Original Article

Breast Cancer and Chemotherapy Knowledge among Undergraduates of Health Sciences: Which Traits Predict Good Knowledge?

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Abstract

Objectives: **Accurate medical information is essential among health care professionals to aid dissemination of information to the public. This study aimed to determine the level of knowledge about breast cancer and to identify related factors among undergraduate health sciences students in a public university in Terengganu, Malaysia.**

Methods: **The respondents included students aged 18 years old or older who were enrolled in nursing, medical laboratory technician (MLT) and radiography diploma programmes. A Breast Cancer and Chemotherapy Questionnaire (BCCQ) was administered; higher scores on it indicated better knowledge. The reliability and validity of the BCCQ was considered adequate. Descriptive statistics, independent t test, one-way analysis of variance (ANOVA) and multiple logistic regressions were employed (SPSS 16).**

Results: **A total of 239 respondents participated (mean age = 19.8 ± 0.1 years; females = 83.7%). The knowledge level was moderate. Females, nursing, and final-year students possessed significantly better knowledge. After adjusting for covariates, significant factors determining good breast cancer knowledge include being in the nursing discipline and years of study.**

Conclusion: **This study has generally ascertained that knowledge related to breast cancer and chemotherapy among this sample population remains moderate and is not uniformly disseminated. An increase in knowledge is required to ensure an optimal level of knowledge, particularly for the junior students and those from courses other than nursing.**

Keywords: *breast cancer, chemotherapy, health sciences, undergraduates*

Introduction

Breast cancer is the most common cancer among women (1), and chemotherapy is an important treatment modality (2). Data from the National Cancer Registry (NCR) in 2006 reported that a total of 21 773 cancer cases were diagnosed among Malaysians, and breast cancer was the most numerous cancer, regardless of gender, among the population in Peninsular Malaysia (3). Indeed, female breast cancer accounted for 16.5% of all cancer cases registered for 2006 (3).

Early detection could mean earlier diagnosis of breast cancer, which could consequently increase the chances of cure and survival. However, many myths related to breast cancer and its treatments still exist, particularly among Asian women (4). The majority of them are not aware of common early signs and symptoms of breast cancer, which translates into low screening rates and late stages at diagnosis (4). Advanced stages of breast cancer have minimal chances for cure by standard treatment. In Malaysia, data show that 50% to 60% of women who presented with this cancer were at stage 3 or stage 4, thus minimizing the benefit of any form of cancer therapy (5).

Essentially, health care workers are expected to be proactive and effective in their role of information dissemination, including promoting breast cancer screenings. Nurses, who form a major proportion of health care providers and commonly interact closely with patients, have the crucial task of educating patients on breast cancer screening and methods (6). Other health care workers may not be directly involved, but they are usually looked upon as strategic role models in their communities. By offering positive examples, they are essential in creating an environment supportive of screening practices (7). Yet, adoption of screening practices requires a high level of awareness gained from having ample and precise knowledge about breast cancer and its treatments.

Apart from that, regardless of their specialties

or gender, staff members at health care sites are often called upon to provide information and support concerning medical problems due to their frequent contact with patients and their relatives (4,8). This role may extend not only to patients but also to staff members' own family and friends. Thus, it is crucial for health care staff in general to possess appropriate and adequate knowledge so as to ensure that the information they deliver is accurate. Since health sciences students will become future health care personnel, they should be equipped at an early stage of their education with accurate knowledge to aid in increasing awareness. Previous studies have indicated that breast cancer knowledge among female university students was inadequate (9) and varied with the major of study (10). Therefore, it is important not only to evaluate students' knowledge about breast cancer but also to identify factors related to their knowledge about this disease. Documenting these factors may contribute to understanding factors relevant to the acquisition of a good level of breast cancer knowledge among health sciences undergraduates. This understanding, in turn, may be useful to policy makers, organisations, parents and community groups to make a difference in the fight against breast cancer. Formerly, studies on breast cancer knowledge focused mainly on female cohorts (11–13), nursing professionals (14,15) and rarely on multi-level health care practitioners. Therefore, this study aimed to determine the level of breast cancer and chemotherapy knowledge and to identify related factors among undergraduate health sciences students in a public university in Terengganu, Malaysia, using a 15-item Breast Cancer and Chemotherapy Questionnaire (BCCQ).

Methods

Study design

The study was a cross-sectional one conducted in January 2011. The population was all available undergraduate students of the health sciences (n = 239), aged 18 years old or older, recruited from a local public university in Terengganu. They were enrolled in nursing, medical laboratory technician (MLT) or radiography diploma programmes. These three groups of student were included based on the common expectation that they possess reasonable additional health information compared to the general public. A convenience sampling was applied because the study was a single-centre pilot study intended for a general health information survey aiming for at least 30 students per groups (16,17), and this resulted in a total of 239 participants. Ethics approval was received from the Research and Ethics Committee of the faculty, which considered appropriateness of the study in terms of research design and ethical issues.

Data collection

Researchers approached available students who suited the target population. Data collection was conducted between the 10th and 14th week of the second semester for each class of students. There were nine groups in total (three groups per class year), stratified according to their programmes and year of study. Self-reported information on age, gender, race/ethnicity, and year of study was collected from all participants. The questionnaires were self-administered, yet completion of them was conducted under supervision of investigators, and then they were collected all at once. The questions on breast cancer and chemotherapy were adopted from previous, related study instruments and literature (18,19). Upon receipt of their consent, students were provided with the Breast Cancer and Chemotherapy Questionnaire (BCCQ), which was administered in English. There were a total of 15 questions, 10 on breast cancer and 5 on chemotherapy. Possible responses included disagree, do not know and agree. Questions about breast cancer were drawn from a previous study by Parsa and Kandiah (18) conducted among Iranian women, which was in turn based on a modified version of the 10-item Breast Cancer Perceptions and Knowledge Survey (BCPKS) (20). Questions focused on the perceived causes of breast cancer, signs and symptoms, risk factors and efficacy of screening and treatment. The adaptation by Parsa and Kandiah (18) involves changes in the response format, which previously had used a five-point Likert scale. Alteration of the original format was implemented to reduce the difficulty in distinguishing levels of gradation within a Likert scale (21) and because the altered form may be more useful for development of educational strategies (18). The questions about chemotherapy were extracted from information on chemotherapy from the literature (19) concerning treatment methods and side effects. Each correct answer would be given a score of 1, with higher total scores indicating better knowledge (summated score range: 0–15). Additionally, the overall knowledge rating was collapsed into three categories based on cut-off percentages for the correct answer. A score of 80% or more correct was defined as high (score range: 12–15), whereas scores of 40% and below were considered low

(score range: 6–0). Scores between these two percentages were considered moderate (score range: 7–11). For further analysis, scores from the breast cancer questions were categorised as either poor or good (as determined by the median score cut-off point). Poor was operationally defined as having a score of 5 or below, while those who scored 6 and above were considered to possess good knowledge related to breast cancer.

Reliability and validity of BCCQ instrument

Based on previous work (18), the Kuder-Richardson reliability of the BCPKS (from which we adopted the breast cancer questions in our BCCQ) was 0.84. Test-retest reliability was conducted by administering the BCPKS to women at baseline and two weeks later (18). The result showed no significant difference in the mean knowledge scores between the two time frames, supporting the stability of the measure. Cronbach's alpha coefficient (for internal consistency and reliability) and Spearman's correlation coefficient (for convergent validity) were used to test reliability and validity of the BCCQ. Essentially, the Cronbach's alpha coefficient for this instrument was 0.68, close to a cut-off value of 0.70, which is usually considered as 'acceptable'. In assessing the convergent validity, questions in the same domain (either breast cancer or chemotherapy) showed higher correlation with their own domains (rs = 0.367–0.583). Only question number 6 (detection of breast cancer) showed poor association (rs = 0.002). Additionally, face validity was preliminarily confirmed by an experienced researcher in the health sciences who had carried out psychometric studies in cancer patients. Overall, the psychometric outcomes were considered acceptable and adequate, hence demonstrating the reliability and validity of the BCCQ for implementation in this study.

Statistical analysis

The Statistical Package for the Social Science (SPSS) Version 16.0 (SPSS Inc., Chicago IL, U.S.A.) was used for data compilation, and statistical analysis. Descriptive statistics were used to determine the mean and standard deviations of knowledge scores. In assessing the subsequent objectives, an independent *t* test and a one-way analysis of variance (ANOVA) test were carried out to compare the mean differences of scores between groups for continuous data. The Bonferroni adjustment was used when necessary. Additionally, significant demographic predictors for breast cancer knowledge were evaluated using logistic regressions whereby the score from the breast cancer questions was treated as a dichotomous binary outcome, i.e. good or poor. The goodness-of-fit test (Hosmer and Lemeshow test) was used for the final multivariate logistic model. The level of significance was set at 5% (2-sided).

Results

A total of 239 respondents (100% responses rate) with a mean of 19.8 age (SD0.1) years participated in this study. Most were female (83.7%) and Malay (96.7%). Students from the nursing programme (50.2%) and those in their second year of study (42.7%) represented the majority of study participants. Table 1 shows the demographics of the respondents.

A majority of students (71.1%) possessed a moderate level of knowledge related to breast cancer and chemotherapy, with a mean score of 8.30 (SD 0.16). When the two domains were assessed separately, both were also in the average level, with the mean score for chemotherapy questions being 2.92 (SD 1.15) (range: 0-5), while for the breast cancer questions it was 5.38 (SD 1.93) (range: 0-10). Despite the fact that they expect to graduate as future medical front-liners, only a small proportion of respondents (7.9%) displayed a high level of knowledge, and 20.9% were identified as having a poor level of knowledge. The percentage of students who had no knowledge related to breast cancer and chemotherapy could be as high as 34%, fully one-third of our sample (Table 2). Less than one-half of the respondents (40.2%) knew that a diet high in fat could increase the risk of developing breast cancer. Half of the students (50.6%) held the misconception that painful lumps are indicative of cancer, while a similar number (54.8%) were mistaken about the right timing for Breast Self-Examination (BSE) procedures. Also, 33.1% were unaware of different modes for chemotherapy administration. One-fifth (21.3%) even agreed that early detection would not increase the chances for a women's survival.

Females, nursing and final-year students generally possessed significantly better knowledge of both breast cancer and chemotherapy ($P < 0.05$). Table 3 shows the mean knowledge rating (total score) among students of different genders and in different courses and years of study. The knowledge rating across programmes was highest among nursing students with mean score = 9.01 (SD 2.37), followed by radiography students; mean score = 8.43 (SD 1.88), and MLT

Table 1: Respondents characteristics (n = 239)

Characteristics	Frequency	Percentage (%)	Mean (SD)
Age (years)			19.8 (0.1)
Gender			
Male	39	16.3	
Female	200	83.7	
Race			
Malays	231	96.6	
Chinese	2	0.8	
Indian	3	1.3	
Others	3	1.3	
Courses			
Nursing	120	50.2	
Radiography	54	22.6	
Medical Laboratory Technology (MLT)	65	27.2	
Year of study			
First	78	32.6	
Second	102	42.7	
Third	59	24.7	

SD = Standard deviation.

students, who recorded the poorest score; mean score = 6.85 (SD 2.51). However, only the mean total scores of students of "nursing and MLT" and "radiography and MLT" were significantly different, as detected by post-hoc testing using Bonferroni's procedures. Furthermore, students in the later years of their studies scored better compared to their juniors. The mean total scores among all groups were significantly different (P = 0.001). Ascending mean total scores across study years were: first year 6.99 (SD 2.34), second year 8.46 (SD 2.36) and final year 9.75 (SD 1.92). The scores of first-year students were considered the baseline against which later years of study were compared.

At univariate analysis, gender, course of study and years of study were the important factors in predicting a good level of breast cancer knowledge (Table 4). Females were more likely than males to possess a good level of breast cancer knowledge, crude OR = 2.27 (95% CI 1.12 to 4.63), P = 0.024. When nursing students' scores covering breast cancer were compared to the breast cancer scores of those in all other courses of study, the odds of having a good level of knowledge were 2.22 times higher among nursing students than others (95% CI 1.32 to 3.73), P = 0.003. Additionally, second- and third-year students were more likely to have a good level of knowledge compared to first-year students, crude OR = 3.03 (95% CI 1.63 to 5.62), P < 0.001; crude OR = 4.83 (95% CI 2.33 to 10.02), P < 0.001. However, upon multivariate logistic analysis, only courses and years of study were significant predictors. The goodness-of-fit assessment using the Hosmer and Lemeshow test on the final model showed that it complied with the model fit (P = 0.600). Students in the nursing discipline have 2.33 times the odds of having a good level of breast cancer knowledge (95% CI 1.33 to 4.09, P = 0.003) when gender and years of study were controlled for. Students in year two or three of their studies have a greater chance of having a good level of knowledge compared to first-year students when adjusted for gender and study disciplines respectively, adjusted OR = 3.35 (95% CI 1.76 to 6.39), P < 0.001; adjusted OR = 5.52 (95% CI 2.57 to 11.86), P < 0.001.

Discussion

Despite their tertiary level of education in health sciences programmes, precise knowledge of these students on breast cancer and chemotherapy

Table 2: Breast cancer and chemotherapy knowledge

No.	Statement (Answer)	Agree *n* (%)	Disagree *n* (%)	I do not know *n* (%)
1.	Breast cancer is more common in women with big breasts *(False)*	44 (18.6)	147 (62.0)*	46 (19.4)
2.	Lumps in the breast that are cancer are usually painful *(False)*	121 (50.6)	77 32.2)*	41 (17.2)
3.	Changes found in the breast during breast self-examination (BSE) are usually breast cancer *(False)*	93 (39.2)	112 (47.3)*	32 (13.5)
4.	A change in the color or discharge of a women's nipple could be a sign of breast cancer *(True)*	163 (68.5)*	26 (10.9)	49 (20.6)
5.	If a women's mother or sister had breast cancer, she is more likely to get breast cancer *(True)*	189 (79.1)*	27 (11.3)	23 (9.6)
6.	One of the best ways to find breast cancer is monthly BSE *(False)*	193 (81.8)	19 (8.1)*	24 (10.1)
7.	A woman who eats foods high in fat and little fruit and vegetables may be more likely to get breast cancer *(True)*	96 (40.5)*	70 (29.5)	71 (30.0)
8.	The best time to check for lumps in the breast is just after the period ends *(False)*	131 (55.2)	35 (14.8)*	71 (30.0)
9.	Doctor and nurses are the only ones who could find a lump in the breast *(False)*	29 (12.2)	189 (79.7)*	19 (8.1)
10.	A women's chance of surviving breast cancer is very low, even if it is found early *(False)*	50 (21.3)	163 (69.4)*	22 (9.3)
11.	Chemotherapy is a treatment that can weaken and destroy cancer cells in the body *(True)*	183 (76.9)*	36 (15.1)	19 (8.0)
12.	Cancer chemotherapy is a systemic treatment that affects only the cancer cells *(False)*	108 (45.4)	99 (41.6)*	31 (13.0)
13.	A complete chemotherapy treatment is made up of several cycles *(True)*	168 (71.2)*	14 (5.9)	54 (22.9)
14.	Chemotherapy medicines can only be given intravenously (IV) *(False)*	79 (33.1)	79 (33.1)*	81 (33.8)
15.	Chemotherapy is highly associated with nutrition-related side effects such as anorexia, nausea, vomiting, mucositis, diarrhoea and constipation *(True)*	168 (70.6)*	15 (6.3)	55 (23.1)

* Percentage of students with correct answer.

were inadequate and not well disseminated, with the majority demonstrating only a moderate level of knowledge. Consistent with previous studies among health care professionals (4), limited knowledge was mainly related to risk factors, signs and symptoms and examination and treatment techniques. This study could not ascertain whether this discrepancy reflects ineffectiveness of the learning process or inadequacy of the syllabus. In developing countries like Malaysia, inadequate knowledge could be one of the significant factors in late detection of breast cancer (9,22). Social and cultural perceptions of the disease, such as fear of a breast cancer diagnosis and of treatment consequences, further contribute to late diagnosis (22). If future health care workers are not well equipped with accurate breast cancer knowledge about symptoms, screening techniques and potential treatments, they will be relatively ineffective in educating others on this disease, let

Table 3: Score of breast cancer and chemotherapy knowledge among health sciences students

Variable	*n*	Mean (SD)	*P* value
Total	239	8.30 (0.16)	–
Gender			
Male	39	6.97 (2.52)	< 0.001
Female	200	8.56 (2.39)	
Course			
Nursing	120	9.03 (2.37)	< 0.001[a]
Radiography	54	8.43 (1.88)	
MLT	65	6.85 (2.51)	
Year of study			
First	78	6.99 (2.34)	< 0.001[b]
Second	102	8.46 (2.36)	
Third	59	9.75 (1.92)	

[a]Significant for "Nursing > MLT" and "Radiography > MLT" (post-hoc test Bonferroni's procedures).
[b]Significant for all groups; 2nd year >1st year, 3rd year > 1st year, and 3rd year > 2nd year.

Table 4: Logistic analysis of breast cancer knowledge

Variable	Crude OR (95% CI)	*P* value	Adjusted OR (95% CI)	*P* value
* Gender				
Male	1 (reference)		1 (reference)	
Female	2.27 (1.12–4.63)	0.024[a]	2.02 (0.94–4.35)	0.072
* Course				
Others	1 (reference)		1 (reference)	
Nursing	2.22 (1.32–3.73)	0.003[a]	2.33 (1.33–4.09)	0.003[a]
* Year of study				
First	1 (reference)		1 (reference)	
Second	3.03 (1.63–5.62)	< 0.001[b]	3.35 (1.76 – 6.39)	< 0.001[b]
Third	4.83 (2.33–10.02)	< 0.001[b]	5.52 (2.57–11.86)	< 0.001[b]

* Included in the multivariate logistic model; [a] significant at $P < 0.05$; b significant at $P < 0.001$; OR = Odds ratio; 95% CI = 95% confidence interval. Outcome variable is knowledge level (good versus poor).

alone in becoming role models to the community. Considering their leadership role in breast cancer awareness and information dissemination, knowledge levels certainly must be increased, perhaps through modifications of undergraduate education or through increased exposure to health awareness campaigns.

Apart from that, although gender was not a significant factor in predicting a good level of breast cancer knowledge, results showed that females were more knowledgeable than men. The reason for this could be that breast cancer affects mostly women, thus leading them to practice screening (23,24), which in turn requires individuals to be more informed. As evidenced by previous studies (4,25), educational level and sound knowledge are the consistent factors influencing BSE and mammogram screening. However, it is also possible that higher knowledge scores among females were due to the fact that respondents were predominantly female. Nevertheless, with only a moderate knowledge level among the female population who are vulnerable to develop this fatal disease (26), further improvement is needed.

As their knowledge level improves, women will be more alert to common symptoms of breast cancer or its risk factors, translating awareness into good breast cancer screening practices (9).

The higher knowledge level demonstrated by nursing students suggests that they are generally more informed about this disease and its treatments than those in other courses because of their role in clinical care (27). In a previous study, breast cancer knowledge was higher among medical and nursing students compared to dental students (10). One possible explanation was that the other students in our study were not directly and clinically involved, such as those in the radiography and MLT courses, who were more involved with the technical parts of diagnosis, such as biochemical readings or radiograph diagrams. However, a systematic review of the need for and sources of information among cancer patients revealed that treatment-related information was the most sought-after, and health care professionals served as their major source of information (8). Therefore, considering their vital role as the major health-information provider, allied health care professionals at all levels should be equipped with accurate and ample knowledge about breast cancer and chemotherapy. Greater emphasis is needed on breast cancer curricula for allied health care training programmes so that all health sciences graduates are better informed about this disease and its treatments.

Understandably, more senior students, those in the second or final year of study, have additional advantages, since they have experienced an extended syllabus compared to more junior students and have been exposed to more clinical training. The variable time points for questionnaire administration also could have influenced the results, because topics on breast cancer and chemotherapy are taught in different semesters in each of the study programmes. However, all our respondents had been taught about these topics, except for the first-year students. Thus, the moderate level of knowledge possessed by first-year students was considered a baseline, because they have not received lectures related to these subjects. Improvement of scores throughout the years of study may indirectly reflect the effectiveness of teaching programmes.

Our study findings should be interpreted in the light of several methodological limitations. One potential limitation is recruitment through only a single study centre (convenience sampling) and might therefore not be truly representative of all health sciences undergraduates. Still, our study sample included all health sciences candidates from our university in all years and all courses. Another possible limitation involves the heterogeneity of the study sample, particularly in gender, with the sample being predominantly female. However, this particular bias was unavoidable given the current trend whereby females increasingly outnumber males in Malaysian tertiary institutions (28). As discussed earlier, the variable time points for questionnaire administration also could have influenced results. Although the reliability and validity of the BCCQ was considered acceptable and adequate, further comprehensive tests could benefit the adaptation within larger interest populations. Additionally, because of the cross-sectional nature of this study, the causal relationship between socio-demographic factors and breast cancer knowledge could not be drawn.

Despite these limitations, this study has ascertained that knowledge related to breast cancer and chemotherapy among this sample population remained moderate and was not uniformly disseminated, although females, senior candidates and students who were majoring in nursing were comparatively more knowledgeable than their respective counterparts. In view of the current knowledge status among these future medical front-liners, knowledge levels certainly require enhancement, particularly for junior students and those from non-nursing courses of study. It is vital to keep them well informed with updated health-issue information, even though such information may not be directly related to their future jobs. Such improvements would allow provision of accurate health information to the public and would eradicate common misconceptions that result in delayed diagnosis and treatment.

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Conflict of interest

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Authors' Contributions

Conception and design, critical revision of the article for the important intellectual content, final approval of the article and statistical expertise: PLL
Analysis and interpretation of the data, drafting of the article, and collection and assembly of data: NSZ

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