Factors Influencing the Level of Knowledge in Identifying Warning Signs of Cancer

I Ismail¹, N F Abd Razak², J Jamalul³, N A I Abdullah⁴ and N S H Ramle⁵
¹,²,³,⁴,⁵Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA
Kelantan, Bukit Ilmu, Machang, Kelantan, Malaysia

Email: idarismail@gmail.com

Abstract. Cancer can be defined as an uncontrolled and unregulated growth of cell in human body and it can be diagnosed in all level of age, races and also both genders. High level of awareness and adequate knowledge of warning signs of cancer might have great impact in surviving the disease. A cross-sectional study was done to determine the level of knowledge in identifying warning signs of cancer among students in Universiti Teknologi MARA (UiTM) Kota Bharu Campus and to examine the factors that contribute significantly to the level of knowledge. There are 9 independent variables involved in this study; gender, CGPA, father’s education level, mother’s education level, family’s monthly income, health insurance status, family history of having cancer, BM, and age. The dependent variable in this study is level of knowledge in identifying warning signs of cancer where it is categorized into 0 and 1; 0 denoting low knowledge and 1 denoting high knowledge. The finding shows that most of the respondents have low level of knowledge (84.9%). Multiple logistic regression analysis was performed to identify the determinants of level of knowledge in identifying warning signs of cancer. Overall, there were two significant variables (family monthly income and family history of having cancer) found in logistic regression analysis. There are several recommendations highlighted in this study such as the strategies to communicate the warning signs of cancer to the public.

1. Introduction
According to Cancer Research UK and American Cancer Society, cancer begins when abnormal cells start to grow in an uncontrolled way. As stated by World Health Organization (WHO) [1], 9.6 million of the death in the world is caused by cancer. WHO also stated that the global cancer burden is estimated to rise to 18.1 million new cases in 2018. In Malaysia, the number of patient diagnosed with cancer rise in 2012 by 5400 cases as compared to 2008 and it is expected to continue rising to 56,932 in 2025[2].

A sign is the indication that can be seen by another person while symptoms is an indication that can be felt or saw by the individual who has it, but may not be observed by any other individual. One of the early warning signs of cancer is the incidence of unusual bleeding and discharge. Having lack of knowledge might cause us to ignore and thus will develop more serious symptoms later if not treated. Therefore, being equipped with an adequate knowledge of warning sign of cancers is extremely required for early detection of the disease. Thus, this study attempts to determine the level of knowledge in
identifying warning signs of cancer among students in UiTM Kota Bharu Campus and to identify factors that significantly related to the level of knowledge.

2. Literature Review
A number of previous studies has been done to examine the level of cancer knowledge among the public where most of the studies have highlighted low level of knowledge in their findings. Feizi et al.[3] carried out a study with 2500 respondents aged 18 and over in Tehran, Iran to examine the awareness level about warning sign of cancer and its determinant. The findings showed that the level of knowledge of warning signs of cancer is low among the Iranian population. The findings also indicated that female respondents were more likely to correctly identify the cancer warning signs.

Likewise, Keeney et al.[4] conducted a study in an attempt to explore and assess the knowledge about the warning signs of cancer among the public in mid-life age. The study found that the public knowledge about the cancer warning signs was low. The finding of this study is also consistent with Feizi et al.[3] where they found that male respondents were less likely to identify the cancer warning signs correctly. Keeney et al.[4] also found out that respondent with high level of education, high income, high socio-economic status and older were more likely to have high knowledge towards the warning signs of cancer.

Similarly, Al-Azri[5] found that 345 out of 450 respondents of community adults in the age ranged between 19 and 84 years old in Oman had poor public awareness of the warning signs of cancer with 40.6% average of awareness. It was also reported that 50.7% of respondents correctly answered that unexplained lump or swelling as a warning sign of cancer.

In Malaysia, Loo et al.[6] carried out a study to investigate cancer awareness among 965 undergraduate students in public and private institutions located in Klang Valley. The findings suggested that female respondents, students in private universities, and science students were more likely to have higher awareness on cancer. However, generally majority of the students had low awareness level on early cancer symptoms. Majority students are unaware of cancer symptoms such as persistent cough and difficulty swallowing, sore that does not heal, and change in appearance of mole.

In a study that was carried out by Qassim et al.[7] among the non-medically under-graduates students to assess cancer awareness and to evaluate the factors associated with this awareness found 92% of the students have awareness of cancer warnings signs and its determinants. These findings are in contradict with previous results reported above. Majority of the students were correctly answered the question that related with thickening or lump in the breast and other organs (90%) and unexplained weight loss (78%) as a warning sign of cancer.

In summary, there were few works that had been done to determine the level of knowledge about cancer. This study is anticipated to fill the gap by focusing to young adults aged between 20 to 28 years old in which most of previous studies were done across different age groups.

3. Method

3.1. Study Design and Sample
A cross sectional study was performed among 205 students from UiTM Cawangan Kelantan, Kampus Kota Bharu. The sample size was determined using Raosoft software and the sample of 205 students was then selected by using simple random sampling.

3.2. Questionnaire
All information was collected by self-report questionnaire. The questionnaire was provided in two language; English and Malay considering the level of understanding of the respondents. In the questionnaire, 17 warning and distracter signs of cancer were listed and respondents were asked to identify the correct seven warning signs of cancer. The 17 warning and distracter signs of cancer were presented in Table 1. The knowledge is identified as ‘high’ if more than five of the warnings signs are identified correctly and ‘low’ if less than five signs identified correctly. This questionnaire on warning signs of cancer is adopted from previous study by Keeney et al.[4].

### Table 1. Warning and Distracter Signs of Cancer

| Warning Signs                      | Distracter Signs                      |
|-----------------------------------|---------------------------------------|
| Unusual bleeding or discharge     | Tiredness                             |
| Indigestion or difficulty swallowing | Poor appetite                       |
| A change in bowel or bladder habits | Bleeding gums                        |
| A change in a wart or mole        | Numbness in parts of your body        |
| Nagging cough or hoarseness       | Nausea or upset stomach               |
| Thickening or lump on body        | Feeling weak in parts of your body    |
| A sore that does not heal         | Headaches                             |
| Unexplained weight loss           | Sore muscles                          |
|                                   | Pain in your heart or chest           |

3.3. Description of Variables

The description of 10 variables that were used in this study is presented in table below. There were nine independent variables involved in this study. The variables included gender, age (years), body mass index(BMI), cumulative grade point average (CGPA), mother’s educational level, father’s educational level, family’s monthly income, health insurance status and family history of having cancer. The dependent variable is the level of knowledge of warning signs of cancer which is categorized as “low” and “high”.

### Table 2. Description of Each Variable

| Variable              | Description                  |
|-----------------------|-----------------------------|
| Gender                | 1: Male  
2: Female             |
| Age                   | years                       |
| Body Mass Index       | kg/m²                       |
| CGPA                  | 1: below 2.50  
2: 2.50-2.99  
3: 3.00-3.49  
4: 3.50-4.00 |
| Father’s Education    | 1: SPM  
2: Diploma              |
3.4. Statistical Analysis

3.4.1. Logistic Regression Analysis

Logistic regression is a method for identifying the relationships between a set of independent variables with a binary categorical outcome. The two categorical outcomes can represent anything, but generally it will be labeled ‘success’ and ‘failure’. Conventionally, 1 is coded to represent success and 0 is coded to represent failure. In this study, logistic regression was used to identify factors that influence the level of knowledge. The logit model is written as follows:

\[
\log \left( \frac{p_i}{1-p_i} \right) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_k X_{ik}
\]

where

- \( p_i = P(Y_i = 1) \)
- \( \beta_0 \) = the constant of the equation
- \( \beta_k \) = the coefficient for predictor variables
- \( X_{ik} \) = the predictor variables

\( Y \) is the dependent variable (level of knowledge in identifying warning signs of cancer) which is categorized as low knowledge and high knowledge.

Thus, by solving the logit equation above Eq.(1), the logistic model is produced as expressed below:

\[
P(Y_i = 1) = \frac{1}{1+e^{-z}}
\]
In this study, \( P(Y = 1) \) is defined as the probability of having high knowledge.

where

\[
z = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_k X_{ik}
\]

\( \beta_0 \) = the constant of the equation
\( \beta_k \) = the coefficient for predictor variables
\( X_{ik} \) = the predictor variables

\( \beta_0 \) is a constant and \( \beta_1, \beta_2, \ldots, \beta_k \) are the regression coefficients of the independent variables \( X_1, X_2, \ldots, X_k \) where the regression coefficient explains the size of contribution.

3.4.2. Odds Ratio

Odds is used to represent the chances of an event occurring. Odds can be determined by the formula below:

\[
Odds, \pi = \frac{p}{1 - p}
\]

\( p \) = Probability of the event
\( 1 - p \) = Probability of no event

Odds-ratio, OR is the ratio of two odds. It measures the probability of event \( (Y = 1) \) that occur between two different groups. Odds-ratio can be calculated by using the formula below:

\[
OR = \frac{\pi_A}{\pi_B}
\]

\[
OR = \frac{p}{1 - p} \div \frac{q}{1 - q}
\]

\[
OR = \frac{p(1 - q)}{q(1 - p)}
\]

where

\( \pi_A \) = Odds of Group A
\( \pi_B \) = Odds of Group B
\( p \) = Probability of event of group A
\( q \) = Probability of event of group B

In addition, odds-ratio can also be determined by the formula below:

\[
OR = e^\beta
\]
where

\( \beta = \) the value of parameter

\( e^\beta \) indicates the change in odds when the value of a predictor increases by one unit. The interpretation of odds-ratio is summarized in table below:

| Odds Ratio | Interpretation |
|------------|----------------|
| OR =1      | There is no significant difference in likelihood of event \( Y = 1 \) between category A and category R(reference). |
| OR > 1     | Event \( Y = 1 \) is more likely to happen for category A than category R(reference) |
| OR < 1     | Event \( Y = 1 \) is less likely to happen for category A than category R(reference) |

4. Results and Discussion

4.1.1 Descriptive Analysis

Data analysis was done using SPSS. The factors are identified as statistically significant if the p-value is less than 0.05. Table 4 presents the frequency analysis for categorical variables in this study.

| Variable                  | Description | n(%)  |
|---------------------------|-------------|-------|
| Gender                    | Male        | 39(19.0) |
|                           | Female      | 166(81.0) |
| CGPA                      | Below 2.50  | 3(1.5)  |
|                           | 2.50 - 2.99 | 27(13.2)|
|                           | 3.00 - 3.49 | 92(44.9)|
|                           | 3.50 - 4.00 | 83(40.5)|
| Father’s Education        | SPM         | 126(61.5) |
|                           | Diploma     | 22(10.7)  |
|                           | Degree      | 28(13.7)  |
|                           | Master      | 5(2.4)    |
|                           | PhD         | 4(2.0)    |
|                           | Other       | 20(9.8)   |
| Mother’s Education        | SPM         | 132(64.4) |
|                           | Diploma     | 22(10.7)  |
|                           | Degree      | 24(11.7)  |
|                           | Master      | 4(2.0)    |
|                           | PhD         | 1(0.5)    |
|                           | Other       | 22(10.7)  |
| Family Monthly Income     | RM2000 and below | 101(49.3) |
|                           | RM2001 to RM4000 | 64(31.2)  |
A total of 39 male and 166 female respondents involved in this study. Of the 205 respondents, 84.9% of respondents had low level of knowledge in identifying warning signs of cancer (174;84.9%). Most of the respondents’ family earned RM2000 and below a month. 157 of the respondents had no health insurance (157;76.6%) and 160 had no family member being diagnosed with cancer (160;78.0%).

Table 5 presents the value of mean, standard deviation, minimum, maximum and median for continuous variables in this study (age and BMI).

### Table 5. Descriptive Statistics

| Variable | Minimum | Maximum | Mean± Std. Deviation |
|----------|---------|---------|---------------------|
| Age      | 20      | 28      | 22.450±0.962        |
| BMI      | 15.060  | 36.330  | 22.325±4.333        |

The mean age of respondents was 22.45 years. On average, BMI of the respondents was 22.32. According to Asia-Pacific guidelines of BMI, the average BMI of the respondents in this study is classified as normal. The maximum value of BMI indicates that the student is identified as obese. Referring to the BMI guidelines in Table 5, people with BMI of 25 and above is categorized as obese while people with BMI 23-24.9 is considered as overweight.

### Table 6: Asia-Pacific Body Mass Index Classifications(Source : Lim et al. [6])

| Classification | BMI     |
|----------------|---------|
| Underweight    | <18.5   |
| Normal         | 18.5-22.9|
| Overweight     | 23-24.9 |
| Obese          | ≥25     |

4.1.2 Logistic Regression Analysis
The dependent variable in this study is the level of knowledge in identifying warning sign of cancer (low, high). Since the dependent variable is binary categorical variable, logistic regression analysis was carried out. For the purpose of building logistic regression model, there are a few variables were re-coded into new category. This is done due to small number of cases for the certain category. Hence, these variables were categorized as follows; CGPA ($\leq 2.99, \geq 3.00$); father’s education level (school level, university level); mother’s education level (school level, university level).

Table 7 summarizes the results of multiple logistic regression result.

**Table 7. Logistic Regression Results**

| Variable                        | Coefficient $(\beta)$ |
|---------------------------------|-----------------------|
| **Gender**                      |                       |
| Male                            | 0.950                 |
| Female                          | ref $^a$              |
| **Age**                         | -0.312                |
| **Family Income**               |                       |
| RM2000 and below                | -3.662**              |
| RM2001 to RM4000                | -2.151*               |
| RM4001 to RM6000                | 1.243                 |
| RM6000 and above                | ref $^a$              |
| **Health Insurance Status**     |                       |
| yes                             | 0.021                 |
| no                              | ref $^a$              |
| **Family History of Cancer**    |                       |
| yes                             | 2.541**               |
| no                              | ref $^a$              |
| **BMI**                         | -0.062                |
| **CGPA**                        |                       |
| $\leq 2.99$                     | 0.625                 |
| $\geq 3.00$                     | ref $^a$              |
| **Father’s Education Level**    |                       |
| school level                    | 1.949*                |
| university level                | ref $^a$              |
| **Mother’s Education Level**    |                       |
| school level                    | -0.176                |
| university level                | ref $^a$              |

$^a$ reference group (selected group to be compared when interpreting the result)

* $p<0.05$

** $p<0.01$

In multiple logistic regression analysis, three significant variables (family income, father’s education level, family history of cancer) were found to be significantly associated with level of knowledge in identifying warning sign of cancer. These significant variables were then analyzed to obtain a final predictive model. Table 8 present the summary of multiple logistic regression result including the odds ratio for the final model.
**Table 8. Logistic Regression Result (final model)**

| Variable                        | Coefficient ($\beta$) | Odds Ratio ($e^\beta$) |
|---------------------------------|-----------------------|------------------------|
| **Family Income**               |                       |                        |
| RM2000 and below                | -3.525**              | 0.029                  |
| RM2001 to RM4000                | -2.014*               | 0.133                  |
| RM4001 to RM6000                | 1.067                 | 2.906                  |
| RM6000 and above                | ref$^a$               |                        |
| **Family History of Cancer**    |                       |                        |
| yes                             | 2.318**               | 10.155                 |
| no                              | ref$^a$               |                        |
| **Father’s Education Level**    |                       |                        |
| school level                    | 1.704                 | 5.494                  |
| university level                | ref$^a$               |                        |

* reference group (selected group to be compared when interpreting the result)

Out of three predictors analyzed, the results found that there were two significant variables for the final model. For those whose family monthly income are RM6000 and above, they are $34.48(1/e^{-3.525})$ times more likely to have high level of knowledge in identifying warning signs of cancer compared to those whose family monthly income are RM2000 and below. Compared to those whose family income are RM2001 to RM4000, respondents whose family monthly income are RM6000 and above are $7.52(1/e^{2.014})$ times more likely to have high level of knowledge in identifying warning signs of cancer. Those with family history of cancer are 10 times more likely to have high knowledge in identifying warning signs of cancer compared to those who does not have family history of cancer.

**Table 9. Summary of Estimated Final Model**

| Analysis                          | Value       | Interpretation                                           |
|-----------------------------------|-------------|----------------------------------------------------------|
| **Model Estimation Fit**          |             |                                                          |
| • Chi-square                      | 51.382      | The model is significant                                  |
| • P-value                         | 0.000       |                                                          |
| **Hosmer and Lemeshow Test**      |             |                                                          |
| • Chi-square                      | 3.098       | The Hosmer and Lemeshow goodness of fit test is not      |
| • P-value                         | 0.685       | significant indicating that the logistic regression     |
|                                   |             | model fits the data well.                                |
| **Evaluation of model performance** |           |                                                          |
| • Overall Percentage              | 88.3%       | The percentage of correct classification is 88.3% which   |
| • Sensitivity                     | 48.4%       | can be considered as good as the value is greater than   |
| • Specificity                     | 95.4%       | 70%. Thus, the value for error rate of the model is 11.7%|
|                                   |             |                                                          |
Thus, the final logistic model is shown as below:

\[ P(\hat{Y}_i = 1) = \frac{1}{1 + e^{-z}} \]

where

\[ z = -1.817 - 3.525(\text{Family Monthly Income}(1)) - 2.014(\text{Family Monthly Income}(2)) + 1.067(\text{Family Monthly Income}(3)) + 2.318(\text{Family History of Cancer}) \]

In this study, \( P(\hat{Y}_i = 1) \) is defined as the probability of having high knowledge.

5. Discussion

The findings in this study may not be generalized to other population with different age groups since this study only involved younger age group (20 to 28 years). However, despite this limitation, this study is believed to provide insight into the level of knowledge about warning signs of cancer among the young adults. In an agreement with the previous studies by Feizi et al.[2] and Keeney et.al[3], this study found that there is low level of knowledge in identifying warning signs of cancer among the respondents. Similarly, Niksic et al.[6] found that the recognition of nine common cancer symptoms was low among respondents in rural and urban areas in England. Also, this study found that the level of knowledge in identifying warning signs of cancer is lower in family monthly income (>RM2000 and below , RM2000-RM4000) compared to family monthly income (>RM6000). This finding supports the finding from previous study by Keeney et al.[3] where they found that the level of knowledge is lower in low income group compared to moderate and high income group. Thus, there is an evidence that income level has an effect on level of knowledge in identifying warning signs of cancer. In contrast to Feizi et al.[2], this study found that those with family history of cancer are more likely to have high level of knowledge to identify warning signs of cancer. This finding is anticipated from those with family history of cancer as they may be more motivated to recognize the warning signs of cancer.

6. Conclusion

This study found that more than half of respondents have low level of knowledge in identifying warning signs of cancer. This result indicates worrying level of cancer knowledge about the warning signs of cancer among the young adults. Thus, the situation need to be urgently addressed in order to increase the awareness among the public regarding warning signs of cancer. It is suggested that more health campaigns are needed to aggressively educate the public about cancer. In conclusion, the findings of this study are believed to be important in developing some strategies to enhance the level of cancer knowledge among the public.
References

[1] Latest global cancer data: Cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018 (2018, September 12).
[2] Rise in Cancer Deaths in Malaysia. (2014, February 18). The Star Online.
[3] Feizi, A., Kazemnejad, A., Hosseini, M., Parsa-Yekta, Z. and Jamali, J 2011 Assessing awareness level about warning signs of cancer and its determinants in an Iranian general population, Journal of Health, Population and Nutrition, 29(6), 656-659.
[4] Keeney, S., McKenna, H., Fleming, P., and McIlfatrick, S. 2011 An exploration of public knowledge of warning signs for cancer, European Journal of Oncology Nursing, 15(1), 31-37.
[5] Loo, J. L., Woo, W. Y., Chin, M. W., Yam, H. R., Ang, Y. K., and Yim, H. S. 2013 Cancer awareness of a sample of Malaysian undergraduate students, American Journal of Cancer Prevention, 1(1), 9-13.
[6] Lim, J. U., Lee, J. H., Kim, J. S., Hwang, Y. I., Kim, T., Lim, S. Y., Yoo, K. H., Jung, K. S., Kim, Y. K. and Rhee, C. K. 2017 Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients, International Journal of Chronic Obstructive Pulmonary Disease, 12, 2465–2475.
[7] Al-Azri, M., Al-Hamedi, I., Al-Awisi, H., Al-Hinai, M. and Davidson, R. 2015 Public awareness of warning signs and symptoms of cancer in Oman: A community-based survey of adults, Asian Pacific Journal of Cancer Prevention, 16(7), 2731-2737.
[8] Niksic, M., Rachet, B., Warburton, F. G., Wardle, J., Ramirez, A. J., and Forbes, A. J. 2015 Cancer symptom awareness and barriers to symptomatic presentation in England—are we clear on cancer?, British journal of cancer, 113(3).
[9] Qassim, S., Al-Hariri, Y., Shanableh, S., Farajallah, A. and Boura, F. 2018 Awareness level of cancer warning signs and its determinants among university students in UAE. Journal of Pharmaceutical Sciences and Research, 10(3), 514-517