and lived with smokers other than their husband (AOR= 3.793, 95% CI 1.192- 12.076). **Conclusion:** Education level and household factors were significant predictors of smoke- free home. Thus, few measures were suggested to increase tobacco bans at home among women including periodic health programs, community empowerment programs and creating smoke- free housing.

Keywords: Second hand smoke, Smoke- free home, Non- smoking women, Passive smoking

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INTRODUCTION

Smoking is a major public health problem (1). Current studies also have suggested that exposure to second hand smoke (SHS) is equally as dangerous as the current smokers, in terms of the risks of getting breast cancer (2), allergic rhinitis and dermatitis (3) as well as pregnancy complications including stillbirths and preterm deliveries (4). From 4,000 constituents present in cigarette smoke, approximately 70 chemicals present in second hand smoke, including arsenic, benzene and ethylene oxide are carcinogenic (5). The commonest cancer as the result of second hand smoke exposure is lung cancer (6). Exposure to second hand smoke at work and home may increase the risk of developing lung cancer by 20 to 30% (1).

Framework Conventions of Tobacco Control (FCTC) by WHO is aimed to reduce the smoking pandemic and to ensure individuals live in 100% smoke- free environment by promoting comprehensive smoke- free policy, and

Malaysia had ratified it since 2005 (7). A successful smoke- free legislation is proven to result in increased decision for banning of smoking at homes (8). A large-scale study involving Ireland, France, Netherland and Germany revealed there was an increase in total home smoking restriction in all 4 countries following implementation of smoke- free policy with the highest changes seen in Germany with 11% difference (30% pre-legislation, 41% post- legislation, p<0.001) and the least changes was in Netherlands with 4% changes (15% pre- legislation, 19% post- legislation) (9). Despite the effectiveness of comprehensive smoke- free policy on the establishment of total smoking bans at home, Malaysia is still partially implementing it with the exception of hospitality services. A cross- sectional study involving 1,064 ten to eleven year-old school children found that Malaysian students have higher level of salivary cotinine concentrations compared to their counterparts who live elsewhere (10). This may be explained by the partial nature of smoke- free policy practised in Malaysia. This study also showed that children who live with at least one smoking parent had higher salivary cotinine concentration (0.65 ng/ml) compared to others who live with non- smoking parents (0.32 ng/ml). This study showed that the effectiveness of a smoke- free policy should be evaluated to the extent it helps promoting

voluntary smoking restrictions at home.

From the prior mentioned study conducted in Ireland, France, Netherland and Germany; being young, male, educated, married with young children, supportive on total bans of smoking at bars, knowledgeable on the health effects of smoking and had intention to quit smoking were the predictors for home smoking bans among smokers pre and post- legislation (9). The International Tobacco Control (ITC) Four Country Survey that was conducted in Canada, US, Australia and United Kingdom in 2006, also revealed the predictors of self-reporting smoke-free homes which included household factors such as having a child especially young child (OR 3.69, 95% CI 2.13 - 6.37) and having other non-smoking adults in the house (OR 5.16, 95% CI 2.29 - 11.65) (11).

The studies on the effect of the smoke- free policy are still lacking in Malaysia. The International Tobacco Control Policy Evaluation Survey (ITC) that was conducted across seven states in Malaysia from 2005 until 2011, revealed an increment of 33% in prevalence of total smoking bans at homes among smokers between 2005 (7%) and 2009 (40%) (12). However, it contradicts with the findings from NHMS 2015, that reported much larger number of people were still exposed to tobacco smoke, regardless of the places of exposure (13). Yet very little attention has been paid to have a better understanding on tobacco bans at the commonest place of exposure among women who are the most vulnerable adults of passive smoking.

This study focused on the main vulnerable group among non- smokers from second hand smoke exposure, who are the women. As many parts in Melaka are declared as smoke- free areas, it is best to assess its benefit in term of the establishment of smoke- free homes among women in Alor Gajah. At the end of this study, we hope to illustrate a clear picture about the adaptation of the smoke- free homes among women and identify the associated factors that can be improved on.

MATERIALS AND METHODS

Study Design and Samples
The study was conducted at Alor Gajah, Melaka. Melaka is located in the West Coast Line of Peninsular Malaysia, and Alor Gajah is among three districts in Melaka state, that is populated by approximately 166 000 residents. According to the spatial dimension from Melaka City, it is considered as rural district in Melaka (14). Melaka is the state in Malaysia that was declared as a smoke- free state in 2011. Following that, many public places have been gazetted as smoke- free zone including the ones in Alor Gajah under the smoke- free policy, called Smoke- free Melaka City (MBAR). Komuniti Sihat Pembina Negara (KOSPEN) is a well- known nationwide community empowerment programme in Malaysia in fighting non-

communicable diseases including smoking. There are currently 40 localities mainly monitored by Community Development Department (KEMAS) established in Alor Gajah.

The study was a cross sectional study, involving non-smoking women, aged 18 years and above, who permanently resided in Alor Gajah. It used multistage sampling and was carried out in four stages (division of three operational zones, simple random sampling of one KOSPEN locality from each operational zone, simple random sampling of houses in the 3 selected KOSPEN localities (60 from KOSPEN *Sungai Jernih*, 60 from KOSPEN *Pegoh* and 60 from KOSPEN *Kelemak Luar*) and simple random sampling of a woman in every selected household list). The list of KOSPEN localities in Alor Gajah was acquired from District Health Office. There were 40 localities of KOSPEN in Alor Gajah. The localities were further divided into 3 operational zones (urban, suburban, rural) according to the distance from the centre of Alor Gajah district (urban-within 10km radius from centre, suburban- 10-20km radius from centre, rural- >20km radius from centre). It is to represent various socio demographic and socio economic characteristics of residents in Alor Gajah. Considering the feasibility of the study, one locality was randomly selected from each zone, making the total number of three KOSPEN localities. In each locality, simple random sampling has again been used to select household from address list attained from respective KOSPEN committee. Finally, simple random sampling was done to select one respondent from each selected household list.

The sample size was calculated using comparing two proportion technique (15). The cross sectional study by Cheng (2011) was used as the reference for sample size calculation (16). The study revealed the proportion of respondents who did not live with smokers and practised tobacco bans at home was 94% compared to those who lived with smokers and practised smoke- free home (62%). As multistage sampling was used, taking into account the design effect of 2 and 10% of expected non- response rate, the final sample size was 180.

The ethics approval for this study was obtained from Human Ethics Committee of Universiti Putra Malaysia (UPM) (Reff : UPM/TNCPI/RMC/1.4.18.2(JKEUPM)). Besides that, the fact sheet and informed consent were prepared before conducting the study, to ascertain the understanding and privacy of respondents' details. The permission from Alor Gajah District Office was acquired as this study was conducted among community members from KOSPEN localities in Alor Gajah.

Study Measures
The data was collected using questionnaires administered through face to face interview. The questionnaires consist of five components (sociodemographic characteristics,

characteristics of second hand smoke exposure at home, knowledge, attitude and avoidance behaviour from second hand smoke. Part III (knowledge) and IV (attitude) of the questionnaires used five- point Likert scale, which was adapted from Kurtz et al. (2003) (17). Part V (avoidance behaviour) of the questionnaires used four- point Likert scale, which was adapted from Martinelli et al. (1998) (18).

The dependant variable in this study is smoking bans at home, which is defined as the restriction of smoking inside respondents' home that is established by mutual decision from family members and was self- reported by respondents. The restriction is classified either as total (smoking is not allowed inside house), partial (smoking is allowed in specific areas or rooms in the house) or no restriction (smoking is allowed anywhere inside the house).

Face validity was done among 20 community members from a KOSPEN locality in Jasin district, Melaka. Content validity on the other hand, were conducted by two appointed Epidemiology lecturers. Internal consistency reliability was estimated by using Cronbach's alpha index, and scored 0.9 for knowledge, 0.7 for attitude and 0.7 for avoidance behaviour scale.

Data Analysis

Data analysis was done using IBM SPSS Statistics version 24. Normality test was done on continuous data. Only age of youngest child was normally distributed. Chi square test was used to determine association between categorized independent variable with the categorized dependent variable. This study used level of significance, p- value of 0.05 and confidence interval of 95%. For results yielded $p < 0.05$, the null hypothesis was rejected. Multiple logistic regression was used to analyse the predictors of smoke free home. The final predictive model was generated using backward conditional method.

Five independent variables which were level of education, number of children live together, living with smokers, relationship with smokers and knowledge were obtained from bivariate analysis of smoke- free home with significance level of less than 0.05. Using "Backward LR" method, maximum significant variables were obtained. The final model containing all significant predictors for smoke- free home was statistically significant ($\chi^2 = 14.458$, df= 4, p= 0.01). This model also fits the sample as shown from Hosmer Lemeshow test ($\chi^2 = 2.816$, df= 5, p=0.73). Besides, this model also correctly classifies about 70.6% of the variables and explains 19.2% (Cox and Snell R square) to 26.3% (Nagelkerke R square) variance of smoke- free home.

RESULTS

Sociodemographic and socioeconomic characteristics of respondents

The response rate was 100%. Table I shows the sociodemographic and socioeconomic distribution of respondents in this study. As the normality testing for age and monthly family income showed skewed distribution, thus the median age of the respondents was 37 ± 15, and median family income was RM 2000 ± 2875. 177 (98.3%) respondents were Malays. Majority of the women attained education until secondary school level (47.8%). Most of the respondents were married (76.1%), and 80 (44.4%) of them did not have any children living together at home.

Table I: Sociodemographic and socioeconomic distribution of respondents (N=180)

Characteristics	Mean ± SD	Median ± IQR	N	(%)
Age (Years)		37 ± 15		
Ethnicity				
Malay			177	(98.3)
Chinese			-	-
Indian			3	(1.7)
Others			-	-
Level of education				
No formal education			4	(2.2)
Primary school			20	(11.1)
Secondary school			86	(47.8)
Certificate/ Diploma			48	(26.7)
Degree/ Masters/ PhD			22	(12.2)
Monthly family income (RM)		2000 ± 2875		
Marital status				
Married			137	(76.1)
Single			22	(12.2)
Divorce/ widow			21	(11.7)
Number of children live together				
None			80	(44.4)
1			29	(16.1)
2			38	(21.1)
3 or more			33	(18.3)
Age of youngest child	5.83 ± 0.38			

Second hand smoke exposure inside home

Table II summarizes the distribution of second hand smoke exposure inside home among respondents. Most of the respondents did not live with smokers (62.8%). 97.1% of the smokers who lived with respondents were their first degree relatives (include husband, father, relatives, siblings and children). It was a multi-response question, in which participants can tick more than one on the options given. 60 respondents (88.2%) lived with only a smoker in their home, and 59.4% of the smokers smoked inside the house. Majority of the respondents (65.6%) claimed that they had never been exposed to cigarette smoke inside their house, whilst only one

Table II: Distribution of second hand smoke exposure inside home (N=180)

Characteristics	N	(%)
Live with smokers		
Yes	68	(37.2)
No	112	(62.8)
Relationship with smokers (n= 68)		
First degree relatives	66	(97.1)
Others	2	(2.9)
No. of smokers live together (n= 68)		
1	60	(88.2)
2 or more	8	(11.8)
Smokers smoke inside house (n= 68)		
Yes	40	(59.4)
No	28	(40.6)
Frequency of exposure		
At least once a day	40	(22.2)
At least once a week	17	(8.9)
At least once a month	5	(2.8)
At least once in 6 months	1	(0.6)
Never exposed	118	(65.6)
Exposure in a day		
1 hour	17	(10)
2 hours	7	(3.9)
3 hours or more	12	(6.7)
Don't know	24	(13.3)
Not related (never exposed to smoke)	119	(66.1)
Situation at home		
Smoking is allowed in my house	10	(5.6)
Smoking is allowed in certain areas in my house	39	(21.7)
Smoking is not allowed in my house	131	(72.8)

Table III: Distribution of knowledge, attitude and avoidance behaviour on second hand smoke exposure (N=180)

Variables	N	(%)
Knowledge		
Poor knowledge	1	(0.6)
Undecided	61	(33.9)
Good knowledge	118	(65.6)
Attitude		
Poor attitude	-	-
Undecided	34	(18.9)
Good attitude	146	(81.1)
Avoidance behaviour		
Poor behaviour	1	(0.6)
Good behaviour	179	(99.4)

respondent (0.6%) claimed they had been exposed to cigarette smoke inside their houses at least once in 6 months. Most of the respondents did not allow smoking inside the house (72.8%), and 27.3% of them allowed smoking inside the house.

Knowledge, attitude and avoidance behaviour on second hand smoke

Table III explains the distribution of knowledge, attitude and avoidance behaviour on second hand smoke exposure. There were 118 (65.6%) respondents who had good knowledge on smoking, followed by undecided (33.9%) and poor knowledge (0.6%). Whilst for the attitude, majority of them had good attitude (81.1%), 18.9% were undecided and none of them had poor attitude towards cigarette smoking. On the other hand, 99.4% of the respondents had good avoidance behaviour against cigarette smoke.

Predictors of smoke- free home

Table IV shows the predictors of smoke- free home. Lower education is considered as attainment of education up to primary school level, middle education as secondary school level and higher education was considered if the respondents had received education at least until certificate level. Respondents with higher education were 12 times more likely to practise smoke- free home compared to lower education (AOR= 11.939, 95% CI 1.175-121.277). Women who did not live with any children had four times higher odds to ban tobacco at home (AOR= 3.546, 95% CI 0.985- 12.765). On the other hand, those who lived with smokers other than their husbands were 4 times more likely to practise smoke- free home (AOR= 3.793, 95% CI 1.192-12.076).

DISCUSSION

Prevalence of smoke- free home

Smoke- free home was measured among women who prohibited smoking inside their houses. Whilst, those who claimed smoking was allowed in certain part or all parts of their homes, they were considered as not practising smoke- free home. Based on the descriptive analysis, the prevalence of smoke- free homes (72.8%) reported by non- smoking women. It compliments the findings from Global Adult Tobacco Survey conducted in 2011, which showed 32.8% of the non- smoking women were exposed to tobacco smoke at home

Table IV: Predictors of smoke- free home (N=180)

Variable	B	SE	Wald	P - value	Adjusted OR	95% CI Upper	95% CI Lower
Level of education							
Lower education					1		
Middle education	1.392	1.154	1.455	0.23	4.024	0.419	38.661
Higher education	2.490	1.183	4.396	0.04	11.939	1.175	121.277
Live with children							
Yes					1		
No	1.266	0.654	3.751	0.05	3.546	0.985	12.765
Relationship with smokers							
Husband					1		
Others	1.333	0.591	5.092	0.02	3.793	1.192	12.076
Constant	-3.155	1.170	7.264	0.01	0.043		

(Note : significance level at p<0.05)
Final predictive model is shown as below :
Log (smoke- free home) = -3.155 + 1.333 (living with smoker husband)+ 1.266 (did not live with any children) +2.490 (higher education)

(19). It can be explained by taking into account the aggressive measures by government in controlling the smoking epidemic in Malaysia, following ratification of FCTC in 2005 (8). Government's commitment can be seen through enforcement of the legislation to prohibit smoking in most of public places, on top of effective health promotion such as 'Tak Nak' anti- smoking mass media campaign to encourage smokers to quit smoking and discourage non- smokers from smoking. Furthermore, Melaka has successfully adopted smoke-free policy in June 2011, with additional public places were established as smoke- free places. Despite many studies have shown living in urban areas is significantly associated with reporting of tobacco bans at home (18, 20), this study which involved suburban community in Alor Gajah still showed positive findings on smoke- free homes. It showed the efficacy of current tobacco control programme that also caters for the rural community.

Level of education

Many studies have proven the association between level of education and establishment of smoke- free homes. For example, a national survey revealed non- smokers who had no formal education were more likely to be exposed to second hand smoke compared to those who attained tertiary education (32%, 95% CI: 28.34- 35.95 VS 19%, 95% CI: 11.19- 30.31) (13). This study also showed similar results like the above survey, whereby it showed that women with higher education (certificate or higher) were more likely to ban tobacco at home (84.3%), compared to those with lower education (no formal education and primary school) (62.5%, p= 0.020). It is probably due to illiterate women tend to stay at home as housewives rather than working outside, compared to women with higher level of education. Thus, the longer duration of staying at home and lack of mobility to outside world will make them unaware of the adverse effect of cigarette smoking to passive smokers, thus less empowered to protect themselves from cigarette smoking at home.

Numbers of children

There are enough evidences to significantly demonstrate the relationship between numbers of children with smoke- free homes. A large study in United States (US) revealed that adults who live with children are 1.1 times more likely to adopt smoke- free home, compared to adults without children (p= 0.003, 95% CI: 1.04-1.16) (21). Another study showed adults who lived with children were more likely to adopt smoke- free home compared to adults who lived alone (78.1% vs 66.3%) (22). However, the results of this study were contrary to the above findings, in which women who live together with 1 or no children were more likely to practise smoke- free home compared to women with higher number of children living together. The reason behind it is due to different constituency of household in this study compared to others. Majority of respondents in

this study did not live together with children (44.4%) and only 18.3% of them live with 3 or more children. Besides, most of the women who lived with smokers have higher number of children live together (Mean number of children = 1.51(1.133)), compared to those who did not live with smokers (Mean number of children = 0.91 (1.146), thus making them at higher risk of exposure to second hand smoke at home.

Relationship with smokers

From this study, women who lived with smokers and had husbands who were smokers were less likely to adopt tobacco bans at their homes. Many other studies showed similar findings. For example, a study among Bangladeshi non- smokers found out second hand smoke exposure was higher among respondents who had a smoking family member (47% vs 31%, p<0.001) (20). Another study, which was conducted among Jordanians revealed highly educated, working women noted exposure to second hand smoke was associated with women who lived with smoking household members (p<0.001) and smoking husbands (p<0.001) (23). It can be explained by the strength of relationship between smokers and respondents and also the local culture. Culturally, women are supposed to obey the men in their family. Men typically have higher rates of smoking, thus increasing the risk of exposure among non- smoking women who live together with them (24). Furthermore, living with smokers, especially husband may affect women's ability to avoid second hand smoke (25). Empowerment is needed to be cultivated among each woman, so as to raise their rights as passive smokers.

The study provides a baseline information on the prevalence of smoke- free home among non- smoking women who lived in rural part of Melaka, with wide coverage of smoke- free policy in term of Melaka Smoke-free City. Besides that, it also provides the information on the factors associated with smoke- free home. On top of that, it also provides a validated and reliable tool in measuring knowledge, attitude and avoidance behaviour on second hand smoke in Melaka.

As the study design used is cross sectional study design, it is only able to measure the relationship and association between independent and dependent variables. Temporal relationship between independent and dependent variable cannot be measured as it was only conducted at one point of time. Besides that, it does not provide general view, as it only represents non- smoking women who lived in Alor Gajah. It was also carried out in KOSPEN localities, in which the health programs and promotions on smoke- free home are concentrated. Hence, it may act as the confounding factor in this study. On the other hand, selection bias was inevitable as the respondents who were only able to read and understand Malay language were selected. In order to improve the study design and quality of

the results gained, a prospective study can be used in the future to look for temporal relationship between variables. A qualitative study also may be suitable to explore the possible factors of smoke- free home as there are limited studies conducted in Malaysia. Multilingual translation can be made in order to reduce selection bias. It is also vital to know the prevalence of smoke-free home among other races too. The more sensitive and specific assessment such as the measurement of cotinine level in respected respondents or measurement of particulate matter (PM) 2.5 in the environment might be helpful in determining the second hand smoke exposure among respondents and could be combined with the self- reporting of smoking bans at home or any other public places.

CONCLUSION

As a conclusion, 72.8% of participants practiced smoking bans at home. Women with higher education, lived with smokers other than their husbands and did not live with any children were more likely to adopt smoke-free home. The high prevalence of smoke- free home in this study is most likely contributed by the fact that the study was conducted among KOSPEN community with established intervention on smoking and Melaka as Smoke- Free State.

By knowing the associated factors for smoke- free home, few measures and intervention can be done at district, state and national levels. As the knowledge is not a problem among the respondents in this study, the best intervention to be conducted is probably the regular and periodic health program to remind and maintain the level of knowledge and awareness on SHS among them. Besides that, community empowerment program such as COMBI and KOSPEN could be efficient to empower the knowledgeable community, especially women to protect themselves and others from the effect of SHS exposure. On top of that, new intervention such as creating smoke- free housing can be adopted by local governments, like what have been implemented by U.S. Department of Housing and Urban Development that had finalized smoke- free policy to be adopted by Public Housing Agency in making all public housings smoke-free by July, 2018 (26).

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