RESEARCH ARTICLE

Development and Validation of a Cancer Awareness Questionnaire for Malaysian Undergraduate Students of Chinese Ethnicity

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Abstract

Objectives: To describe the development and validation of a cancer awareness questionnaire (CAQ) based on a literature review of previous studies, focusing on cancer awareness and prevention. Materials and Methods: A total of 388 Chinese undergraduate students in a private university in Kuala Lumpur, Malaysia, were recruited to evaluate the developed self-administered questionnaire. The CAQ consisted of four sections: awareness of cancer warning signs and screening tests; knowledge of cancer risk factors; barriers in seeking medical advice; and attitudes towards cancer and cancer prevention. The questionnaire was evaluated for construct validity using principal component analysis and internal consistency using Cronbach's alpha (α) coefficient. Test-retest reliability was assessed with a 10-14 days interval and measured using Pearson product-moment correlation. Results: The initial 77-item CAQ was reduced to 63 items, with satisfactory construct validity, and a high total internal consistency (Cronbach's α=0.77). A total of 143 students completed the questionnaire for the test-retest reliability obtaining a correlation of 0.72 (p<0.001) overall. Conclusions: The CAQ could provide a reliable and valid measure that can be used to assess cancer awareness among local Chinese undergraduate students. However, further studies among students from different backgrounds (e.g. ethnicity) are required in order to facilitate the use of the cancer awareness questionnaire among all university students.

Keywords: Cancer awareness - questionnaire development - questionnaire validation - undergraduate students

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Introduction

Globally, cancer is the second leading cause of premature death after cardiovascular disease (Pérez-Contreras et al., 2004; San et al., 2005; Uauy and Solomons, 2005). More than 11 million people worldwide are diagnosed with cancer annually, and by year 2030, it has been estimated that cancer will account for 12 million deaths each year (Keeney et al., 2011). In Malaysia, the National Cancer Registry reported that a total of 18,219 new cancer cases were diagnosed in 2007. This figure was made up of 8,123 males (44.6%) and 10,096 females (55.4%). The ten most common cancers among Malaysians are breast, colorectal, lung, nasopharynx, cervix, lymphoma, leukaemia, stomach and liver. When comparing the common cancer incidence between ethnic groups, cancers among Chinese appeared more predominantly compared to Malay and Indian. The age-standardised rate (ASR) for Chinese male was 111.9 per 100,000 and female 115.0 per 100,000 populations; Indian male was 68.2 per 100,000 and female 99.9 per 100,000; while Malay male was 66.9 per 100,000 and female 79.0 per 100,000 populations (NCR Malaysia, 2007).

Numerous risk factors are associated with cancer and 80% of deaths from cancer are due to unhealthy lifestyle practices – such as nutritional deficiencies, sedentary lifestyles, obesity, smoking, excessive alcohol consumption and sexually transmitted infections. Awareness and knowledge about a disease, its treatment and prevention constitutes an aspect of cancer prevention; particularly in the area of prevention practices that are nutrition and lifestyle-related. Having the knowledge itself is insufficient to motivate change towards healthy behaviour, but knowledge is involved in the behaviour change process. For instance, knowledge pertaining to the link between certain behaviours like smoking or physical inactivity is one variable influencing the participation in healthy behaviour and prevention of unhealthy ones (Pérez-Contreras et al., 2004). In addition, other prevention behaviours including tackling modifiable risk factors and increasing participation in cancer screening programs are vital in reducing cancer incidence and mortality (Redeker et al., 2009).

Survival from many types of cancer can be significantly improved if the detection and treatment started at an early stage (Adlard and Hume, 2003; de Nooijer et al., 2002; Keeney et al., 2011), while some major types of cancer are potentially avoidable with healthy prevention practices

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(Redeker et al., 2009; San et al., 2005). Early detection is possible when people have the knowledge to identify warning signs of cancer (Keeney et al., 2011). However, in many cases, a delay may occur between the time a cancer symptom is detected and commencement of treatment. The delay is commonly brought about by practical and emotional barriers. Understanding a patient's barriers in seeking medical advice may help to tackle this issue and to encourage help seeking behaviours (Adlard and Hume, 2003).

The degree of knowledge in the general population is essential to determine the most appropriate strategy for planning an effective intervention. Measures for health promotion, disease prevention and screening can only be made with accurate knowledge about the awareness and beliefs of the population towards the disease (Medeiros and Ramada, 2011). Data on levels of awareness and knowledge among a targeted population are necessary in designing an intervention towards cancer prevention. Evaluation of data collected from the target population will be able to give an insight to define the content of the intervention program, as well as to provide indicators for evaluation of its effectiveness (Pérez-Contreras et al., 2004; Medeiros and Ramada, 2011). Hence, there is a need to develop a standardized and valid measurement tool for monitoring cancer awareness, examining its risk factors and consequences, in order to evaluate interventions programs (Linsell et al., 2010; Stubbings et al., 2009).

In Malaysia, studies on cancer awareness among Chinese undergraduate students are limited and no valid and reliable scales are being developed at this juncture. Hence, this study aimed to develop a comprehensive instrument to measure cancer awareness, which is essential in providing valid and reliable assessments, contributing to future intervention programs.

Materials and Methods

Sample and procedure

A cross-sectional study was conducted in a leading private university in Kuala Lumpur, Malaysia, with a total of seven faculties and student population of approximately 8,000. From the seven faculties, three were science faculties (e.g. Faculty of Applied Sciences), while four were non-science faculties (e.g. Faculty of Social Sciences and Liberal Arts). Four faculties were randomly selected (by lottery), and a list of lecturers, tutors and their email addresses were obtained from the registrar office. Permission letters were emailed to all lecturers and tutors from these faculties to request for permission to conduct the study during lecture sessions. Students were recruited with informed consent using convenience sampling with the inclusion criteria: 1) aged 19-25 years; 2) Malaysian Chinese; 3) a current undergraduate student from a non-medical science faculty; 4) English literate; and 5) not being currently diagnosed or a have past history of cancer or other chronic diseases. Sample size calculation was based on the subject to item ratio of 5:1 as suggested by Costello and Osborne (2005). The ethical approval for this study was granted by the Centre of Excellence for Research, Value Innovation and Entrepreneurship (CERVIE), UCSI University Ethics Committee.

Development of the cancer awareness questionnaire (CAQ)

Literature searches were carried out using Google and journal databases (Science Direct, PubMed and Medline), using keywords such as "cancer awareness", "cancer prevention", "cancer risk factors" and "cancer KAP (knowledge, attitude and practices)". Following this, a preliminary questionnaire was developed from the literature review of previous studies. The overall questionnaire consisted of the four sections: awareness of cancer warning signs and screening tests; knowledge of cancer risk factors; barriers in seeking medical advice; and attitude towards cancer and cancer prevention. The developed self-administered questionnaire was reviewed by a team of experts to confirm content validity and pilot tested to confirm face validity. The content summary of each section is presented in Table 1.

Awareness of cancer warning signs and screening tests

A total of 13 items on awareness of warning signs of cancer were adopted from the Cancer Awareness Measure (CAM) Toolkit version 2 (Cancer Research UK, 2008) and a study by Keeney et al. (2011). These items assessed the ability of participants to recognise cancer symptoms from non-cancer symptoms. Items on cancer screening tests included a list of 15 items, which were adopted from literature by the World Cancer Research Fund/American

Table 1. Summary of Item Content and Scoring of the CAQ

Domain/Constituent	No. of Item	Item description	Scoring
- Awareness of cancer warning signs and screening tests	28	Cancer and non-cancer symptoms; and gender and general screening tests	"1 = correct answer 0 = incorrect answer"
- Knowledge of cancer risk factors	23	Modifiable (nutrition, physical activity and lifestyle) and non-modifiable risk factors	"1 = correct answer 0 = incorrect answer"
- Barriers in seeking medical advice	11	Emotional, practical and service barriers	"1 = yes, often/sometimes 0 = no/don't know"
- Attitude towards cancer and cancer prevention	15	Diet, lifestyle, attitudes towards cancer and attitude towards cancer prevention	"4 = Strong agree 3 = Agree 2 = Don't know 1 = Disagree 0 = Strongly disagree (Scoring is reversed for negative statements)"

Institute for Cancer Research (2007). Using categorical response scale (yes, no or don't know) respondents were required to indicate whether they considered the symptom as a possible cancer symptom, or are aware of each of the cancer screening tests. The maximum possible score for this scale was 28. Items with correct responses were scored 1 point, while incorrect responses were scored 0 point.

Knowledge of cancer risk factors

The knowledge of cancer risk factors scale consisted of 23 items which were adopted from literature by the World Cancer Research Fund/ American Institute for Cancer Research (2007). This section included cancer risk factors in relation to nutrition, physical activity and lifestyle practices. A total of 19 out of 23 items were positive statements while the remaining four were negative statements. Responses included were 'true', 'false' and 'don't know', whereby correctly answered items were awarded 1 point, while incorrect answers or 'don't know' responses were given 0 point.

Barriers in seeking medical advice

The barriers in seeking medical advice section included 11 items which were adopted from the CAM Toolkit version 2 (Cancer Research UK, 2008). This section measures barriers in seeking medical advice in terms of emotional, practical and service barriers. The maximum score for this section was 11. Responses with 'yes often' and 'yes sometimes' were given 1 point, while 'no' and 'don't know' responses were given 0 point (Waller et al., 2009).

Attitude towards cancer and cancer prevention

There were 15 items on attitudes towards cancer and cancer prevention section which were adopted from a study by Lopez et al. (2006). From a total of 15 items, there were 11 positive and four negative statements. Items were rated on a five-point Likert scale from strong positive feelings to strong negative feelings – 'strongly agree', 'agree', 'don't know', 'disagree' and 'strongly disagree', which were scored as 4, 3, 2, 1 and 0, respectively. The reverse score was used for negative statements. The maximum score for this scale was 60.

Statistical analysis

All the data were analysed using the PASW version 18.0 (SPSS Inc., 2012) that include the followings:

Item Difficulty and Discrimination: Item difficulty and item discrimination were measured for the awareness and knowledge items. Item difficulty was examined to ensure that items on the questionnaire were not too easy or too difficult to answer. The recommended criterion is to exclude items that are answered correctly by >80% or<20% of participants. Item discrimination explains of how well the individual item correlates (or discriminates) from the overall scores, whereby items are deleted when item-to-total correlations of <0.2 was obtained (Cohen and Swerdlik, 2005; Stubbings et al., 2009).

Construct Validity: Construct validity of the questionnaire was measured using principal component analysis (factor analysis) with varimax rotation. Exploratory factory analysis was applied to each section in order to identify the principle factors that would explain the maximum percentage of variance in the study groups. Bartlett's test of sphericity ($p<0.001$) and the Kaiser-Meyer-Olkin (KMO) measurement of sampling adequacy (>0.6) were met for a satisfactory factor analysis to proceed. The number of factors to retain was determined by considering the eigenvalues (>1), scree plot and interpretability of the factor (Pallant, 2011). Names were given for each identified factor.

Internal Consistency: Internal consistency is a measure of reliability, and it is determined using Cronbach's alpha (α) coefficient and item-to-total correlations. An acceptable Cronbach's α coefficient is 0.7 or greater; however, a cut-off value of 0.6 is acceptable for newly created scales (Aron et al., 2006).

Test-retest Reliability: Test-retest reliability was carried out to determine the extent to which the measure was repeatable (Aron et al., 2006). From the first CAQ administration, participants were given the identical questionnaire again 10 to 14 days apart, which is considered as an appropriate time frame to prevent memory as a confounding factor (Siklosi et al., 2010). The reproducibility study was measured using Pearson product-moment correlation, whereby correlation coefficients with $r \geq 0.5$ are considered strong correlation (Pallant, 2011) and indicate good reproducibility of the questionnaire.

Results

Demographic characteristics

A total of 388 Chinese undergraduate university students from a private university in Kuala Lumpur, Malaysia, participated in this study. The participants were within the age range of 19-25 years (mean age of 20.21±1.08 years) (Table 2). In terms of gender, 70.6% were females and 29.4% were males. In addition, students from science faculties made up 52.8% of the samples while the remaining 47.2% were from non-science faculties. Half of the students (50%) reported to have a monthly household income/allowance of RM2,000 (~USD 650).

Table 2. Socio-Demographic and Economic Information of Participants (n=388)

Description		n	(%)
Age	19-21 years old	348	(89.7)
	22-25 years old	40	(10.3)
Gender	Male	114	(29.4)
	Female	274	(70.6)
Faculty	Science	205	(52.8)
	Non-science	183	(47.2)
Monthly Household Income/Allowance			
	Below RM2,000 (~USD640)	194	(50.0)
	RM2,000 – 3,000 (~USD640 – 960)	61	(15.7)
	RM3,000 – 4,000 (~USD960 – 1,280)	50	(12.9)
	RM4,000 – 5,000 (~USD1,280 – 1,600)	36	(9.3)
	RM5,000 – 10,000 (~USD1,600 – 3,200)	35	(9.0)
	Above RM10,000 (~USD3,200)	12	(3.1)

*Exchange rate: RM1 ~ USD0.32

Item difficulty and discrimination

Based on the analyses conducted, majority of the items met the criteria for both item difficulty (items being answered correctly by<80% or >20% of participants), and item discrimination (item-to-total correlations of >0.20 for each item) (Table 3). However, there were some items which did not meet these criteria but were retained based on content validity. In the Awareness section, four items that did not meet the above criteria were retained; while in the Knowledge section, of the five items which did not meet the above criteria, only two items were retained. Examples of items that were retained included persistent unexplained pain as a symptom of cancer and smoking as a risk factor of cancer.

Construct validity

The CAQ was divided into four sections, which are the Awareness (of cancer warning signs and screening tests), Knowledge (of cancer risk factors), Barriers (in seeking medical advice) and Attitude (towards cancer and cancer prevention) sections as shown in Table 4.

The first section, Awareness, a four-factor solution with 22 items was identified. Factor I, II and IV had items on awareness of screening tests loaded on them, with Factor I labelled as 'Laboratory tests' (e.g. 'Alpha fetoprotein test' and 'CEA test'), Factor II as 'Physical examinations' (e.g. 'Breast self-examination' and 'Clinical breast examination') and Factor IV as 'Imaging tests' (e.g. 'Colonoscopy' and 'Sigmoidoscopy'). On the other hand, Factor III was loaded with items on awareness of cancer warning signs and was named 'Recognition of cancer symptoms' (e.g. 'Persistent unexplained pain' and 'Persistent difficulty swallowing'). The total variance explained by the four factors was 48.7%. Six items were removed from this section as they did not have satisfactory factor loadings and Cronbach's α values.

In the Knowledge section, a three-factor solution was obtained with a total of 20 items. The first factor were mostly loaded with items on diet and nutrition, hence it was named 'Diet' (e.g. 'Limiting the consumption of processed meat can reduce the risk of cancer' and 'High intakes of salt-preserved and barbequed foods are associated with cancer'). Factor II was labelled as 'Other risk factors' (e.g. 'Having a close relative with cancer increases the risk of getting cancer' and 'Infection with HPV increases the risk of getting cancer'), while Factor III was named 'Lifestyle' (e.g. 'Body and abdominal fatness does not increase the risk of developing cancer' and 'Household chores cannot be considered as healthy physical activity'). The total variance explained by the three factors was 28.9%.

Analysis on the third section, Barriers, revealed a three-factor model. Four items loaded on Factor I, termed as 'Emotional barrier' (e.g. 'Too scared' and 'Worried what the doctor might find'), Factor II, identified as 'Practical barrier' (e.g. 'Too busy to make time' and 'Too many other things to worry about') had three items, while four items yielded on Factor III, labelled as 'Service barrier' (e.g. 'Doctor would be difficult to talk to' and 'Difficult to make an appointment'). The total variance explained by this three-factor model was 48.3%.

The last section, Attitude, obtained a three-factor solution and yielded a total of 10 items. The first factor described items on Diet (e.g. 'A diet rich in vegetables helps to control cholesterol' and 'A diet rich in fats harms the health of the heart'), Factor II was on lifestyle practices (e.g. 'Drinking alcohol gives me great pleasure' and 'Smoking relaxes me') and Factor III was on cancer prevention (e.g. 'Cancer can be prevented early' and 'Maintaining a healthy weight prevents a lot of illnesses'),

Table 3. Item Analysis for Difficulty and Discrimination of Awareness and Knowledge Sections

Description	Difficulty range (% answering correctly)	Discrimination range (r value)
Awareness section		
Screening-Laboratory tests	10.3-23.7	0.24-0.56
Screening-Physical examinations	57.7-80.7	0.31-0.46
Recognition of cancer symptoms	39.2-80.9	0.20-0.26
Screening-Imaging tests	11.3-30.4	0.31-0.40
Knowledge section		
Diet	59.5-98.7	0.15-0.40
Other risk factors	33.8-70.9	0.16-0.30
Lifestyle	44.1-71.9	0.10-0.28

Table 4. Factor Analysis of the CAQ

Factors	Range of Factor Loading	Eigen-value	Total Variance Explained (%)
Awareness section (22 items)			
I: Screening-Laboratory tests	0.40-0.87	4.87	22.2
II: Screening-Physical examinations	0.52-0.79	2.81	12.8
III: Recognition of cancer symptoms	0.38-0.66	1.72	7.8
IV: Screening-Imaging tests	0.51-0.71	1.3	5.9
Knowledge section (20 items)			
I: Diet	0.22-0.67	2.83	14.1
II: Other risk factors	0.37-0.65	1.51	7.5
III: Lifestyle	0.24-0.61	1.46	7.3
Barriers section (11 items)			
I: Emotional barrier	0.59-0.75	2.7	24.5
II: Practical barrier	0.55-0.78	1.53	13.9
III: Service barrier	0.36-0.78	1.09	9.9
Attitude section (10 items)			
I: Diet	0.48-0.73	2.32	23.2
II: Lifestyle practices	0.44-0.79	1.33	13.4
III: Cancer prevention	0.55-0.69	1.11	11.1

Table 5. Reliability Test for the CAQ

Description	Cronbach's alpha coefficient (α)
Awareness of cancer warning signs and screening tests	0.78
Knowledge of cancer risk factors	0.65
Barriers in seeking medical advice	0.68
Attitude towards cancer and cancer prevention	0.6
Overall questionnaire (63 items)	0.77

Table 6. Test-retest Reliability of CAQ

Description	Test-retest reliability (Pearson correlation, r)
Awareness of cancer warning signs and symptoms	0.59**
Knowledge of cancer risk factors	0.66**
Barriers in seeking medical advice	0.50**
Attitude towards cancer and cancer prevention	0.59**
Overall questionnaire (63 items)	0.72**

**Correlation was significant at $p < 0.001$ (2-tailed)

with some exclusions. Five items were deleted as they did not meet the minimum cut-off for factor loadings. The Cronbach's α for this scale met the cut-off criteria for newly created scales (α≥0.60). The total variance explained by the three-factor model was 47.6%.

Internal consistency

A Cronbach's alpha coefficient (α) of 0.77 was obtained for the overall questionnaire. The section for awareness of cancer warning signs and screening test (22 items) had a α of 0.78; knowledge of cancer risk factors (20 items); barriers in seeking medical advice (11 items) had a α of 0.65 and 0.68, respectively. While a α of 0.60 was obtained for attitude towards cancer and cancer prevention (10 items). The reliability test results were summarised in Table 5.

Test-retest reliability

A total of 143 students from the original 388 participants completed the questionnaire on a volunteer basis, for the test-retest reliability of this study. The correlation obtained for the overall questionnaire was 0.72 ($p<0.001$). The correlation coefficients for test-retest reliability of each section are shown in Table 6.

Discussion

A CAQ was developed among the Chinese undergraduate students. This questionnaire appeared to be valid and reproducible for assessing awareness level of cancer development. Different principal factors that were demonstrated with high factor loadings were identified under each section. The overall correlation coefficient between the two questionnaires filled in 10 to 14 days apart were relatively high (r=0.72), suggesting good reproducibility. Most students in this study were found to have moderate (77%) awareness and knowledge scores, while showing positive attitudes (81.4%) towards cancer and cancer prevention which are essential for behavioural modification.

According to Simon et al. (2010), higher knowledge levels of cancer warning signs increased the chance that a person would consider the possibility that their symptom is related to cancer. The ability to recognise the warning sign of cancer leads to early detection of cancer, which encourages the help seeking behaviour and shortens the anticipated delay in help-seeking when there is a symptom (Simon et al., 2010; Keeney et al., 2011). Another study by Sheikh and Ogden (1998) revealed that good knowledge of cancer warning signs encouraged good consultation behaviour. However, there is still a gap between knowledge and behaviour, which may be explained by various factors including understanding cancer and its aetiology, making sense of symptoms and describing their help seeking behaviour, and available screening programs (Sheikh and Ogden, 1998).

The delay in seeking help after observing a symptom may be due to several practical and emotional barriers, particularly considered as 'worrying' (Simon et al., 2010). Understanding the different barriers towards seeking medical advice can help to tailor different interventions to encourage help seeking (Waller et al., 2009). In this study, the main barriers that were endorsed by students were being 'too scared' (63.7%) and 'worry what the doctor might find' (61.1%). Interventions to address these problems can focus on highlighting on the benefits of early diagnosis and the efficacy of many cancer treatments. Interventions can be designed depending on the barriers endorsed, which are specific and culturally sensitive for effective communication across the different groups to encourage medical help-seeking behaviour (Waller et al., 2009).

Besides that, behaviour is associated with attitude, social influence and self-efficacy of one's ability to develop a specific behaviour, with attitude being a strong determinant of one's behaviour. These three factors are in turn associated with the intention of developing the behaviour or not. In addressing this, educational interventions can be designed to focus on a range of existing beliefs and emotional responses held by each individual instead of focusing on knowledge alone (Sheikh and Ogden, 1998). Emphasis may be put on the benefits of having healthy behaviour and lifestyle that leads to cancer prevention, and also present alternatives to the benefits individuals perceive their risk behaviours (López et al., 2006).

The population in this study only included students from a private university and of Chinese ethnicity, hence the results could not be generalised to all the university students. As the data collected were based on self-report by the students, results of cancer awareness that was obtained may be underestimated. Further studies should be conducted by expanding the administration of the CAQ to other ethnic groups, and later, to the whole population.

In conclusions, the cancer awareness questionnaire that was developed is a reliable and valid measure, evident from factor analysis, internal consistency and test-retest reliability. This measure can be used to provide a comprehensive evaluation of cancer awareness among Chinese undergraduate university students in Kuala Lumpur, Malaysia. As a preliminary study, the current findings provide valuable insight on cancer awareness level among Chinese students. Using data collected from this questionnaire, informed interventions can be developed, and the impact of the interventions can be assessed.

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