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Determinants of Breast Cancer Knowledge among Public University Students

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Abstract: Breast cancer is still a leading global health concern, with Malaysia experiencing a notable burden, accounting for approximately 34.1% of all female cancers between 2017 and 2021. The National Cancer Registry highlights the disease as a common cause of death among Malaysian women. Even though the case of breast cancer remains high, the level of breast cancer knowledge is still low, making it difficult to educate the community to effectively fight against the disease. Thus, this study aims to determine the influence of demographic factors and lifestyle factors on breast cancer knowledge and to examine the difference between gender and family history on breast cancer knowledge levels among university students. A cross-sectional survey was conducted with 261 students from the Bachelor's Degree of Health Administration (Hons.) from Universiti Teknologi Mara, Puncak Alam Campus. Results indicated that gender is an important factor in breast cancer knowledge, with females exhibiting higher knowledge levels. Moreover, physical activity and healthy dietary patterns also emerged as significant predictors of a higher level of knowledge. Future research should continue promoting early screening and prevention, raising awareness of male breast cancer to emphasize its importance alongside female breast cancer. Implementing the gamification technique is an interesting way as an educational tool to attract more community members and improve their health-related knowledge.

Keywords: *Breast cancer, Awareness, Demographic, Lifestyle, Knowledge, Family History*

1. Introduction and Background

Breast cancer is still the leading global health concern for women. In 2022, approximately 2.3 million new cases were reported, with 685,000 deaths reported 685,000. Countries with a high Human Development Index (HDI) report a lifetime risk of 1 in 12 women being diagnosed, compared to 1 in 27 in countries with a low HDI. (Andrew Tong & Hee, 2023). Even though there are many advancements in early detection and treatment initiated by authorities, the burden remains high, particularly in low-and middle-income countries where access to healthcare services is quite limited (Li & Li, 2025).

Like other countries, Malaysia also faces the health burden of approximately 34.1% of all female cancers between 2017 and 2021. The age-standardized incidence rate (ASR) for breast cancer in Malaysia was reported to be 34.1 per 100,000 population during this period. Even though the mortality rate among Malaysian women is lower than the global average, this disease still poses a significant public health challenge. The National Cancer Registry Report indicates that Malaysian women who suffer from cancer face a higher risk of death. It is good to emphasize the importance of improving awareness and knowledge, especially among younger populations, to reduce mortality and encourage early detection (Abdullah & Tan, 2022).

To continuously improve early detection and prevention, focusing on younger females, including those studying at the university, needs to be given some attention. In Malaysia, there have been many past studies determined the awareness level of breast cancer among university students. For example, a study conducted at City University Malaysia found that the level of breast cancer awareness among female students was moderate, with significant gaps in knowledge about risk factors and early detection methods (Harlina, 2024). Another one is from the International Islamic University Malaysia revealed that while students had high knowledge about breast cancer, the practice of breast self-examination was still lacking (Zhang et al., 2024). In other previous study from Saudi Arabia showed more than 55% of university female students had an acceptable level of knowledge, but there were still significant areas for improvement (Arya & Kumari, 2024). Another study in the United States emphasized the need for targeted educational interventions to improve breast cancer awareness among young women (Zainul Azlan et al., 2022).

2. Literature Review

Level of Knowledge of Breast Cancer among Youth: Young people across different regions generally have limited information and exposure to breast cancer and breast self-examination (Skreka et al., 2024). This gap is often due to a lack of participation in health education programs and limited access to early detection information. In Malaysia, studies have shown that while some university students possess moderate knowledge about breast cancer, there are still significant gaps in understanding risk factors and early detection methods. (Abdullah & Tan, 2022). It is shown through the previous study at City University Malaysia that the majority of female students were not notice of the early age that can start with breast self-examinations can start and the frequency with which they should be performed. Similar trends are seen internationally, where in Saudi Arabia, over 55% of students showed acceptable knowledge levels, though improvement is needed. In the United States, targeted interventions were recommended to improve awareness among young women (Islam et al., 2022 & Zainul Azlan et al., 2022). These results underscore the importance of educational exposure in improving awareness and knowledge among the younger generation. Some of the important focuses are early detection, the benefits of regular self-examinations, and the information on risk factors.

Demographic Factors Influencing Breast Cancer Knowledge: Demographic factors like age, gender, and family history influence breast cancer knowledge. Younger age women often have less knowledge compared to older adults, who are more likely to have encountered information through personal or familial experiences (Li & Li, 2025). A previous study in Pakistan also has the same lack of awareness and knowledge resulting in breast cancer among university students. Some results were only 25.2% identified inward pulled nipples, 25.7% recognized sores at the nipple area, and 31.7% noted abrupt changes in breast size as indicators of breast cancer. Moreover, only 20.9% of participants knew the correct age to start breast cancer examinations, and 44.4% indicated that mammography should begin after age 40 (Hussain et al., 2022). Another previous study in Syria presented the result of moderate knowledge among the female students due to their study background in medical, pharmacy, and dentistry. However, the knowledge gap still needs to be improved. (Alshafie et al., 2025). Gender differences are also notable, where females generally exhibit higher awareness and better knowledge regarding breast cancer compared to males (Zainul Azlan et al., 2022). The knowledge differences may be due to the disease that occurred mainly in women, which urged them to search for more information about the cancer. A previous study in Malaysia highlighted that both females and males scored moderate knowledge on breast cancer; however, females scored better for symptom knowledge, breast self-examination, and mammogram (Lee et al., 2022). The last factor, family history, is another significant factor in having better information and personal experiences (Li et al., 2025). The role of family history in influencing knowledge is mixed. While some studies indicate that individuals with a family history are more likely to seek information and engage in preventive behavior (Li et al., 2025 & Liu et al., 2021), others found no significant difference in knowledge levels (Mohebi et al., 2023 & Subramanian et al., 2013). Overall, these findings suggest that family history alone may not ensure greater understanding without proper educational support in this health-seeking information.

Lifestyle Factors Influencing Breast Cancer Knowledge: Being physically active and consuming a healthy diet are common lifestyle choices that contribute to a good level of breast cancer knowledge. It is supported by a previous study that healthy lifestyle choices, including regular physical activity and a balanced diet, are associated with better breast cancer knowledge (Liu et al., 2025). Exposure to active physical activity leads to improved health information access from fitness programs, gyms, and social interactions with groups that are concerned with health-related topics. Healthy dietary patterns are also linked to a greater understanding of cancer prevention strategies, including overall health literacy (Jia et al., 2022 & Mertens et al., 2023). Additionally, qualitative research has highlighted that personal and behavioural factors influence physical activity among women with metastatic breast cancer, underscoring the need for tailored education and services. Likewise, greater breast cancer knowledge has been associated with healthier eating patterns and improved overall lifestyle choices (Deeb et al., 2024 & Liu et al., 2025). These findings suggest that promoting healthy lifestyle choices can be a helpful approach in improving breast cancer knowledge among young adults; thus, hypotheses were drawn based on the previous literature reviews.
H1: Young age does not influence breast cancer knowledge
H2: Being female is a factor that influences breast cancer knowledge
H3: Having a family history of breast cancer influences a student's breast cancer knowledge

H4: Engaging in physical activity influences breast cancer knowledge
H5: Following a healthy dietary pattern influences breast cancer knowledge
H6: There is a difference in breast cancer knowledge between males and females
H7: There is a difference in breast cancer knowledge between individuals with a family history of breast cancer and those who do not.

Despite the existing research, there are still gaps in understanding the specific factors that influence breast cancer knowledge among Malaysian university students. This study aims to address these gaps by focusing on the following objectives:

- To determine the influence of demographic factors and lifestyle factors on breast cancer knowledge among public university students in Selangor.
- To examine the difference between gender and family history towards breast cancer knowledge levels among public university students in Selangor.

3. Research Methodology

This study uses a cross-sectional survey research design, and the population is the students who enrolled in the Bachelor's Degree in Health Administration (Hons.) program in Universiti Teknologi Mara, Puncak Alam campus, Selangor. The sample includes 261 students, consisting of both males and females from various semesters. This acknowledges the limitation of the findings, which may not be generalizable to students in other programs within the faculty due to the limited timeframe and available resources to conduct a broader study. Nevertheless, this study provides valuable insights within the context of health awareness.

This study used an established questionnaire from previous publications to evaluate the research objectives. The questionnaire has 18 questions. It consisted of three sections: section a (3 questions of demographics; gender, age, and family history of breast cancer), section b (10 questions of lifestyles; 5 from physical activity and 5 from dietary pattern), and section c (5 questions for breast cancer knowledge). Each section has various types of responses. For section A, it was the categorical data scale. For sections b and c, the five-point Likert scale was used between 1- strongly disagree to 5 – strongly agree. Respondents' feedback was gathered within three weeks during the semester.

All collected data were verified, modified, and analyzed using the IBM SPSS V.29.0 statistical package. The normality results in Table 1 for demographic, lifestyle, and breast cancer knowledge categories indicate that all variables fall within the acceptable range, suggesting a normal distribution. The reliability analysis shows that the breast cancer knowledge scale has a high reliability coefficient of 0.830, indicating strong consistency. The lifestyle factors scale has a moderate reliability coefficient of 0.665, reflecting acceptable but less consistent results.

Table 1: Reliability and Normal Distribution Analysis

Variables	Total Items	M	SD	CA	Skewness	Kurtosis	Distribution
DG	3	2.1379	0.28712		-.535 to .151	1.893 to .300	Normal
LS	10	3.5257	0.51118	0.665	.197 to .151	.623 to .300	Normal
BCK	5	3.105	0.79451	0.830	-.007 to .151	-.813 to .300	Normal

***Note:** M = mean, SD = standard deviation, CA = Cronbach Alpha, DG = demographic, LS = lifestyle, BCK = breast cancer knowledge*

4. Results and Discussion

The demographic data in Table 2 indicate that 79.7% of the participants are female, while 20.3% are male. Age-wise, the majority of respondents are between 21 to 23 years old (65.5%), followed by those aged 24 to 26 (26.1%), 18 to 20 (4.6%), and 27 to 30 (3.8%). When it comes to family history, 15.3% reported having a family history of breast cancer, whereas 84.7% did not. This demographic breakdown helps in understanding the target population and tailoring the level of knowledge initiatives accordingly.

Referring to the gender gap in the university's enrolment, throughout much of the twentieth century, men obtained more bachelor's degrees than women globally. For example, in 1970, 20% of men and only 14% of women graduated from college. However, a significant shift occurred as women born in the late 1950s and early 1960s began to surpass men in college completion rates during the 1980s. While men's college completion rates stagnated, women's rates increased dramatically, from 14% in 1970 to 36% in 2010. Since 2000, women have consistently earned about 57% of all bachelor's degrees annually, with 58.5% in 2022. The ability to earn a degree completely relies on certain factors, for instance, academic skills, preparation, incentives, educational aspirations, and the ability to manage financial costs. Research indicates that educational transitions and academic performance are strong predictors of college enrollment and completion. (Buchmann et al., 2025).

In Malaysia, the trend in higher education enrollment has also seen significant growth, particularly among women. The gross enrollment ratio in Malaysia rose from 19.6% in 2000 to 42% in 2020, and it is projected to reach 70% by 2025. The gross enrollment ratio for females has increased dramatically from 10.7% in the 1950s at the University of Malaya (UM) to around 48% today, surpassing 50% in 2015. In 2022, public universities in Malaysia enrolled a total of 589,879 students, with 230,161 (39%) being male and 359,718 (61%) being female. These figures suggest that Malaysia has nearly achieved gender parity in public universities, reflecting a similar trend to the global increase in women's higher education attainment. (Elhadary & Samat, 2023).

Table 2: Respondents' Background

Variables	Description	Frequencies	Percentage
Gender	Male	53	20.3
	Female	208	79.7
Age	18 - 20	12	4.6
	21 - 23	171	65.5
	24 - 26	68	26.1
	27 - 30	10	3.8
Family History	Yes	40	15.3
	No	221	84.7

Demographic and Lifestyle Factors on Breast Cancer Knowledge Among Students

Next, this study used a regression analysis to determine the influence of demographic factors and lifestyle factors on breast cancer knowledge. The table below illustrates the coefficients and collinearity statistics:

Table 3: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	**(Constant)**	-0.868	2.370		-0.366	0.714		
	Age	0.373	0.363	0.058	1.030	0.304	0.965	1.037
	Gender	3.690	0.601	0.374	6.136	0.000	0.813	1.230
	Family history	-0.791	0.623	-0.072	-1.270	0.205	0.945	1.058
	MEAN_PA	1.072	0.414	0.167	2.588	0.010	0.729	1.371
	MEAN_Diet	1.859	0.381	0.290	4.880	0.000	0.854	1.171
	R	0.478		**f**	15.089			
	R^2	0.228		**sig**	<.001			
	Adjusted R^2	0.213		**df**	5			
	Std. Error of the Estimate	3.52375						

The analysis results of this study provide a model summary indicating that the independent variables of demographic and lifestyle explain approximately 22.8% of the variance in breast cancer knowledge, with an adjusted R^2 of 21.3%. This indicates that although the model has moderate explanatory power, there could be other significant factors that were not included in the study but may also play an important role.

The study identified that gender, physical activity, and healthy dietary patterns significantly predict breast cancer knowledge. Female students demonstrated higher knowledge levels than males (B = 3.690, p < 0.001), supporting H2. Nevertheless, age (B = 0.373, p = 0.304) and family history (B = -0.791, p = 0.205) do not significantly impact breast cancer knowledge, indicating weak relationships with the dependent variable. Thus, H1 is accepted, and H3 fails to reject.

Regarding lifestyle factors, both physical activity (MEAN_PA) and a healthy dietary pattern (MEAN_Diet) are significant predictors of breast cancer knowledge. Physical activity has a positive coefficient (B = 1.072, p = 0.010) with a moderate relationship strength (Beta = 0.167). A healthy dietary pattern shows a stronger positive relationship (B = 1.859, p < 0.001) with a higher standardized coefficient (Beta = 0.290). Students who engage in repeated physical activity and maintain a good, balanced diet are more likely to have better knowledge about breast cancer. Thus, H4 and H5 are both accepted. This underscores the role of promoting healthy lifestyle practices as part of educational programs to improve breast cancer awareness among the students.

The collinearity statistics in the regression analysis help in determining if the independent variables have a strong correlation with one another, which could affect the reliability of the regression coefficients. The Tolerance values for all variables are above 0.7, and the Variance Inflation Factor (VIF) values are below 10, indicating no multicollinearity issues. This means that the independent variables do not excessively overlap in what they measure, ensuring that the regression results are reliable and each variable's contribution to the model is distinct.

The p-value is <0.001, indicating that the model is statistically significant, and the independent variables impact the dependent variable. The F-statistic value of 15.089, with a significance level of less than 0.001, further supports the overall significance of the model. The degree of freedom (df) for the model is 5, corresponding to the number of independent variables included in the analysis.

In conclusion, the study identifies gender, physical activity, and healthy dietary patterns as good predictors of breast cancer knowledge among public university students. These findings suggest that targeted interventions focusing on these factors could effectively enhance breast cancer awareness and may play a role in supporting early detection techniques and prevention efforts.

Role of Gender and Family History towards Breast Cancer Knowledge Among Students

Furthermore, this study adopted an independent sample t-test to determine the difference between gender and individuals with a family history of breast cancer in breast cancer knowledge among the respondents. The table below illustrates both the descriptive and t-test statistics:

Table 4: Descriptive Analysis

Variables	N	Mean	SD
Gender			
Male	53	2.6528	0.77176
Female	208	3.2202	0.75997
Family History			
Yes	40	3.0750	0.79574
No	221	3.1104	0.79597

The descriptive analysis revealed the number of participants. Regarding gender, there were 53 males and 208 females. The mean score for breast cancer knowledge among males was 2.6528, with a standard deviation of 0.77176. In contrast, the mean score for females was 3.2202, with a standard deviation of 0.75997. Additionally, the study examined whether participants had a family history of breast cancer. Among those with a family history, 40 participants had a mean score of 3.0750, with a standard deviation of 0.79574. This is slightly different from participants without a family history, who had a mean score of 3.1104 and a standard deviation of 0.79597. Based on this result, it was indicated that females scored higher in breast cancer knowledge compared to males. Moreover, individuals without a family history of breast cancer had a higher mean score than individuals with a family history.

Next, Table 5 presents the t-test analysis results between gender, family history of breast cancer, and breast cancer knowledge. For the gender variable, there was a significant difference in the knowledge level scores between males and females. Using equal variances assumed for Levene's Test, the t-test yielded a value of -4.837 while the degree of freedom (df) of 259 and two-sided p-value (0.000) indicated a statistically significant difference. Moreover, the mean score between genders is -0.56736, followed by a standard error value of 0.11730 and a 95% confidence interval ranging between 0.79835 to 0.33637 as stated. To summarize, the knowledge of breast cancer is different between males and in, specifically, females scored higher in understanding the knowledge of breast cancer. Thus, H6 is accepted.

For the family history variable, this study referred to equal variances assumed for Levene's Test, as the significance value was greater than p = 0.05. The t-test results showed no statistically significant difference in breast cancer knowledge scores between respondents with a family history of breast cancer and those without. The t-value was -0.259 with 259 degrees of freedom, and the two-sided p-value was 0.796. In terms of mean difference, these two groups had a value of -0.03541, with a standard error difference of 0.13676, and a 95% confidence interval ranging from -0.30472 to 0.23390. Therefore, the results indicate that there is no statistically significant difference in breast cancer knowledge between respondents with a family history of the disease and those without, fail to reject H7.

Females generally possess better knowledge in health-related areas, particularly those involving women's health issues. In previous studies on breast cancer knowledge, female students demonstrated a superior overall understanding of breast cancer compared to male students (Odhiambo & Hunter, 2023). A study conducted in Malaysia yielded similar results, indicating that a higher number of females were categorized at a high knowledge level (Lee et al., 2022). Another study from Greece, which conducted a systematic review analysis, corroborated these findings. The majority of the research revealed that females dominated breast cancer knowledge, while males were less likely to have a positive attitude toward the disease (Skreka et al., 2024).

Nevertheless, some contradictory results emerged from earlier studies conducted in 2000 and 2006. For example, a study in Saudi Arabia measured the level of knowledge among adolescents and found that gender—males and females—was not a significant factor in the overall cancer knowledge score, despite slight differences in the questionnaire results. This might be explained by the fact that both genders possess specific knowledge related to cancer prevention. For instance, females were generally better at learning about breast cancer prevention overall, while males might have been more knowledgeable about smoking and physical exercise for cancer prevention (Hashim, 2000). Another study using instructional videos or palpation aids to improve breast self-examination also found that gender and personal traits were not significant factors in enhancing knowledge about breast self-examination (Von Georgi et al., 2006). In summary, considering various past studies in conjunction with the current paper's results, it is evident that there is a significant variance in breast cancer knowledge between males and females, with females predominantly having a better understanding of the subject.

Additionally, this study's findings explain that having a family history of breast cancer does not necessarily correlate with the level of breast cancer knowledge. It highlighted that the group of students may have attained the same level of breast cancer knowledge and awareness, regardless of the presence of family history. One possible reason is that having a family history does not translate into in-depth knowledge, especially when the discussion involves clinical aspects, which may be difficult to understand due to complex scientific explanations. This suggests that family history itself is not a strong predictor of disease-related knowledge. This is consistent with previous results, such as a study conducted among females in Iran, which found no important variance in knowledge between students with and without a family history of breast cancer. Although the majority of respondents did not have a family history of breast cancer, their level of knowledge was considered moderate to low (Mohebi et al., 2023). In a previous Malaysian study it revealed majority of the respondents, who have the family history of breast cancer, showed poor of knowledge in risk factors (Subramanian et al., 2013) but a study in the United States, showed a contrast result that respondents with family history of breast cancer scored high level of knowledge with 88% (Khushalani et al., 2020). A previous study done among Mexican women, which is consistent with these findings, highlighted that individuals with a family history have no statistically significant with those without a family history (Bird et al., 2011). Even though individuals with a family history are a known risk factor, however majority of women who are

diagnosed with the cancer, approximately 80% with those who do not have the cancer. Only 5% to 10% of cases are considered hereditary. This highlighted the importance of comprehensive educational efforts regardless of family history (Coryell Health, 2022, National Breast Cancer Foundation, 2025 & World Health Organization, 2024).

Table 5: Independent t-test Analysis

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						P			Lower	Upper
Gender and BCKmean	Equal variances assumed	0.002	0.965	-4.837	259	0.000	-0.56736	0.11730	-0.79835	-0.33637
Family history and BCKmean		0.214	0.644	-0.259	259	0.796	-0.03541	0.13676	-0.30472	0.23390

5. Conclusion

In conclusion, this study identified key gaps in breast cancer knowledge among the public university students in Selangor, highlighting significant gender differences in awareness levels. Thus, these findings underscore the need for more inclusive breast cancer awareness strategies, particularly aimed at increasing awareness among male students. While there is no disparity found based on family history, the result emphasized that personal experience itself may not be sufficient for fostering better understanding.

Recommendations

Based on the findings, several alternatives can be proposed to improve the understanding of breast cancer. While keeping up with promoting early assessment on breast health and prevention, efforts should be made to raise awareness of male breast cancer. In 2025, it was reported by the American Cancer Society that around 2,800 men are expected to be diagnosed with breast cancer, and 510 of them will die due to the disease. Due to the lack of research being done on male breast cancer, it should be highlighted in future studies to create better awareness not only for females, but also for males and the community. (breast cancer research foundation, 2025). In addition, it can be suggested that future studies introduce game-based learning to capture the community's attention and raise awareness of breast cancer. While maintaining the channels through physical booths and social media, future studies may start to introduce the concept into learning about cancer, since it is more engaging and easily accessible for the community to explore. Game-based learning is a game concept that includes entertainment and fun ways to be applied in a reality scenario. In a healthcare setting, it has been implemented in the area of diabetes and cardiovascular disorders. (poliani et al., 2023). By addressing these limitations and implementing the recommendations, future research and public health initiatives can better address the gaps in breast cancer knowledge and promote greater awareness and early detection of the disease.

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