**Awareness of cancer risk factors and warning signs among urban dwellers in Malaysia**

Tin Tin Su1,\*

tstin@ummc.edu.my

Mohammadreza Amiri2

[mreza@um.edu.my](mailto:mreza@um.edu.my)

Jane Wardle3

j.wardle@ucl.ac.uk

Hazreen Abdul Majid1

[hazreen@ummc.edu.my](mailto:hazreen@ummc.edu.my)

1Centre for Population Health (CePH), Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, 50603, Kuala Lumpur, Malaysia

2Department of Development Studies, Faculty of Economics and Administration, University of Malaya, 50603, Kuala Lumpur, Malaysia

3Cancer Research UK Health Behaviour Research Centre (HBRC), University College London.

\*Corresponding author

# ABSTRACT

**Objective.** In this study, we evaluated the level of awareness of cancer causing risk factors amid urban residents of Malaysia.

**Methods.** A cross sectional survey was conducted in four randomly selected communities located in metropolitan Kuala Lumpur, Malaysia. Altogether, 833 households were selected using simple random sampling approach. Totally, 2,360 adults (47.1% males) who were more than 18 years old replied to the Cancer Awareness Measure (CAM) questionnaire. The analysis of covariance determined the significant relationships between sample characteristics and awareness of cancer risk factors or cancer warning signs.

**Results.** While elder respondents had lower levels of awareness, males had a lower awareness score comparing to females (p <0.05). In addition, education level (p <0.001) and occupational status (p <0.001) were strong associates of the awareness level. While, participants were highly aware of tobacco related risk factors [i.e. smoking tobacco (73.5%) and exposure to tobacco smoke (71.1%)], they were least aware of ageing more than 70 years (33.7%), viral infection (27.6%), physical inactivity (26.9%), and less fruit and vegetables daily (25.4%).

**Conclusions.** Awareness of risk factors for cancer was high for some behavioral risk factors but low in the rest. Growing the awareness of cancer risk factors and improving the knowledge of cancer warning signs would not only enhance the chance of treating cancer in initial stages but also the number of cancer incidence rates would drop sharply.

**Keywords:** Cancer; risk factor; awareness; symptom; warning sign.

# INTRODUCTION

Cancer is a serious health problem. In 2012, about 14.1 million new cancer cases, 8.2 million cancer related deaths, and 32.6 million people living with cancers diagnosed [1]. The number of new cases is expected to increase by 70% reaching 22 million over the next 2 decades [2, 3]. In South-East Asian region, about 1,724 (per 100,000) new cases of cancer and 1,171 (per 100,000) cancer related deaths occurred in 2012 [4]. The cancer incidences and mortalities in Malaysia are alarming too. According to the International Agency for Research on Cancer (IARC) GLOBOCAN of the World Health Organization (WHO), from 2008 to 2012 the incidence of cancer increased from 32,000 to 37,400 while cancer related deaths raised from 20,100 to 21,700 [4]. However, about half of the known major types of cancers (11 types) are potentially avoidable [5].

About fifty percent of cancers [6, 7] and one third of cancer deaths [2] are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco and alcohol use. The primary (modifying causes) and secondary (enhancing participation in cancer screening programs) preventions of cancer are the main actions to reduce cancer incidents and subsequently mortalities due to it [8]. The guidelines related to tobacco and alcohol consumption, nutrition intake, and physical activity encouragements are not only believed to tackle cancer incidents but they can also play a significant role in defeating other diseases including heart and chronic illnesses as well as diabetes [8, 9].

Promoting healthy lifestyles is mandatory to decrease future incidents of cancers. To our best of knowledge, the public awareness of risk factors for cancer has never been studied before comprehensively.

# METHODS

## Design Setting and Data Collection

A cross-sectional survey was conducted in four randomly selected Community Housing Projects (PPR: Projek Perumehan Rakyat) located in metropolitan Kuala Lumpur, Malaysia. From 4728 households residing in PPRs, we selected 833 households using simple random sampling method. Then, individual adults (aged ≥18 years) from selected households were recruited. Written consents were taken from all participants. Ethics application was approved by the University of Malaya Medical Centre; Medical Ethics Committee (Ref. no. 890.161). This survey was conducted from February to November 2012.

## Sample Size

To determine the sample size we considered the following assumptions: the urban population in Kuala Lumpur to be five million; the true frequencies of the surveyed population to lie between ± 5% of confidence limits; power to be 80%; and, the confidence interval to be 95%. We assumed that at least 50% of our population is aware of one or more cancer risk factors. The calculated sample size was 384. However, to increase the accuracy of our analysis we included all eligible participants from the household survey. The sample size was determined by OpenEpi online program [10].

## Risk factors for cancer

We conducted this study using the cancer awareness measure (CAM) [11]. The unprompted (recall—open question) question was ‘what things do you think affect a person’s chance of getting cancer?’ The respondents were asked to include as many risk factors as they could recall. In addition, ‘in the next year, who is most likely to develop cancer? Someone in their…’ assessed the awareness of the age risk factor for cancer. Various risk factors for cancer were included in the prompted questions (recognition—closed). The following cancer risk factors were included in the questionnaire: active and passive smoking; drinking alcoholic beverages; low intake of fruit and vegetables daily; eating red/processed meat daily; being overweight/obese; being over 70 years old; having a close relative with cancer; infection with Human Papillomavirus (HPV); and, doing less than 30 minutes of moderate physical activity five times a week. If respondents agreed or strongly agreed with any of the risk factors, the response considered to be positive (the respondent is aware of the risk factor). In the end, these risk factors were summed up to form the overall awareness of cancer risk factors.

The CAM questionnaire also included questions regarding the three most common cancers in women and men (unprompted—open). In addition, the following question assessed whether respondent is aware of any breast cancer screenings programmes being conducted by Ministry of Health Malaysia: ‘as far as you are aware, is there a MOH breast cancer screening programme?’ This question was accompanied by: ‘if YES, at what age are women first invited for breast cancer screening?’ The same questions were asked for the ‘cervical cancer screening (smear)’ programme being conducted in Malaysia. Finally, the history of cancer in a relative/close friend/other friends were assessed by ‘have you, your family or close friends had cancer?’

The original CAM questionnaire was translated into local language of Malaysia, i.e., Bahasa Melayu. Independent individuals performed forward and backward translation. Before conducting the survey, face validity was done with 30 respondents. The intentions were: 1) to assess the comprehensiveness, simplicity, understandability, and clarity of the questionnaire; 2) to diagnose whether there is any inappropriate, redundant or missing items included that may dilute the contents; 3) to evaluate how likely the questionnaire addresses the research objectives; 4) to find the relevancy, flow, arrangement, and proper wording of the inquiries. The internal reliability, assessing by Cronbach’s α, was 0.95 indicating that the questionnaire items measured the same construct. We conducted face to face interviews both pilot testing and survey by using trained interviewers.

## Demographic and Socioeconomic Variables

The demographic variables included age (in years), gender, marital status (i.e., single, married, divorced, and widow/widower), and ethnic/race (i.e., classified under Malay, Indian, and Chinese/others—we combined the last two groups as the observations were too few). The socioeconomic status (SES) variables were monthly income, highest education obtained, and occupational status. The classifications for income levels were below 1,000 RM; 1,000–1,999RM; 2,000–2,999RM; and, above 3,000 RM. The highest education obtained was categorized as none (no official education); primary (1–6 years); secondary (7–12 years); and, tertiary (above 13 years). Finally, occupational statuses were grouped as paid-employee, self-employed, retired, the house maker, and others [12, 13]. The others included students, traineeship or apprenticeship.

## Statistical Analysis

Descriptive analyses were conducted for demographic and SES characteristics of respondents as well as for prompted and unprompted cancer warning signs and risk factors. The analysis of covariance (ANCOVA) were employed to analyze the precise comparison between groups of variables in association with warning signs and risk factors for cancer. We analyzed our data using Stata v11.2 (Stata Corp., USA).

# RESULTS

From 833 households (3722 individuals), 2360 adult individuals (63.4%) participated in our study. The description of participants is presented in Table 1.

Table 1 Characteristics of the sample (N = 2360)

|  |  |
| --- | --- |
|  | Percentage |
| Age (yrs., SD) | 39.8 (± 16.4) |
| Gender |  |
| *Male* | 47.1 |
| *Female* | 52.9 |
| Ethnicity |  |
| *Malay* | 82.4 |
| *Indian* | 15.5 |
| *Chinese / Others* | 2.1 |
| Marital Status |  |
| *Single* | 34.3 |
| *Married* | 56.7 |
| *Divorced* | 5.0 |
| *Widow* | 4.0 |
| Education Level |  |
| *None* | 7.9 |
| *Primary* | 14.8 |
| *Secondary* | 64.9 |
| *Tertiary* | 12.4 |
| Income Level |  |
| *<1000* | 18.2 |
| *1,000-1999* | 38.9 |
| *2000-2999* | 24.5 |
| *≥3000* | 18.7 |
| Occupation Status |  |
| *Paid Employee* | 47.2 |
| *Self-Employed* | 9.8 |
| *Retiree* | 2.8 |
| *Housewife* | 16.9 |
| *Others* | 23.5 |

[Table 1 here]

Table 2 shows the unprompted (recall—open question) and prompted (recognition—closed questions) awareness of warning signs of cancer among respondents. The unexplained lump or swelling (unprompted [U]: 18.4%; prompted [P]: 61.9%), persistent unexplained pain (U: 9.5%; P: 56.3%), and unexplained bleeding (U: 7.1%; P: 52.2%) were the highest recalled and recognized cancer symptoms by participants.

Table 2 Awareness of warning signs of cancer (N = 2360)

|  |  |  |
| --- | --- | --- |
| Signs and symptoms | Unprompted | Prompted |
| Unexplained lump or swelling | 18.4 | 61.9 |
| Persistent unexplained pain | 9.5 | 56.3 |
| Unexplained bleeding | 7.1 | 52.2 |
| Unexplained weight loss | 1.9 | 44.6 |
| Persistent cough or hoarseness | 1.1 | 39.1 |
| Persistent difficulty swallowing | 0.1 | 37.7 |
| Sore that does not heal | 1.1 | 36.7 |
| Change in the appearance of a mole | 0.1 | 34.6 |
| Persistent change in bowel or bladder | 0.3 | 33.1 |

[Table 2 here]

Results from the analysis of the unprompted risk factors for cancer revealed that very few respondents (<0.6%) had the knowledge of various cancer risk factors such as consumption of being >70 years old (0.1%), fruit and vegetables daily (0.2%), infection with HPV (0.3%), eating red/processed meat daily (0.3%), and being overweight/obese (0.6%). However, the most cited risk factors for cancer were smoking (15.9%), having a close relative with cancer (11.3%), and drinking alcohol (3.5%). The prompted risk factors results indicated that 73.5, 71.1, and 52.3 percent of participants recognized smoking one cigarette per day, exposure to another person’s cigarette smoke, and having a close relative with cancer respectively (see Figure 1).



Figure 1 Awareness of risk factors for cancer (N = 2360)

[Figure 1 here]

The ANCOVA results illustrated that significant relationships existed between all variables (except gender and marital status variables with awareness scores of warning signs) and awareness of warnings signs and risk factors of cancer. For instance, age categories (p <0.01), ethnic groups (p <0.001), education levels (p <0.001), income levels (p <0.05), and occupational statuses (p <0.001) had significantly different scores for warning signs of cancer (see Table 3).

Table 3 Variance of cancer warning signs and risk factors (N = 2360)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Warning signs | | Risk factors | |
| score [0 to 9] | | score [0 to 10] | |
| Demographic Groups | Mean (95% CI) | ANCOVA | Mean (95% CI) | ANCOVA |
| Age (years) |  |  |  |  |
| 18-24 | 4.23 (3.95 – 4.50) |  | 4.28 (4.01 - 4.55) |  |
| 25-34 | 4.81 (4.22 – 4.73) |  | 4.83 (4.59 - 5.08 |  |
| 35-44 | 3.97 (3.70 – 4.24) |  | 4.68 (4.40 - 4.96) |  |
| 45-54 | 4.05 (3.77 – 4.32) |  | 4.61 (4.34 - 4.88) |  |
| 54-64 | 3.13 (2.75 – 3.51) | F(3.14) | 4.14 (3.76 - 4.52) | F(2.76) |
| 65 and over | 2.47 (2.03 – 2.91) | p <0.01 | 3.03 (2.55 - 3.51) | p <0.05 |
| Gender |  |  |  |  |
| Male | 3.84 (3.66 – 4.02) | F(3.62) | 4.27 (4.09 - 4.44) | F(5.69) |
| Female | 4.06 (3.89 – 4.23) | p = 0.0574 | 4.59 (4.42 - 4.75) | p <0.05 |
| Ethnicity |  |  |  |  |
| Malay | 3.87 (3.73 – 4.00) |  | 4.36 (4.22 - 4.49) |  |
| Indian | 4.50 (4.18 – 4.82) | F(9.68) | 4.93 (4.62 - 5.24) | F(6.2) |
| Chinese / Others | 3.58 (2.74 – 4.41) | p <0.001 | 3.92 (3.16 - 4.67) | p <0.01 |
| Marital Status |  |  |  |  |
| Single | 4.02 (3.80 – 4.23) |  | 4.11 (3.89 - 4.33) |  |
| Married | 4.01 (3.85 – 4.17) |  | 4.63 (4.47 - 4.79) |  |
| Divorced | 3.47 (2.91 – 4.02) | F(0.72) | 4.47 (3.88 - 5.07) | F(5.93) |
| Widow | 3.34 (2.75 – 3.92) | p = 0.5386 | 4.47 (3.87 - 5.08) | p <0.01 |
| Education Level |  |  |  |  |
| None | 1.94 (1.54 – 2.34) |  | 2.69 (2.23 - 3.15) |  |
| Primary | 3.24 (2.93 – 3.54) |  | 4.13 (3.81 - 4.52) |  |
| Secondary | 4.20 (4.04 – 4.35) | F(22.70) | 4.65 (4.50 - 4.80) | F(12.13) |
| Tertiary | 4.87 (4.53 – 5.22) | p <0.001 | 4.80 (4.45 - 5.15) | p <0.001 |
| Income Level |  |  |  |  |
| <1000 | 3.79 (3.53 – 4.06) |  | 4.52 (4.24 - 4.80) |  |
| 1,000-1999 | 3.68 (3.48 – 3.88) |  | 4.39 (4.20 - 4.59) |  |
| 2000-2999 | 4.36 (4.10 – 4.61) | F(3.76) | 4.59 (4.34 - 4.83) | F(3.21) |
| ≥3000 | 4.17 (3.87 – 4.47) | p <0.05 | 4.24 (3.94 - 4.54) | p <0.05 |
| Occupation Status |  |  |  |  |
| Paid Employee | 4.43 (4.25 – 4.60) |  | 4.83 (4.66 - 5.00) |  |
| Self-Employed | 3.46 (3.09 – 3.84) |  | 4.27 (3.89 - 4.65) |  |
| Retiree | 3.66 (2.93 – 4.38) |  | 4.58 (3.86 - 5.30) |  |
| Housewife | 4.04 (3.75 – 4.32) | F(6.36) | 4.67 (4.38 - 4.95) | F(6.69) |
| Others | 3.20 (2.94 – 3.47) | p <0.001 | 3.52 (3.25 - 3.79) | p <0.001 |

The history of cancer and scores of warning signs and risk factors for cancer are illustrated in Table 4. Participants’ cancer risk factor scores differed only when they had history of cancer in their friends (F(9.74); p <0.01). None of categories of having cancer in self/spouse/close family and having cancer in other family members showed significant association with awareness of warning signs of cancer and its risk factors.

Table 4 History of cancer and scores of warning signs and risk factors (N = 2360)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Warning signs | | Risk factors | |
| score [0 to 9] | | score [0 to 10] | |
|  |  |  |  |  |
| Having cancer in self/spouse/close family |  |  |  |  |
| Yes (n = 279) | 3.74 (3.42 - 4.06) | F(1.60) | 4.52 (4.19 - 4.86) | F(0.26) |
| No (n = 2081) | 3.99 (3.85 - 4.12) | p = 0.2058 | 4.42 (4.29 - 4.56) | p = 0.6136 |
| Having cancer in other family member |  |  |  |  |
| Yes (n = 164) | 3.59 (3.17 - 4.02) | F(2.51) | 4.04 (3.57 - 4.50) | F(3.03) |
| No (n = 2196) | 3.99 (3.86 - 4.12) | p = 0.1129 | 4.47 (4.34 - 4.59) | p = 0.0817 |
| Having cancer in friends |  |  |  |  |
| Yes (n = 232) | 4.17 (3.80 - 4.54) | F(1.24) | 5.03 (4.65 - 5.40) | F(9.74) |
| No (n = 2128) | 3.94 (3.80 - 4.07) | p = 0.2647 | 4.37 (4.24 - 4.50) | p <0.01 |

In addition, just five (0.2%) respondents were aware that a person’s likelihood of developing cancer is highest if the age exceeds 70 years old. While 53.6 percent of participants were aware of breast cancer as the most common cancer in women, just 0.4 and 0.8 percent of participants were aware of lung and colorectal cancers as the second and third commonest cancers in women. In addition, about 11.9 and 11.4 percent of respondents were aware of prostate and lung cancer as the first and second most common cancers in men, however no one was aware of colorectal cancer as the third most common cancer in men.

# DISCUSSION

To our best of knowledge, this is the first study assessing the awareness of cancer risk factors among Malaysian urban dwellers. Our results generally tallied with previous findings where elder respondents were less aware of risk factors contributing to cancer which were in line with previous studies conducted in Canada, Australia, US, and UK in which a similar negative relationship between ageing and awareness of cancer risk factors were illustrated [14, 15]. This finding suggests that elder Malaysians are less aware that cancer incidents are relative to ageing. Therefore, increasing the awareness among older population might in fact decrease the cancer incidents in Malaysia.

Our findings of gender differences in awareness of cancer risk factors were consistent with previous findings where males had significantly lower awareness of cancer risk factors [14, 16, 17]. However, there was an instance in previous study in which there was no difference between genders about the awareness of cancer risk factors [18]. Hence, this finding allows policy makers to address gender awareness inequalities of cancer risk factors to be focused more on the disadvantaged gender.

Comparing ethnic groups, Chinese or others ethnic groups had least awareness scores followed by Malays. A previous study in the UK found awareness of cancer risk factors differ between various ethnic groups in that country which supports our finding [19]. To diminish disparities existed among ethnic groups in Malaysia, policies must disseminate information on the awareness of cancer risk factors to the less aware ethnic groups to reach a more balanced awareness in this regard.

Likewise previous studies [17, 18, 20, 21], we found a direct association between educational level and awareness of cancer risk factors. In fact, people in higher educational classes have more access to health protective facilities and understand information dissemination by cancer prevention campaigns [18]. Nonetheless, higher level of education relates to a greater access to various sources of information [22, 23]. In addition, not only a previous study showed that the majority of cancers occurred among people with lower levels of cancer awareness [14], but also another studies pointed out that the disparities in spreading the information among the different socioeconomic groups might explain the gaps in awareness existed among different classes of people [18, 24]. Thus, the homogenous information dissemination throughout the society is highly recommended [25].

A study of ethnic minorities conducted in the UK found that smoking is a well-known risk factor for cancer which was in line with our finding where smoking a cigarette was known by the majority (73.5%) of respondents [26]. However, our finding of the awareness of alcohol consumption as a risk factor for cancer was lower comparing to findings of the UK, US, and Omani populations [21, 26, 27], but higher comparing to a study by Redeker et al. [8] conducted in the UK in which they showed a low awareness of alcohol consumption in their study participants. In Malaysia, however, since Islam (i.e. forbids alcohol intake as a religious faith) is the dominant religion, one possible reasoning behind the relatively high awareness of alcohol consumption might be the religious beliefs. Therefore, if policies address such risk factors incorporating the residents’ beliefs, the awareness would increase both dramatically and efficiently.

Similar to the findings of the awareness of cancer risk factors, the awareness of cancer warning signs was lower among older people. While our findings contradicted with a previous study that found elder people had higher awareness of cancer symptoms [28], it was in line with another study which found a decreasing awareness of cancer warning signs by ageing [29]. This finding of senior citizens of Malaysia is worrying us as more cancer incidents occur among older people. The ethnicity background of our study participants also played a significant role in recognition of the cancer symptoms where awareness among Indian was higher comparing to Malay ethnic group. This was in line with previous findings in which they emphasized on the ethnic disparities in the awareness of cancer warning signs and suggested ethnicity-based health promotion policies to narrow the gap of awareness among different ethnic groups [30, 31]. Our finding of the low awareness of cancer warning signs were in line with a previous study conducted among Malaysian undergraduate student [32] illustrating that 94.4% of Malaysian undergraduate university students had low awareness (unprompted questions: recall) and 64.9% had low knowledge (prompted questions: recognition) of cancer symptoms [32].

Overall, the awareness of cancer risk factors was high among urban residents in Malaysia. However, diet, exercise, and viral infection risk factors did not possess a high awareness among respondents. The participants cited diet related (i.e. eating red/processed meat [38.3%] and less fruit and vegetables daily [25.4%]) and being overweight/obese (44.8%) risk factors more than a study in ethnic minorities in the UK [19] where just 23.2% of their respondents endorsed diet related and overweight (2.3%) as risk factors for cancer. In addition, the low awareness of diet related and obesity risk factors were also found among Omani population [21] as well as UK population [8, 17]. However, we found lower awareness rates compared to other studies from the whole populations of UK [18] and US [27]. Low public awareness of a healthy lifestyle could be a key cause for the increasing incidents of cancer in any population [33]. Therefore, developing a healthier lifestyle could indeed decrease cancer as well as other chronic illnesses [21, 34].

The exercise related risk factor was cited by about one in four respondents (26.9%) whereas in UK ethnic minorities [19], US [27], and UK population representative samples [18], the awareness of this risk factor accounted for 5, 25, and 53 percent of participants. This finding clarifies that about three out of four respondents (73.1%) were not aware of physical inactivity as a contributor to cancer. Therefore, lifestyle modifications must be incorporated in policies to promote more physical activity to raise the awareness of Malaysians about it as a risk factor for cancer and subsequently prevent the future incidents of cancer in the country [35].

The awareness of viral infection (e.g. HPV) as a risk factor for cancer (i.e. mainly cervical cancer) was low among our respondents which was in line with findings from Oman [21], UK [8, 36], and USA [26]. Therefore, an urgent policy to increase the awareness of the significant role of viral infections in cancer has been suggested [36].

A study conducted in a Japanese representative population [37] reported the viral infections (51%) and tobacco smoking (43%) to be the highest cancer risk factors endorsed by participants while in our study the highest endorsed risk factors were smoking at least one cigarette per day (73.5%) and exposure to another person’s cigarette smoke (71.1%). They also found awareness of alcohol drinking and red/processed meat consumption to be 22 and 21 percent respectively while our participants recognized the same risk factors 50.4 and 38.3 percent respectively.

One of the best known risk factors of cancer among our respondents was history of cancer which was in line with findings from western societies [14], but it contradicted with findings from an Omani population which had a very low awareness about the potential significance of this risk factor in developing cancers [21]. However, the only history of cancer that influenced the overall awareness of risk factors was the history of cancer in friends that significantly associated with the awareness of cancer risk factors. However, a previous study conducted in UK found a weak associate with family history of cancer and awareness of cancer risk factors [18]. The family history of cancer increases the risk to certain types of cancer [38]. For instance, the presence of breast cancer among first degree relatives increase the risk of cancer by 5.7 times [39]. Therefore, adults who have relatives with any type of cancer are advised to adopt a healthy lifestyle to decrease the incident of cancer [21, 40].

Limitations of this study included the fact that this study is not representative of the whole population of Malaysia as it focused on Malaysian urban residents. Further studies are needed to address the awareness of total Malaysian population. Since this study followed a cross-sectional design, it does not provide a comprehensive picture of what causes the awareness in the longer terms. Therefore, a longitudinal study is highly suggested to view this issue as a panel of long-run information. Strengths of this research included the measurement of people’s awareness about the campaigns being conducted by the Ministry of Health Malaysia about various cancers. This study is the first study in Malaysia assessing the level of awareness of urban population of Malaysia. In addition, it may act as a baseline for future studies evaluating the success of campaigns targeting the cancer awareness enhancements among Malaysians.

# CONCLUSION

Awareness of risk factors for cancer was high for some behavioral risk factors but very low for the rest. By increasing the awareness of cancer warning signs, the early diagnosis of cancer in initial stages would be assured. In addition, enhancing the awareness of risk factors and subsequently adopting a healthy lifestyle would effectively reduce the incidents of cancer in the country.

# REFERENCES

1. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F: **Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012**. *International journal of cancer Journal international du cancer* 2015, **136**(5):E359-386.

2. **Cancer fact sheet** [<http://www.who.int/mediacentre/factsheets/fs297/en/>]

3. Bernard WS, Christopher PW: **World Cancer Report 2014. International Agency for Research on Cancer**. In: *World Health Organization, Lyon, France.* 2014.

4. **GLOBOCAN 2012: Estimated cancer incidence, mortality and prevalence worldwide in 2012** [<http://globocan.iarc.fr/Pages/fact_sheets_population.aspx>]

5. Soerjomataram I, de Vries E, Pukkala E, Coebergh JW: **Excess of cancers in Europe: a study of eleven major cancers amenable to lifestyle change**. *International journal of cancer Journal international du cancer* 2007, **120**(6):1336-1343.

6. **Cancer** [<http://www.who.int/mediacentre/factsheets/fs297/en/>]

7. World Health Organization: **Global battle against cancer won’t be won with treatment alone Effective prevention measures urgently needed to prevent cancer crisis**. *International Agency for Research on Cancer* 2014.

8. Redeker C, Wardle J, Wilder D, Hiom S, Miles A: **The launch of Cancer Research UK's 'Reduce the Risk' campaign: baseline measurements of public awareness of cancer risk factors in 2004**. *European journal of cancer* 2009, **45**(5):827-836.

9. Boyle P, Autier P, Bartelink H, Baselga J, Boffetta P, Burn J, Burns HJ, Christensen L, Denis L, Dicato M *et al*: **European Code Against Cancer and scientific justification: third version (2003)**. *Annals of oncology : official journal of the European Society for Medical Oncology / ESMO* 2003, **14**(7):973-1005.

10. Sullivan KM, Dean A, Soe MM: **OpenEpi: a web-based epidemiologic and statistical calculator for public health**. *Public health reports (Washington, DC : 1974)* 2009, **124**(3):471-474.

11. Cancer Research UK: **Cancer awareness measure (CAM) toolkit (version 2)**. In*.*: Cancer Research UK, University College London, Kings College and University of Oxford; 2008.

12. **Codes & Classifications** [<http://www.statistics.gov.my/portal/index.php?option=com_content&view=article&id=1492&Itemid=99&lang=en>]

13. The HLS-EU Consortium: **Final report Executive summary (D17)**. In: *The European Health Literacy Project (HLS-EU).* <http://www.maastrichtuniversity.nl/web/file?uuid=b994bc0b-bf89-477c-af47-125cfbea4666&owner=5113a977-24b4-40c8-96e3-4b38cf5e99f5;> 2012.

14. Breslow RA, Sorkin JD, Frey CM, Kessler LG: **Americans' knowledge of cancer risk and survival**. *Preventive medicine* 1997, **26**(2):170-177.

15. Forbes L, Simon A, Warburton F, Boniface D, Brain K, Dessaix A, Donnelly C, Haynes K, Hvidberg L, Lagerlund M: **Differences in cancer awareness and beliefs between Australia, Canada, Denmark, Norway, Sweden and the UK (the International Cancer Benchmarking Partnership): do they contribute to differences in cancer survival&quest**. *Brit J Cancer* 2013, **108**(2):292-300.

16. Brunswick N, Wardle J, Jarvis MJ: **Public awareness of warning signs for cancer in Britain**. *Cancer causes & control : CCC* 2001, **12**(1):33-37.

17. Wardle J, Waller J, Brunswick N, Jarvis MJ: **Awareness of risk factors for cancer among British adults**. *Public Health* 2001, **115**(3):173-174.

18. Sanderson SC, Waller J, Jarvis MJ, Humphries SE, Wardle J: **Awareness of lifestyle risk factors for cancer and heart disease among adults in the UK**. *Patient Educ Couns* 2009, **74**(2):221-227.

19. Marlow LA, Robb KA, Simon AE, Waller J, Wardle J: **Awareness of cancer risk factors among ethnic minority groups in England**. *Public Health* 2012, **126**(8):702-709.

20. El Rhazi K, Bennani B, El Fakir S, Boly A, Bekkali R, Zidouh A, Nejjari C: **Public awareness of cancer risk factors in the Moroccan population: a population-based cross-sectional study**. *BMC Cancer* 2014, **14**:695.

21. Al-Azri M, Al-Rasbi K, Al-Hinai M, Davidson R, Al-Maniri A: **Awareness of risk factors for cancer among Omani adults--a community based study**. *Asian Pacific journal of cancer prevention : APJCP* 2014, **15**(13):5401-5406.

22. Norlaili AA, Fatihah MA, Daliana NF, Maznah D: **Breast cancer awareness of rural women in Malaysia: is it the same as in the cities?** *Asian Pacific journal of cancer prevention : APJCP* 2013, **14**(12):7161-7164.

23. Su TT, Goh JY, Tan J, Muhaimah AR, Pigeneswaren Y, Khairun NS, Normazidah AW, Tharisini DK, Majid HA: **Level of colorectal cancer awareness: a cross sectional exploratory study among multi-ethnic rural population in Malaysia**. *BMC Cancer* 2013, **13**:376.

24. Viswanath K, Breen N, Meissner H, Moser RP, Hesse B, Steele WR, Rakowski W: **Cancer knowledge and disparities in the information age**. *Journal of health communication* 2006, **11 Suppl 1**(S1):1-17.

25. Gordon EJ, Wolf MS: **Beyond the basics: designing a comprehensive response to low health literacy**. *The American journal of bioethics : AJOB* 2007, **7**(11):11-13; discussion W11-12.

26. Marlow LA, Wardle J, Forster AS, Waller J: **Ethnic differences in human papillomavirus awareness and vaccine acceptability**. *J Epidemiol Community Health* 2009, **63**(12):1010-1015.

27. Hawkins NA, Berkowitz Z, Peipins LA: **What does the public know about preventing cancer? Results from the Health Information National Trends Survey (HINTS)**. *Health education & behavior : the official publication of the Society for Public Health Education* 2010, **37**(4):490-503.

28. Robb K, Stubbings S, Ramirez A, Macleod U, Austoker J, Waller J, Hiom S, Wardle J: **Public awareness of cancer in Britain: a population-based survey of adults**. *Br J Cancer* 2009, **101 Suppl 2**:S18-23.

29. Waller J, McCaffery K, Wardle J: **Measuring cancer knowledge: comparing prompted and unprompted recall**. *British journal of psychology* 2004, **95**(Pt 2):219-234.

30. Waller J, Robb K, Stubbings S, Ramirez A, Macleod U, Austoker J, Hiom S, Wardle J: **Awareness of cancer symptoms and anticipated help seeking among ethnic minority groups in England**. *Br J Cancer* 2009, **101 Suppl 2**:S24-30.

31. Robb K, Wardle J, Stubbings S, Ramirez A, Austoker J, Macleod U, Hiom S, Waller J: **Ethnic disparities in knowledge of cancer screening programmes in the UK**. *Journal of medical screening* 2010, **17**(3):125-131.

32. Loo JL, Woo WY, Chin MW, Yam HR, Ang YK, Yim HS: **Cancer Awareness of a Sample of Malaysian Undergraduate Students**. *American Journal of Cancer Prevention* 2013, **1**(1):9-13.

33. Danaei G, Vander Hoorn S, Lopez AD, Murray CJ, Ezzati M, Comparative Risk Assessment collaborating g: **Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors**. *Lancet* 2005, **366**(9499):1784-1793.

34. Liu XO, Huang YB, Gao Y, Chen C, Yan Y, Dai HJ, Song FJ, Wang YG, Wang PS, Chen KX: **Association between Dietary Factors and Breast Cancer Risk among Chinese Females: Systematic Review and Meta-analysis**. *Asian Pac J Cancer P* 2014, **15**(3):1291-1298.

35. Giovannucci E: **Diet, body weight, and colorectal cancer: a summary of the epidemiologic evidence**. *Journal of women's health* 2003, **12**(2):173-182.

36. Marlow LA, Waller J, Wardle J: **Public awareness that HPV is a risk factor for cervical cancer**. *Br J Cancer* 2007, **97**(5):691-694.

37. Inoue M, Iwasaki M, Otani T, Sasazuki S, Tsugane S: **Public awareness of risk factors for cancer among the Japanese general population: a population-based survey**. *BMC Public Health* 2006, **6**:2.

38. Murff HJ, Spigel DR, Syngal S: **Does this patient have a family history of cancer?: An evidence-based analysis of the accuracy of family cancer history**. *JAMA : the journal of the American Medical Association* 2004, **292**(12):1480-1489.

39. Gokdemir-Yazar O, Yaprak S, Colak M, Yildirim E, Guldal D: **Family History Attributes and Risk Factors for Breast Cancer in Turkey**. *Asian Pac J Cancer P* 2014, **15**(6):2841-2846.

40. Lotrean LM, Ailoaiei R, Torres GM: **Health Risk Behavior of Romanian Adults having Relatives with Cancer**. *Asian Pac J Cancer P* 2013, **14**(11):6465-6468.