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# Knowledge, Attitudes and Practices Toward Breast Cancer Among Nursing and Midwifery Students at the University of Health Sciences, Cambodia

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## Abstract

# Background

Breast cancer is the most commonly diagnosed cancer among Cambodian women, with an estimated 2,116 new cases and 917 deaths in 2022. Nurses and midwives deliver most primary care in Cambodia, yet evidence on the knowledge, attitudes and practices (KAP) of students in these professions toward breast cancer is lacking. This study assessed breast cancer KAP among nursing and midwifery students in Cambodia.

# Methods

A cross-sectional online survey was conducted in November 2024 among 705 students enrolled in four nursing and midwifery programmes at the University of Health Sciences, Phnom Penh. A structured, self-administered 50-item questionnaire assessed knowledge (25 items), attitudes (16 items) and breast self-examination (BSE) practice (3 items). Data were analysed using Pearson's chi-square tests, Welch two-sample t-tests, one-way analysis of variance and Pearson correlation.

# Results

Overall, 73.3% of students had adequate knowledge, 99.7% held positive attitudes and 85.2% were classified as having good BSE practice. Knowledge, attitude and practice scores differed significantly by year of study ($p < 0.001$), with mean knowledge scores increasing from 13.9 in Year 1 to 19.7 in Year 4. Knowledge and attitude scores did not differ between programmes, whereas midwifery students more often reported practising BSE than nursing students (88.2% vs. 66.4%, $p < 0.001$). Only 45.1% had heard of mammography and 56.3% recognised a painless lump as a warning sign, while 48.1% believed that breast cancer is fatal for all patients. Knowledge correlated moderately with attitude ($r = 0.425$) and practice ($r = 0.400$) (both $p < 0.001$).

# Conclusions

Nursing and midwifery students held favourable attitudes toward early detection, but important gaps persisted in mammography awareness, recognition of a painless lump as a warning sign and identification of hormonal and lifestyle risk factors. Integrating structured breast health education, including clinical breast examination skills, early in pre-service curricula may strengthen the capacity of this workforce to support early detection of breast cancer in Cambodia.

## Introduction

Breast cancer remains the most common cancer among women globally, with 2.3 million new cases and 670,000 deaths recorded worldwide [1]. Across Asia, approximately 985,817 new cases and 315,309 deaths are reported annually [2]. Although incidence rates are comparable between developed and developing regions, mortality is disproportionately higher in low- and middle-income countries, largely due to late diagnosis and limited access to treatment [1, 3].

In Cambodia, breast cancer is the most commonly diagnosed cancer among women, accounting for almost 20% of all new cancer cases in women [4, 5]. Cambodia also has one of the highest breast cancer burdens and mortality rates in Asia [6]. Systemic barriers, including the absence of a national screening programme, limited diagnostic infrastructure, financial constraints, cultural stigma and low public awareness, impede early detection and timely treatment in this resource-limited setting [7–9]. A recent analysis of the 2021–2022 Cambodia Demographic and Health Survey (CDHS) found that only 10.9% of women aged 15–49 years had ever had their breasts examined by a health provider [9].

Regular screening and early identification are central to effective cancer prevention and care [10].. Breast self-examination (BSE) is a simple, low-cost component of breast awareness that enables women to identify abnormalities and seek clinical assessment. Our earlier work found that BSE awareness was low among rural Cambodian women, with fewer than half of participants familiar with the practice [11]. A subsequent study of rural and urban women confirmed that approximately half had never performed BSE [12]. Among those who reported performing BSE in the past 12 months, only about 20% did so consistently once per month as recommended [12]. Limited knowledge and awareness contribute directly to inadequate BSE practice and delayed detection, with serious consequences for survival [13]. Education and regular breast self-awareness practices promote earlier presentation and improve outcomes [14]. Nevertheless, many Cambodian women remain unaware of the importance of BSE and have never been counselled about it by a health professional.

These evidenced highlight a critical public health gap which Cambodia also facing the healthcare workers shortage across the country [15]. Nurses and midwives play a central role in community engagement and health promotion both globally and in Cambodia [16]. In rural and remote areas, primary healthcare is delivered predominantly by nurses and midwives, who are often the first point of contact for health education and disease prevention. Their knowledge and skills regarding breast cancer therefore have direct implications for patient education, timely referral and community-level early detection. Nursing and midwifery students represent the future frontline of this workforce, yet, to our knowledge, no published study has examined their breast cancer KAP in Cambodia.

This study therefore aimed to assess KAP toward breast cancer among nursing and midwifery students at the University of Health Sciences, to compare KAP by programme and year of study, and to examine the relationships between knowledge, attitudes and practices. Findings are interpreted in light of regional evidence to inform nursing and midwifery education in low-resource settings.

## Materials and Methods

# Study design and setting

This cross-sectional study was conducted at the Technical School for Medical Care (TSMC), University of Health Sciences (UHS), Phnom Penh, Cambodia. Data were collected from 8 to 23 November 2025.

## Participants

The target population comprised all students enrolled in four programmes: Bachelor of Science in Nursing (BSN, n = 682), Associate Degree in Nursing (ADN, n = 844), Bachelor of Science in Midwifery (BSM, n = 258) and Associate Degree in Midwifery (ADM, n = 233) during the 2024–2025 academic year (total: 2,017 students). Convenience sampling was used. Of the 739 students who responded (response rate 36.6%), 9 declined consent and 25 were excluded because of incomplete responses, yielding a final analytical sample of 705 (553 nursing [BSN and ADN] and 152 midwifery [BSM and ADM] students).

## Instrument

A structured, self-administered questionnaire of 50 closed-ended items was adapted from existing literature [17–19] and translated into Khmer by the research team. To ensure translation accuracy, the questionnaires was reviewed by bilingual nursing students and a faculty advisor (see Supplementary file). The instrument comprised four sections: (i) socio-demographic characteristics (6 items); (ii) knowledge toward breast cancer (25 items covering risk factors, signs and symptoms, BSE technique, and early detection); (iii) attitudes toward breast cancer (16 items); and (iv) BSE practice (3 items).

Knowledge was scored as the percentage of correct responses (0 = incorrect or 'don't know'; 1 = correct) and categorized as poor (< 40%), moderate (40–70%) or good (> 70%) [17, 18]. For comparative analyses, knowledge was further classified as adequate (moderate or good) or inadequate (poor). Attitude items were rated on a three-point scale (agree, uncertain, disagree), with five negatively worded items reverse-scored. Total attitude scores were classified as positive (≥ 70%) or negative (< 70%); internal consistency of the attitude scale was acceptable (Cronbach's $\alpha = 0.812$). Practice was scored as the number of correct responses (range 0–3) and classified as good (≥ 70%) or poor (< 70%) [19].

## Data collection and analysis

The questionnaire was administered as a Google Form and distributed via Telegram through class monitors. Responses were exported to Microsoft Excel for cleaning and analysed in R. Categorical variables were summarised as frequencies and percentages and continuous variables as means and standard deviations (SD). Pearson’s chi-square tests compared item responses and KAP levels between nursing and midwifery students. Welch two-sample t-tests compared mean KAP scores between programmes, and one-way analysis of variance (ANOVA) compared mean scores across years of study.

Pearson correlation coefficients assessed relationships between knowledge, attitude and practice scores. A two-sided p-value < 0.05 was considered statistically significant.

## Results

# Socio-demographic characteristics

Of the 705 participants, 83% were female and 17% were male; all midwifery students were female, whereas 21% of nursing students were male. The mean age was 20.15 years (SD = 1.35). Most participants were single (99.6%). Midwifery students comprised 21.6% (n = 152) and nursing students 78.4% (n = 553) of the participants. One-third were in Year 3 (33.3%). Only 6.4% reported a family history of breast cancer **(**Table 1**).**

Table 1
Socio-demographic characteristics (N = 705)

| **Characteristic** | **Overall** **N = 705[1]** | **Midwifery** **N = 152[1]** | **Nursing** **N = 553[1]** |
|---|---|---|---|
| **Age**, mean (SD) | 20.15 (1.35) | 20.38 (1.33) | 20.08 (1.35) |
| **Sex**, n (%) | | | |
| Female | 588 (83%) | 152 (100%) | 436 (79%) |
| Male | 117 (17%) | 0 (0%) | 117 (21%) |
| **Year**, n (%) | | | |
| Year 1 | 185 (26%) | 28 (18%) | 157 (28%) |
| Year 2 | 200 (28%) | 50 (33%) | 150 (27%) |
| Year 3 | 235 (33%) | 52 (34%) | 183 (33%) |
| Year 4 | 85 (12%) | 22 (14%) | 63 (11%) |
| **Marital Status**, n (%) | | | |
| Married | 3 (0.4%) | 1 (0.7%) | 2 (0.4%) |
| Single | 702 (100%) | 151 (99%) | 551 (100%) |
| **Family Hx BC**, n (%) | 45 (6.4%) | 10 (6.6%) | 35 (6.3%) |

## Knowledge toward breast cancer

Knowledge of risk factors varied (Table 2). The risk factors most often recognised were older age (71.3%), early radiation exposure (69.1%) and smoking (58.9%). Fewer participants recognised a history

of benign breast tumour (41.1%), oral contraceptive use (42.6%) or alcohol use (47.7%) as risk factors. Around half recognised early menarche or late menopause (53.0%), heredity (55.2%) and not breastfeeding (54.3%). Uncertainty was highest for long-term hormone replacement therapy (33.8% "don't know") and oral contraceptive use (30.9%).

Table 2
Knowledge of breast cancer (N = 705)

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **Older age is a risk factor** | | | | 0.9 |
| Don't Know | 86 (12%) | 17 (11%) | 69 (12%) | |
| No | 116 (16%) | 24 (16%) | 92 (17%) | |
| Yes | 503 (71%) | 111 (73%) | 392 (71%) | |
| **History of benign tumour increases risk** | | | | 0.12 |
| Don't Know | 105 (15%) | 16 (11%) | 89 (16%) | |
| No | 310 (44%) | 76 (50%) | 234 (42%) | |
| Yes | 290 (41%) | 60 (39%) | 230 (42%) | |
| **Breast cancer is hereditary** | | | | 0.5 |
| Don't Know | 90 (13%) | 20 (13%) | 70 (13%) | |
| No | 226 (32%) | 54 (36%) | 172 (31%) | |
| Yes | 389 (55%) | 78 (51%) | 311 (56%) | |
| **Menopause / early menarche increases risk** | | | | 0.8 |
| Don't Know | 191 (27%) | 39 (26%) | 152 (27%) | |
| No | 140 (20%) | 29 (19%) | 111 (20%) | |
| Yes | 374 (53%) | 84 (55%) | 290 (52%) | |
| **Not breastfeeding increases risk** | | | | **< 0.001** |
| Don't Know | 127 (18%) | 9 (5.9%) | 118 (21%) | |
| No | 195 (28%) | 25 (16%) | 170 (31%) | |
| Yes | 383 (54%) | 118 (78%) | 265 (48%) | |
| **Oral contraceptive use increases risk** | | | | **0.004** |
| Don't Know | 218 (31%) | 32 (21%) | 186 (34%) | |
| No | 187 (27%) | 53 (35%) | 134 (24%) | |
| Yes | 300 (43%) | 67 (44%) | 233 (42%) | |

[2]Pearson's Chi-squared test

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **Long-term hormone replacement therapy increases risk** | | | | **< 0.001** |
| Don't Know | 238 (34%) | 40 (26%) | 198 (36%) | |
| No | 70 (9.9%) | 33 (22%) | 37 (6.7%) | |
| Yes | 397 (56%) | 79 (52%) | 318 (58%) | |
| **Smoking increases risk** | | | | 0.8 |
| Don't Know | 142 (20%) | 32 (21%) | 110 (20%) | |
| No | 148 (21%) | 34 (22%) | 114 (21%) | |
| Yes | 415 (59%) | 86 (57%) | 329 (59%) | |
| **Alcohol use increases risk** | | | | **0.020** |
| Don't Know | 175 (25%) | 28 (18%) | 147 (27%) | |
| No | 194 (28%) | 54 (36%) | 140 (25%) | |
| Yes | 336 (48%) | 70 (46%) | 266 (48%) | |
| **Early radiation exposure increases risk** | | | | 0.8 |
| Don't Know | 141 (20%) | 30 (20%) | 111 (20%) | |
| No | 77 (11%) | 19 (13%) | 58 (10%) | |
| Yes | 487 (69%) | 103 (68%) | 384 (69%) | |
| **Painful breast lump** | | | | 0.9 |
| Don't Know | 62 (8.8%) | 12 (7.9%) | 50 (9.0%) | |
| No | 101 (14%) | 21 (14%) | 80 (14%) | |
| Yes | 542 (77%) | 119 (78%) | 423 (76%) | |
| **Painless breast lump** | | | | **0.034** |
| Don't Know | 126 (18%) | 21 (14%) | 105 (19%) | |
| No | 182 (26%) | 51 (34%) | 131 (24%) | |
| Yes | 397 (56%) | 80 (53%) | 317 (57%) | |
| **Axillary lymph node swelling** | | | | 0.090 |
| Don't Know | 97 (14%) | 13 (8.6%) | 84 (15%) | |

[2]Pearson's Chi-squared test

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| No | 84 (12%) | 17 (11%) | 67 (12%) | |
| Yes | 524 (74%) | 122 (80%) | 402 (73%) | |
| **Orange-peel skin texture** | | | | 0.2 |
| Don't Know | 111 (16%) | 18 (12%) | 93 (17%) | |
| No | 54 (7.7%) | 15 (9.9%) | 39 (7.1%) | |
| Yes | 540 (77%) | 119 (78%) | 421 (76%) | |
| **Redness / inflammation / ulceration** | | | | 0.14 |
| Don't Know | 96 (14%) | 14 (9.2%) | 82 (15%) | |
| No | 67 (9.5%) | 18 (12%) | 49 (8.9%) | |
| Yes | 542 (77%) | 120 (79%) | 422 (76%) | |
| **Nipple retraction or inversion** | | | | **0.001** |
| Don't Know | 115 (16%) | 22 (14%) | 93 (17%) | |
| No | 94 (13%) | 34 (22%) | 60 (11%) | |
| Yes | 496 (70%) | 96 (63%) | 400 (72%) | |
| **Bloody nipple discharge** | | | | 0.5 |
| Don't Know | 128 (18%) | 23 (15%) | 105 (19%) | |
| No | 68 (9.6%) | 17 (11%) | 51 (9.2%) | |
| Yes | 509 (72%) | 112 (74%) | 397 (72%) | |
| **Knows what BSE is** | | | | **0.012** |
| Don't Know | 53 (7.5%) | 8 (5.3%) | 45 (8.1%) | |
| No | 47 (6.7%) | 3 (2.0%) | 44 (8.0%) | |
| Yes | 605 (86%) | 141 (93%) | 464 (84%) | |
| **BSE recommended monthly** | | | | 0.8 |
| Don't Know | 46 (6.5%) | 9 (5.9%) | 37 (6.7%) | |
| No | 34 (4.8%) | 6 (3.9%) | 28 (5.1%) | |
| Yes | 625 (89%) | 137 (90%) | 488 (88%) | |

[2]Pearson's Chi-squared test

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **BSE on day 7 post-menstruation** | | | | 0.14 |
| Don't Know | 143 (20%) | 24 (16%) | 119 (22%) | |
| No | 50 (7.1%) | 8 (5.3%) | 42 (7.6%) | |
| Yes | 512 (73%) | 120 (79%) | 392 (71%) | |
| **BSE performed in front of a mirror** | | | | 0.6 |
| Don't Know | 55 (7.8%) | 9 (5.9%) | 46 (8.3%) | |
| No | 70 (9.9%) | 17 (11%) | 53 (9.6%) | |
| Yes | 580 (82%) | 126 (83%) | 454 (82%) | |
| **Fingers used during BSE** | | | | 0.5 |
| Don't Know | 36 (5.1%) | 5 (3.3%) | 31 (5.6%) | |
| No | 18 (2.6%) | 4 (2.6%) | 14 (2.5%) | |
| Yes | 651 (92%) | 143 (94%) | 508 (92%) | |
| **Breast cancer curable if detected early** | | | | 0.3 |
| Don't Know | 76 (11%) | 11 (7.2%) | 65 (12%) | |
| No | 17 (2.4%) | 3 (2.0%) | 14 (2.5%) | |
| Yes | 612 (87%) | 138 (91%) | 474 (86%) | |
| **Early detection increases cure rate** | | | | 0.4 |
| Don't Know | 45 (6.4%) | 7 (4.6%) | 38 (6.9%) | |
| No | 13 (1.8%) | 4 (2.6%) | 9 (1.6%) | |
| Yes | 647 (92%) | 141 (93%) | 506 (92%) | |
| **Has heard of mammography** | | | | 0.6 |
| Don't Know | 70 (9.9%) | 12 (7.9%) | 58 (10%) | |
| No | 317 (45%) | 69 (45%) | 248 (45%) | |
| Yes | 318 (45%) | 71 (47%) | 247 (45%) | |

[1]n (%)

[2]Pearson's Chi-squared test

The two programmes differed on four risk factor items. Midwifery students were more likely than nursing students to identify not breastfeeding as a risk factor (77.6% vs. 47.9%, $p < 0.001$). Nursing students more often answered "don't know" about oral contraceptive use (33.6% vs. 21.1%, $p = 0.004$), alcohol use (26.6% vs. 18.4%, $p = 0.020$) and hormone replacement therapy (35.8% vs. 26.3%, $p < 0.001$).

Most participants recognised the warning signs of breast cancer, including redness or ulceration (76.9%), orange-peel skin texture (76.6%), axillary lymph node swelling (74.3%), bloody nipple discharge (72.2%) and nipple retraction (70.4%). A painful breast lump was identified as a warning sign by 76.9% of participants, whereas only 56.3% recognised a painless lump, and 25.8% considered a painless lump not to be a warning sign. Responses differed by programme for painless lump ($p = 0.034$) and nipple retraction ($p = 0.001$). For both items, midwifery students more often answered "no".

Knowledge of BSE was high. Most participants knew what BSE is (85.8%), that it is recommended monthly (88.7%), that it should be done in front of a mirror (82.3%) and that it is done with the fingers (92.3%). Fewer knew that BSE is best done around day 7 after menstruation (72.6%). Midwifery students more often reported knowing what BSE is (92.8% vs. 83.9%, $p = 0.012$). Most participants agreed that breast cancer is curable if detected early (86.8%) and that early detection improves cure rates (91.8%). In contrast, only 45.1% had heard of mammography.

## Attitudes toward breast cancer

Attitudes toward early detection were generally positive (Table 3). Most participants agreed that women should examine their breasts regularly (93.5%), that early detection makes treatment easier (92.2%), that they wanted to detect health problems early (90.2%) and that BSE is necessary for women aged 20 years and older (87.4%). Self-efficacy was comparatively lower. About three quarters felt confident performing BSE correctly (74.0%) or knew the steps involved (72.8%), and 67.1% felt they could tell normal from abnormal breast tissue.

Table 3
Attitudes towards breast cancer (N = 705)

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **Early detection makes treatment easier** | | | | 0.6 |
| Agree | 650 (92%) | 137 (90%) | 513 (93%) | |
| Disagree | 4 (0.6%) | 1 (0.7%) | 3 (0.5%) | |
| Uncertain | 51 (7.2%) | 14 (9.2%) | 37 (6.7%) | |
| **BSE is necessary for women aged > = 20 years** | | | | 0.052 |
| Agree | 616 (87%) | 134 (88%) | 482 (87%) | |
| Disagree | 24 (3.4%) | 9 (5.9%) | 15 (2.7%) | |
| Uncertain | 65 (9.2%) | 9 (5.9%) | 56 (10%) | |
| **Mammography is important for early detection** | | | | 0.4 |
| Agree | 558 (79%) | 126 (83%) | 432 (78%) | |
| Disagree | 24 (3.4%) | 4 (2.6%) | 20 (3.6%) | |
| Uncertain | 123 (17%) | 22 (14%) | 101 (18%) | |
| **I always seek BSE information (internet/books)** | | | | 0.10 |
| Agree | 559 (79%) | 130 (86%) | 429 (78%) | |
| Disagree | 25 (3.5%) | 4 (2.6%) | 21 (3.8%) | |
| Uncertain | 121 (17%) | 18 (12%) | 103 (19%) | |
| **Women should perform regular breast examinations** | | | | > 0.9 |
| Agree | 659 (93%) | 143 (94%) | 516 (93%) | |
| Disagree | 9 (1.3%) | 2 (1.3%) | 7 (1.3%) | |
| Uncertain | 37 (5.2%) | 7 (4.6%) | 30 (5.4%) | |
| **I am confident I can perform BSE correctly** | | | | **0.031** |
| Agree | 522 (74%) | 124 (82%) | 398 (72%) | |
| Disagree | 20 (2.8%) | 5 (3.3%) | 15 (2.7%) | |
| Uncertain | 163 (23%) | 23 (15%) | 140 (25%) | |

[2]Pearson's Chi-squared test

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **I know the steps involved in BSE** | | | | 0.052 |
| Agree | 513 (73%) | 122 (80%) | 391 (71%) | |
| Disagree | 20 (2.8%) | 2 (1.3%) | 18 (3.3%) | |
| Uncertain | 172 (24%) | 28 (18%) | 144 (26%) | |
| **I can distinguish normal from abnormal breast tissue** | | | | 0.5 |
| Agree | 473 (67%) | 106 (70%) | 367 (66%) | |
| Disagree | 35 (5.0%) | 5 (3.3%) | 30 (5.4%) | |
| Uncertain | 197 (28%) | 41 (27%) | 156 (28%) | |
| **I can notice breast changes in the mirror** | | | | 0.7 |
| Agree | 574 (81%) | 127 (84%) | 447 (81%) | |
| Disagree | 28 (4.0%) | 6 (3.9%) | 22 (4.0%) | |
| Uncertain | 103 (15%) | 19 (13%) | 84 (15%) | |
| **I want to detect health problems as early as possible** | | | | 0.8 |
| Agree | 636 (90%) | 138 (91%) | 498 (90%) | |
| Disagree | 7 (1.0%) | 2 (1.3%) | 5 (0.9%) | |
| Uncertain | 62 (8.8%) | 12 (7.9%) | 50 (9.0%) | |
| **I check my health regularly even when not ill** | | | | 0.14 |
| Agree | 563 (80%) | 129 (85%) | 434 (78%) | |
| Disagree | 23 (3.3%) | 2 (1.3%) | 21 (3.8%) | |
| Uncertain | 119 (17%) | 21 (14%) | 98 (18%) | |
| **Breast cancer is fatal for all patients [R]** | | | | **0.035** |
| Agree | 339 (48%) | 87 (57%) | 252 (46%) | |
| Disagree | 153 (22%) | 29 (19%) | 124 (22%) | |
| Uncertain | 213 (30%) | 36 (24%) | 177 (32%) | |
| **I feel afraid just thinking about breast cancer [R]** | | | | 0.2 |
| Agree | 550 (78%) | 124 (82%) | 426 (77%) | |

[2]Pearson's Chi-squared test

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| Disagree | 57 (8.1%) | 14 (9.2%) | 43 (7.8%) | |
| Uncertain | 98 (14%) | 14 (9.2%) | 84 (15%) | |
| **I would feel ashamed if diagnosed with breast cancer [R]** | | | | 0.3 |
| Agree | 283 (40%) | 55 (36%) | 228 (41%) | |
| Disagree | 261 (37%) | 65 (43%) | 196 (35%) | |
| Uncertain | 161 (23%) | 32 (21%) | 129 (23%) | |
| **I do not need BSE if I have no symptoms [R]** | | | | 0.3 |
| Agree | 195 (28%) | 44 (29%) | 151 (27%) | |
| Disagree | 371 (53%) | 85 (56%) | 286 (52%) | |
| Uncertain | 139 (20%) | 23 (15%) | 116 (21%) | |
| **Traditional medicine is best if a lump is found [R]** | | | | 0.12 |
| Agree | 141 (20%) | 33 (22%) | 108 (20%) | |
| Disagree | 425 (60%) | 98 (64%) | 327 (59%) | |
| Uncertain | 139 (20%) | 21 (14%) | 118 (21%) | |
| [1]n (%) | | | | |
| [2]Pearson's Chi-squared test | | | | |

On the reverse-scored items, 78.0% said they felt afraid when thinking about breast cancer, 48.1% agreed that breast cancer is fatal for all patients and 40.1% said they would feel ashamed if diagnosed. In addition, 27.7% believed BSE was unnecessary without symptoms, and 20.0% preferred traditional medicine if a lump was found. The programmes differed on two attitude items. Midwifery students more often felt confident performing BSE (81.6% vs. 72.0%, $p = 0.031$) and more often agreed that breast cancer is fatal for all patients (57.2% vs. 45.6%, $p = 0.035$).

# Practice of breast self-examination

Overall, 86.8% of participants had heard of BSE, 71.1% reported practising it and 86.1% knew the correct timing (Table 4). Midwifery students were more likely than nursing students to practise BSE (88.2% vs. 66.4%, $p < 0.001$) and to know the correct timing (92.1% vs. 84.4%, $p = 0.022$).

Table 4
Breast self-examination practice (N = 705)

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **Heard of BSE** | 612 (87%) | 138 (91%) | 474 (86%) | 0.13 |
| **Practice of BSE** | 501 (71%) | 134 (88%) | 367 (66%) | < 0.001 |
| **Correct timing knowledge** | 607 (86%) | 140 (92%) | 467 (84%) | 0.022 |

[1]*n (%); Mean (SD)*

[2]*Pearson's Chi-squared test; Welch Two Sample t-test*

# Overall KAP levels

The mean scores were 17.0 (*SD* = 5.4) for knowledge, 40.3 (*SD* = 3.6) for attitude and 2.44 (*SD* = 0.87) for practice (Table 5). Overall, 73.3% of participants had adequate knowledge, 99.7% had a positive attitude and 85.2% had good practice. Knowledge ($p = 0.3$) and attitude ($p = 0.14$) scores did not differ by programme. Midwifery students had higher practice scores than nursing students (2.71 vs. 2.37, $p < 0.001$) and were more often classified as having good practice (93.4% vs. 83.0%, $p = 0.002$).

Table 5
KAP levels (N = 705)

| Characteristic | Overall N = 705[1] | Midwifery N = 152[1] | Nursing N = 553[1] | p-value[2] |
|---|---|---|---|---|
| **Knowledge Score** | 17.0 (5.4) | 17.4 (5.0) | 16.9 (5.6) | 0.3 |
| **Attitude Score** | 40.3 (3.6) | 40.7 (3.5) | 40.2 (3.7) | 0.14 |
| **Practice Score** | 2.44 (0.87) | 2.71 (0.65) | 2.37 (0.91) | **< 0.001** |
| **Knowledge Level** | | | | 0.7 |
| Adequate | 517 (73%) | 114 (75%) | 403 (73%) | |
| Inadequate | 188 (27%) | 38 (25%) | 150 (27%) | |
| **Attitude Level** | | | | > 0.9 |
| Negative | 2 (0.3%) | 0 (0%) | 2 (0.4%) | |
| Positive | 703 (99.6%) | 152 (100%) | 551 (99.6%) | |
| **Practice Level** | | | | **0.002** |
| Good | 601 (85%) | 142 (93%) | 459 (83%) | |
| Poor | 104 (15%) | 10 (6.6%) | 94 (17%) | |

[1]Mean (SD); n (%)

[2]Welch Two Sample t-test; Pearson's Chi-squared test

# KAP scores by year of study

Knowledge, attitude and practice scores all differed significantly by year of study (all $p < 0.001$; Table 6). Knowledge scores were lowest in Year 1 (13.9, *SD* = 5.0) and highest in Year 4 (19.7, *SD* = 3.3). Attitude scores rose from 39.3 (*SD* = 3.7) in Year 1 to 41.8 (*SD* = 3.9) in Year 4. Practice scores were lowest in Year 1 (2.09, *SD* = 1.06), peaked in Year 2 (2.60, *SD* = 0.70) and stayed similar in Years 3 (2.57) and 4 (2.49).

Table 6
Comparison of KAP scores by year of study (N = 705)

| Characteristic | Overall N = 705[1] | Year 1 N = 185[1] | Year 2 N = 200[1] | Year 3 N = 235[1] | Year 4 N = 85[1] | p-value[2] |
|---|---|---|---|---|---|---|
| **Knowledge Score** | 17.0 (5.4) | 13.9 (5.0) | 18.1 (4.7) | 17.5 (5.9) | 19.7 (3.3) | < 0.001 |
| **Attitude Score** | 40.3 (3.6) | 39.3 (3.7) | 40.5 (3.1) | 40.4 (3.7) | 41.8 (3.9) | < 0.001 |
| **Practice Score** | 2.44 (0.87) | 2.09 (1.06) | 2.60 (0.70) | 2.57 (0.79) | 2.49 (0.81) | < 0.001 |

[1]*Mean (SD)*

[2]*One-way analysis of variance (ANOVA)*

# Correlations among KAP

All three scores were positively correlated (Table 7). Knowledge correlated moderately with attitude ($r$ = 0.425, $p$ < 0.001) and with practice ($r$ = 0.400, $p$ < 0.001). Attitude correlated weakly with practice ($r$ = 0.282, $p$ < 0.001).

Table 7
Pearson correlation matrix of knowledge, attitude, and practice scores

| Variable | Knowledge score | | Attitude score | | Practice score | |
|---|---|---|---|---|---|---|
| | ***r*** | ***p*-value** | ***r*** | ***p*-value** | ***r*** | ***p*-value** |
| **Knowledge score** | — | — | **0.425** | < 0.001 | **0.400** | < 0.001 |
| **Attitude score** | **0.425** | < 0.001 | — | — | **0.282** | < 0.001 |
| **Practice score** | **0.400** | < 0.001 | **0.282** | < 0.001 | — | — |

# Discussion

This cross-sectional study of 705 nursing and midwifery students at public university in Cambodia found that 73.3% had adequate breast cancer knowledge, 99.7% held positive attitudes and 85.2% were classified as having good BSE practice. Knowledge increased markedly with year of study, yet specific gaps persisted in mammography awareness, recognition of a painless lump and several hormonal and lifestyle risk factors.

Global evidence on breast cancer KAP among healthcare students is heterogeneous. A study from Malaysia reported good knowledge in 79.3% of nursing students[20], whereas studies from Pakistan (35% good knowledge)[21] and Egypt (15% good knowledge)[22, 23] reported substantially lower levels. The proportion of students with positive attitudes also varied widely, from 99.7% in the present study to

70.3% in Vietnam[24], 66% in Egypt[23] and only 44.3% in Iran [25]. Community studies in Cambodia have consistently documented low BSE awareness and practice [11, 12], providing the context against which data from training institutions should be interpreted.

Overall knowledge and attitude scores did not differ between nursing and midwifery students, but midwifery students more often reported practising BSE (88.2% vs. 66.4%) and were more often classified as having good practice (93.4% vs. 83.0%). Midwifery students were also more likely to recognise not breastfeeding as a risk factor (77.6% vs. 47.9%) and to feel confident performing BSE (81.6% vs. 72.0%). These differences may reflect the greater emphasis on women's and reproductive health within midwifery curricula and greater exposure to female-centred clinical training. However, because all midwifery students were female whereas 21% of nursing students were male, the difference in BSE practice may partly reflect sex composition rather than programme alone. Curriculum emphasis and clinical exposure in women's health settings have previously been associated with better breast cancer–related KAP [20, 24, 26].

At the item level, differences between programmes were less consistent. Midwifery students more often answered "no" to a painless lump and nipple retraction as warning signs, and more often agreed that breast cancer is fatal for all patients (57.2% vs. 45.6%). This suggests that greater exposure to women's health does not by itself correct specific misconceptions, and that increased knowledge alone may not be sufficient to change attitudes and practices in the absence of structured clinical exposure and targeted preventive training [20, 26]. These results highlight the importance of contextual and educational factors in shaping breast cancer–related behaviours.

Knowledge, attitude and practice scores were positively correlated. Knowledge correlated moderately with both attitude ($r = 0.425$) and practice ($r = 0.400$), whereas the correlation between attitude and practice was weak ($r = 0.282$). The association between knowledge and attitude suggests that a better understanding of breast cancer contributes to more favourable perceptions of prevention and early detection, consistent with previous studies showing that improved knowledge reduces misconceptions and promotes positive attitudes toward screening and BSE [20, 25, 27].

Similarly, the association between knowledge and practice indicates that students with greater knowledge are more likely to perform BSE. Comparable findings have been reported in Cambodia and elsewhere, where lack of knowledge was a key barrier to regular BSE practice [12, 24, 28]. The weaker association between attitude and practice suggests that favourable attitudes do not consistently translate into action, and that self-efficacy and practical skills may be needed to bridge this gap [23]. Because the study was cross-sectional, these correlations do not establish the direction of the relationships.

Beyond the overall scores, several item-level findings are relevant to early detection in Cambodia. Fewer than half of the students (45.1%) had heard of mammography, which likely reflects the absence of an organised breast screening programme and the limited availability of mammography outside a small number of hospitals and private clinics. Only 56.3% recognised a painless lump as a warning sign, a

concerning gap in a setting where women commonly delay seeking care until a lump becomes painful. In addition, 48.1% believed that breast cancer is fatal for all patients, 40.1% would feel ashamed if diagnosed and 20.0% preferred traditional medicine if a lump was found. These beliefs mirror community perceptions in Cambodia, where most patients present at an advanced stage and traditional remedies are often tried before hospital care. The higher proportion of midwifery students who considered breast cancer universally fatal may reflect clinical exposure to women with advanced disease, although this interpretation requires confirmation. Finally, the near-universal positive attitude scores indicate a ceiling effect, suggesting that item-level responses better capture the beliefs that need to be addressed in teaching.

# Implications for nursing and midwifery education

Knowledge was lowest in Year 1 (13.9) and highest in Year 4 (19.7), suggesting that breast health content is acquired during training but unevenly across the programme. A structured breast health module introduced in the first or second year, with practical training in BSE and clinical breast examination using breast models, could address this gap. Teaching should explicitly target the misconceptions identified in this study, including the significance of a painless lump, hormonal and lifestyle risk factors, fatalism and reliance on traditional medicine. As nurses and midwives in health centres routinely see women during antenatal, postnatal and family planning visits, strengthening these competencies before graduation could support earlier detection of breast cancer in primary care.

# Limitation of the study

This study has several limitations. First, the cross-sectional design does not permit causal inference regarding the relationships between knowledge, attitudes and practices. Second, data were self-reported and may be subject to recall and social desirability bias; BSE practice was not observed, and the practice domain comprised only three items that did not capture frequency or technique. Third, male students, for whom BSE timed to the menstrual cycle is not applicable, were included in the practice analysis, and all midwifery students were female, so programme differences in practice may partly reflect sex composition. Fourth, the near-universal positive attitude scores indicate a ceiling effect that limited discrimination between participants. Finally, the study was conducted at a single institution using convenience sampling, with a response rate of 36.6%; students with greater interest in the topic may have been more likely to participate, which limits generalisability to all nursing and midwifery students in Cambodia. Future multi-site studies should include the Regional Training Centres, where many associate degree nurses and midwives are trained.

## Conclusion

Nursing and midwifery students at UHS demonstrated generally favourable KAP toward breast cancer: 73.3% had adequate knowledge, 99.7% held positive attitudes and 85.2% were classified as having good BSE practice. Knowledge, attitudes and practices were positively correlated, and scores improved with year of study. However, important gaps remained, including low awareness of mammography, limited

recognition of a painless lump as a warning sign and of oral contraceptive use and alcohol consumption as risk factors, and persistent fatalistic beliefs and preference for traditional medicine. Integrating structured breast health education and clinical breast examination training early in nursing and midwifery curricula is recommended to prepare this workforce to support early detection of breast cancer in Cambodia.

## Declarations

### Ethics approval and consent to participate

The study received approval from the National Ethics Committee for Health Research (NECHR) on 31st October 2025. Electronic informed consent was obtained from all participants on the first page of the online questionnaire before any questions were displayed. Participation was voluntary, no identifying information was collected, and the study was conducted in accordance with the Declaration of Helsinki.

### Consent for publication

Not Applicable

# Competing interests

The authors declare that they have no competing interests

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# Author Contribution

SK, SR, SV, SS, CS: data curation, validation, formal analysis, investigation and writing of the original draft. DP and RV: conceptualisation, methodology, and writing, review and editing for important intellectual content. All authors read and approved the final manuscript.

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# Data Availability

The datasets used in this study are available from the corresponding author upon reasonable request.

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## Supplementary Files

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- EnglishQuestionnaire.docx