**Knowledge, Practices, and Family Support Regarding Health-Seeking Behavior Among Breast Cancer Patients in Bangladesh**

Introduction:

Methods:

We followed the STROBE guideline for better observational cross-sectional study reporting in epidemiology.

Study sites and study design:

A multi-center retrospective cross-sectional study was conducted in two primary cancer care facilities located in Dhaka the capital of Bangladesh.

Data collection:

Due to the lack of patient registries, a convenience sampling methodology was used. Patients visiting these facilities were potential participants in the study. If they meet study inclusion-exclusion criteria, they are requested to participate in the study. Verbal informed consent was taken before collecting data as per study protocol.

Eligibility criteria

In this study, we surveyed women aged ≥18 years with suspected breast cancer and patients diagnosed with breast cancer referred to our participating centers. These patients will only be included in the study if their initial stage is documented in the medical records or if their initial stage is unavailable but the initial diagnosis is made no more than 6 months before staging at our facilities. Face-to-face interviews with a structured questionnaire were conducted by previously trained interviewers who were not involved in the clinical management of the patients.

Outcome variables:

The study assessed the knowledge and practice of participants towards risk factors and health-seeking behavior of breast cancer. Patients' knowledge and practice regarding risk factors were calculated out of the total knowledge-specific and practice-specific questions. Each accurate response gets one point and zeroes for the incorrect one based on the respondent's response. Finally, the respondents who scored greater than or equal to the mean score were considered to have 'good knowledge', and respondents who scored less than the mean score were considered to have 'low knowledge' 1. There were 7 knowledge and practice assessment questions with a reliability coefficient above 70% respectively which was calculated using Cronbach’s alpha 2.

Possible factors

To find out potential risk factors associated with various types of delays, we examined a range of socioeconomic factors and the medical history of the patients as independent variables. These included the patient's age, geographic location (division), residency (urban or rural), educational attainment (illiterate, primary, and secondary) of both the patient and their spouse, household monthly income, access to portable electronic devices, exposure to mass media, lump breast pain, nipple discharge, skin changes, bone pain, breast self-examination, family history of breast cancer, diagnostic delay, and health-seeking behavior. Diagnosis delay encompasses the period from the patient's first symptom recognition to the commencement of definitive treatment, incorporating both patient and provider delay 3. In this study, a diagnostic delay is typically regarded as exceeding sixteen (16) weeks.

Statistical analysis

We conducted descriptive statistics by crosstabs, presenting counts and percentages to summarise categorical variables. Chi-square tests and Fisher's exact test were employed to investigate factors associated with knowledge and practices. Binary and multivariable logistic regression was utilised to identify associated risk factors. Initially, bivariable analysis assessed the relationship between knowledge and practices with other factors. Univariable (unadjusted) and multivariable (adjusted) logistic regression analyses were then conducted to compare associated risk factors. In the univariable analysis, variables were individually added to the logistic regression model, while in the adjusted model, all possible variables were included simultaneously. Results were reported as unadjusted/crude odds ratios (COR) and adjusted odds ratios (AOR) with their respective 95% confidence intervals and 5% level of significance. All analyses were performed using R software.

Variable selection

Variables were chosen through a two-stage process. Initially, bivariable analysis (chi-square test) was performed individually for each independent variable. A significance threshold of p-value ≤ 0.20 was applied arbitrarily to determine the inclusion of covariates in the multivariable models 4. In the second stage, a comprehensive multivariable model was constructed using the selected predictor variables. Additionally, we assessed multicollinearity in the final model using a cut-off value of 4.00 for the variance inflation factor (VIF) analysis 5. At this stage, all variables were incorporated into the model since the VIF values for each variable were below 4.00.

Model performance

We utilized the Area under the Receiver Operating Characteristic (AUROC) curve, sensitivity, specificity, and the Hosmer–Lemeshow goodness-of-fit test to assess the accuracy of the best model. Higher AUROC values indicated superior model performance. In the ROC curve, a lower p-value suggests that the model effectively discriminates between two categories, with an area under the curve exceeding 0.50 6. The Hosmer–Lemeshow goodness-of-fit test evaluates the similarity between model-estimated probabilities and observed outcomes, typically through a goodness-of-fit test. A Hosmer–Lemeshow goodness-of-fit test with a p-value greater than 0.05 indicates the model's ability to accurately classify observations into outcome categories 7.

Results

Study population

In a study involving 355 participants, it was found that a significant majority had lower level of knowledge and practices regarding breast cancer. Specifically, 64.67% were unaware of the symptoms associated with the condition, while 88.89% did not routinely conduct self-examinations of their breasts. Additionally, 88.79% did not seek medical attention promptly upon noticing potential symptoms. Remarkably, before experiencing any symptoms, 95.21% had not undergone breast examinations by healthcare professionals, and 93.99% were unfamiliar with mammography. Furthermore, a substantial portion, 72.08%, did not have personal connections with individuals who had encountered cancer, and 83.54% had limited prior knowledge about breast cancer. Moreover, familial history of breast cancer was largely overlooked, with 90.48% of participants being unaware of any such occurrences in their families. Notably, the study revealed that 77.46% of patients exhibited low levels of knowledge and practices in preventative practices, as indicated by a mean score of 1 or less (Table 1).

Among the patient cohort examined, the majority, reaching a peak of 58.02%, fell within the age range of 40 to 49 years. Notably, within this age group, 76.67% exhibited lower level of knowledge and practices to breast cancer compared to other age demographics. Geographically, the highest concentration of participants, comprising 43.95%, came from the Dhaka division, with particularly low levels of breast cancer awareness noted in Barisal (84.62%) compared to other divisions. Demographic factors such as rural residence was prevalent, encompassing 72.75% of the sample, and corresponded with lower levels of knowledge (78.09%) compared to their urban counterparts. The marital status of participants also played a role, with 82.75% being married and demonstrating comparatively lower levels of awareness (77.03%) compared to unmarried individuals. Furthermore, a significant proportion of patients exhibited illiteracy (42.86%), correlating with poor knowledge and practices (88.44%), while primary education was predominant among spouses (37.11%), similarly correlating with limited knowledge and practices (81.36%). Financial status emerged as a critical determinant, with over a third of participants reporting a monthly family income of less than 5,000 BDT, signifying the highest figure observed in the study (34.88%) and correlating with poor knowledge and practices (84.96%) compared to their counterparts. Initial healthcare-seeking behaviour varied, with a majority (56.72%) opting for private clinics/hospitals as their first point of contact upon experiencing symptoms, while those who first visited general government hospitals exhibited comparatively higher levels of knowledge and practice (81.54%). Moreover, a notable proportion of patients refrained from utilizing alternative remedies for breast cancer treatment (66.87%), and a considerable portion (44.28%) did not encounter delays in diagnosis and treatment, both groups demonstrating relatively poor knowledge and practices (Table 2).

The majority of patients had access to portable electronic devices like mobile phones (83.38%), smartphones (85.63%), and computers (0.85%). However, a significant portion of mobile phone users (76.69%), smartphone users (74.51%), and all computer users demonstrated low knowledge and practices regarding breast cancer, while the rest showed good understanding and practices. Among all patients using any portable devices (89.86%), a considerable proportion (75.86%) had low knowledge and practices. Additionally, only a small percentage had access to social media (0.85%), television (39.15%), and newspapers (6.20%), with a high prevalence of low knowledge and practices among users in each category. When considering access to any form of mass media, 40.56% of patients had such access, but a significant majority (75.69%) exhibited low knowledge and practices (Table 2).

Table 3 presents the medical history of the patients. The majority (88.45%) of them identified lump symptoms as their initial clinical presentation indicative of breast cancer. Among these patients, 95.12% exhibited low knowledge and practices regarding breast cancer. Other symptoms reported included breast pain (26.20%), nipple discharge (5.63%), skin changes (4.23%), bone pain (3.38%), and various other symptoms (11.83%), all identified as potential signs of breast cancer. However, among patients presenting with these symptoms, varying percentages exhibited low levels of knowledge and practices: breast pain (74.19%), nipple discharge (80.00%), skin changes (73.33%), bone pain (50.00%), and other symptoms (78.57%). Additionally, 92.11% of patients experienced some form of symptoms, with 75.84% demonstrating low levels of knowledge and practice. The majority of patients sought their first checkup at a medical facility when their cancer was in stage II (48.82%), followed by stage III (44.09%). A smaller percentage visited during stages I (3.94%) and IV (3.15%). Notably, a significant proportion of patients in stage III exhibited lower levels of knowledge and practice (8.36%), followed by those in stage II (70.97%). Most patients reported experiencing discomfort in the breast (52.06%), followed by the presence of a lump (45.86%), discomfort in the arm (34.81%), itching (33.82%), changes in breast shape (31.36%), skin changes (12.72%), nipple discharge (12.13%), and ulcer or sore skin (11.5%). Regarding knowledge and practices, patients experiencing arm pain exhibited low levels (77.38%), followed by those with changes in breast shape (76.42%), a lump (76.13%), itching (75.65%), and breast pain (74.01%).

The findings from Table 4 regarding family support reveal that the majority of patients initially discussed breast cancer symptoms with their husbands (54.55%), and among them, 75.27% exhibited low levels of knowledge and practices. Interestingly, patients who first discussed symptoms with their mothers showed the lowest level of low knowledge and practices. Husbands recommended consulting a doctor to 40.88% of patients, and among them, 74.82% demonstrated low levels of knowledge and practices. However, patients who received recommendations from others to consult with a doctor exhibited the lowest knowledge and practices at 83.72%. Although 81.05% of patients expressed no fear or discomfort in discussing the problem with their spouse, they still showed a high prevalence of low knowledge and practices at 77.92%. Patients receiving support from their spouses and social circles accounted for 83.63% and 70.46%, respectively, with knowledge and practice levels at 75.74% and 75.11%.

The proportions of patients expressing no fear or discomfort in discussing their health problems with their spouse varied across districts: 68.18% in Barisal, 86.96% in Chittagong, 76.42% in Dhaka, 96.77% in Khulna, 79.31% in Mymensingh, 80.00% in Rajshahi, 100.00% in Rangpur, and 75.00% in Sylhet. Additionally, percentages of patients receiving support from their spouse after diagnosis also varied: 77.27% in Barisal, 93.48% in Chittagong, 80.00% in Dhaka, 83.87% in Khulna, 96.55% in Mymensingh, 80.00% in Rajshahi, 76.92% in Rangpur, and 75.00% in Sylhet. Furthermore, proportions of patients receiving support from their social circle varied across districts: 56.00% in Barisal, 84.62% in Chittagong, 70.21% in Dhaka, 74.29% in Khulna, 58.06% in Mymensingh, 57.89% in Rajshahi, 78.57% in Rangpur, and 100.00% in Sylhet (Figure 1).

Table S1 outlines the prevalence and risk factors associated with knowledge and practice, as determined by the unadjusted logistic regression model. Notably, among the evaluated risk factors, significant contributions were observed from the patient's geographic location, education level, spouse's education level, household monthly income, alternative remedies, any diagnosis delay, access to portable electronic devices, and access to newspapers. Additionally, the medical history of patients, including their identified history of lump, bone pain, presence of any symptoms, cancer stage, and experience of discomfort in arm pain, exhibited significant associations with patients’ knowledge and practice, as indicated in Table S2. Family support factors such as the initial person patients confided in about their health problem and the person recommended to consult with a doctor also showed significant associations with patients' knowledge and practices, as outlined in Table S3. All these variables were incorporated into the adjusted logistic regression model.

In the adjusted analysis, several factors were found to be significantly associated with patient knowledge and practice. These included the patient's geographic location, education level, household monthly income, use of alternative remedies, presence of any diagnosis delay, history of lump and bone pain, cancer stage, and the person they first confided in about their health problem, as well as who recommended them to consult with a doctor. Upon further examination using adjusted logistic regression model, it was noted that patients from Rangpur had nearly five times higher odds of knowledge and practice (Adjusted Odds Ratio [AOR]: 5.56, 95% Confidence Interval [CI]: 1.54-9.50; P-value=0.045) compared to those from Barisal. Illiterate patients exhibited 87% lower odds of knowledge and practice (AOR: 0.13, 95% CI: 0.03-0.53, P-value<0.001) compared to those with secondary/higher education levels. Patients with a household monthly income <5000 had 53% lower odds of knowledge and practice (AOR: 0.47, 95% CI: 0.16-0.74, P-value=0.049) compared to those with a monthly income >20000. Furthermore, patients who used alternative remedies and experienced any diagnosis delay showed lower odds of knowledge and practice compared to their counterparts. Conversely, patients with a history of lump and bone pain exhibited higher odds of knowledge and practice. Stage-III patients had lower odds of knowledge and practice (AOR: 0.15, 95% CI: 0.10-0.56, P-value=0.009) compared to Stage-IV patients. Patients who first talked with their son or daughter had 4.55 times higher odds of knowledge and practices (AOR: 4.55, 95% CI: 1.68-7.56, P-value=0.012) than those who confided in someone else. Moreover, patients recommended by themselves had 6.54 times higher odds, while those recommended by their husbands had 2.78 times higher odds of knowledge and practices compared to those recommended by others to consult with a doctor.

The adjusted model utilized in this study demonstrated a good fit as it successfully passed the Hosmer and Lemeshow goodness-of-fit test. Furthermore, the classification accuracy was deemed acceptable, with AUC values of 80.97%, as shown in Tables 6 and Figure 2.

References

1 Mehiret G, Molla A, Tesfaw A. Knowledge on risk factors and practice of early detection methods of breast cancer among graduating students of Debre Tabor University, Northcentral Ethiopia. *BMC Womens Health* 2022; **22**. DOI:10.1186/S12905-022-01768-0.

2 Tavakol M, Dennick R. Making sense of Cronbach’s alpha. *Int J Med Educ* 2011; **2**: 53.

3 Harris M, Thulesius H, Neves AL, *et al.* How European primary care practitioners think the timeliness of cancer diagnosis can be improved: a thematic analysis. *BMJ Open* 2019; **9**: e030169.

4 Hasan MN, Abdul Baker Chowdhury M, Jahan J, Jahan S, Ahmed NU, Uddin MJ. Cesarean delivery and early childhood diseases in Bangladesh: An analysis of Demographic and Health Survey (BDHS) and Multiple Indicator Cluster Survey (MICS). *PLoS One* 2020; **15**: e0242864.

5 Hasan MN, Babu MR, Chowdhury MAB, *et al.* Early childhood developmental status and its associated factors in Bangladesh: a comparison of two consecutive nationally representative surveys. *BMC Public Health* 2023; **23**: 1–13.

6 Hasan MN, Tambuly S, Trisha KF, Haque MA, Chowdhury MAB, Uddin MJ. Knowledge of HIV/AIDS among married women in Bangladesh: analysis of three consecutive multiple indicator cluster surveys (MICS). *AIDS Res Ther* 2022; **19**: 1–10.

7 Islam MA, Hasan MN, Ahammed T, *et al.* Association of household fuel with acute respiratory infection (ARI) under-five years children in Bangladesh. *Front Public Health* 2022; **10**: 985445.

Tables

Table 1: Frequency distribution of patients’ knowledge and practice

|  |  |  |  |
| --- | --- | --- | --- |
|  | Variables | Frequency | Percentage (%) |
| K1 | Do you know the symptoms of breast cancer? |  |  |
|  | Yes | 118 | 35.33 |
|  | No | 216 | 64.67 |
| P1 | Did you usually check your breasts for any symptoms? |  |  |
|  | Yes | 37 | 11.11 |
|  | No | 296 | 88.89 |
| P2 | After noticing any symptoms, do you go to the doctor immediately? |  |  |
|  | Yes | 38 | 11.21 |
|  | No | 301 | 88.79 |
| P3 | Before this health problem, did a doctor or nurse check your breasts? |  |  |
|  | Yes | 16 | 4.79 |
|  | No | 318 | 95.21 |
| K2 | Before your breast problem have you heard of mammography or mammogram? |  |  |
|  | Yes | 20 | 6.01 |
|  | No | 313 | 93.99 |
| K3 | Do you know someone close to you who had or has cancer? |  |  |
|  | Yes | 55 | 27.92 |
|  | No | 142 | 72.08 |
|  | Did you know about breast cancer before? |  |  |
|  | Yes | 26 | 16.46 |
|  | No | 132 | 83.54 |
| K4 | Are you aware of a family history of breast cancer? |  |  |
|  | Yes | 32 | 9.52 |
|  | No | 304 | 90.48 |
| Total | Knowledge and Practice |  |  |
|  | Good (mean>1) | 80 | 22.54 |
|  | Low (mean<=1) | 275 | 77.46 |

*K = knowledge, P = practice*

Table 2: Prevalence of patient socioeconomic characteristics by knowledge and practice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Knowledge and Practice | | | |
| Characteristics | Good | Poor | Total |  |
| n (%) | n (%) | n (%) | P-value |
| **Socioeconomic characteristics** |  |  |  |  |
| Age at presentation (years) |  |  |  |  |
| <40 | 28 (24.56) | 86 (75.44) | 114 (33.24) | 0.918 |
| 40-59 | 28 (23.33) | 92 (76.67) | 199 (58.02) |  |
| ≥60 | 7 (23.33) | 23 (76.67) | 30 (8.75) |  |
| Geographic location |  |  |  |  |
| Chittagong | 9 (17.31) | 43 (82.69) | 52 (15.34) | 0.825 |
| Dhaka | 39 (26.17) | 110 (73.83) | 149 (43.95) |  |
| Khulna | 11 (28.21) | 28 (71.79) | 39 (11.50) |  |
| Mymensingh | 8 (24.24) | 25 (75.76) | 33 (9.73) |  |
| Rajshahi | 4 (19.05) | 17 (80.95) | 21 (6.19) |  |
| Rangpur | 4 (28.57) | 10 (71.43) | 14 (4.13) |  |
| Sylhet | 1 (20.00) | 4 (80.00) | 5 (1.47) |  |
| Barisal | 4 (15.38) | 22 (84.62) | 26 (7.67) |  |
| Area of residence |  |  |  |  |
| Rural | 55 (21.91) | 196 (78.09) | 251 (72.75) | 0.477 |
| Urban | 24 (25.53) | 70 (74.47) | 94 (27.25) |  |
| Current marital status |  |  |  |  |
| Single | 14 (23.73) | 45 (76.27) | 59 (17.25) | 0.900 |
| Married | 65 (22.97) | 218 (77.03) | 283 (82.75) |  |
| Patient education level |  |  |  |  |
| Illiterate | 17 (11.56) | 130 (88.44) | 147 (42.86) | <0.001 |
| Primary | 33 (28.70) | 82 (71.30) | 115 (33.53) |  |
| Secondary/Higher | 29 (35.80) | 52 (64.20) | 81 (23.62) |  |
| Spouse education level |  |  |  |  |
| Illiterate | 16 (17.98) | 73 (82.02) | 89 (27.99) | 0.018 |
| Primary | 22 (18.64) | 96 (81.36) | 118 (37.11) |  |
| Secondary/Higher | 36 (32.43) | 75 (67.57) | 111 (34.91) |  |
| Household monthly income (BDT) |  |  |  |  |
| <5000 | 17 (15.04) | 96 (84.96) | 113 (34.88) | 0.005 |
| 5000-10000 | 24 (24.00) | 76 (76.00) | 100 (30.86) |  |
| 10001-20000 | 11 (25.00) | 33 (75.00) | 44 (13.58) |  |
| >20000 | 26 (38.81) | 41 (61.19) | 67 (20.68) |  |
| First health facility visits after symptoms |  |  |  |  |
| General Govt. Hospital | 24 (18.46) | 106 (81.54) | 130 (38.81) | 0.251 |
| Private clinic/hospital | 50 (26.32) | 140 (73.68) | 190 (56.72) |  |
| Others | 4 (26.67) | 11 (73.33) | 15 (4.48) |  |
| Alternative remedy |  |  |  |  |
| Yes | 17 (15.60) | 92 (84.40) | 109 (33.13) | 0.023 |
| No | 59 (26.82) | 161 (73.18) | 220 (66.87) |  |
| Any diagnosis delay |  |  |  |  |
| Yes | 35 (18.42) | 155 (81.58) | 190 (55.72) | 0.015 |
| No | 45 (29.80) | 106 (70.20) | 151 (44.28) |  |
| **Portable electronic devices** |  |  |  |  |
| Mobile phone |  |  |  |  |
| Yes | 69 (23.31) | 227 (76.69) | 296 (83.38) | 0.435 |
| No | 11 (18.64) | 48 (81.36) | 59 (16.62) |  |
| Smartphone |  |  |  |  |
| Yes | 13 (25.49) | 38 (74.51) | 304 (85.63) | 0.585 |
| No | 67 (22.04) | 237 (77.96) | 51 (14.37) |  |
| Personal computer |  |  |  |  |
| Yes | 1 (33.33) | 2 (66.67) | 3 (0.85) | 0.348 |
| No | 80 (22.73) | 272 (77.27) | 352 (99.15) |  |
| Any portable electronic devices |  |  |  |  |
| Yes | 77 (24.14) | 242 (75.86) | 319 (89.86) | 0.031 |
| No | 3 (8.33) | 33 (91.67) | 36 (10.14) |  |
| **Mass media access** |  |  |  |  |
| Social media |  |  |  |  |
| Yes | 1 (33.33) | 2 (66.67) | 3 (0.85) | 0.653 |
| No | 79 (22.44) | 273 (77.56) | 352 (99.15) |  |
| Television |  |  |  |  |
| Yes | 34 (24.46) | 105 (75.54) | 139 (39.15) | 0.486 |
| No | 46 (21.30) | 170 (78.70) | 216 (60.85) |  |
| Newspaper |  |  |  |  |
| Yes | 8 (36.36) | 261 (78.38) | 22 (6.2) | 0.116 |
| No | 72 (21.62) | 14 (63.64) | 333 (93.8) |  |
| Any mass media access |  |  |  |  |
| Yes | 35 (24.31) | 109 (75.69) | 144 (40.56) | 0.510 |
| No | 45 (21.33) | 166 (78.67) | 211 (59.44) |  |

Table 4: Prevalence of patient medical history by knowledge and practice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Knowledge and Practice | | | |
| Characteristics | Good | Low | Total |  |
|  | n (%) | n (%) | n (%) | P-value |
| **Medical history of the patients** |  |  |  |  |
| Lump |  |  |  |  |
| Yes | 2 (4.88) | 39 (95.12) | 314 (88.45) | 0.011 |
| No | 78 (24.84) | 236 (75.16) | 41 (11.55) |  |
| Breast pain |  |  |  |  |
| Yes | 24 (25.81) | 69 (74.19) | 93 (26.2) | 0.380 |
| No | 56 (21.37) | 206 (78.63) | 262 (73.8) |  |
| Nipple discharge |  |  |  |  |
| Yes | 4 (20.00) | 16 (80.00) | 20 (5.63) | 0.780 |
| No | 76 (22.69) | 259 (77.31) | 335 (94.37) |  |
| Skin changes |  |  |  |  |
| Yes | 4 (26.67) | 11 (73.33) | 15 (4.23) | 0.696 |
| No | 76 (22.35) | 264 (77.65) | 340 (95.77) |  |
| Bone pain |  |  |  |  |
| Yes | 6 (50.00) | 6 (50.00) | 12 (3.38) | 0.029 |
| No | 74 (21.57) | 269 (78.43) | 343 (96.62) |  |
| Other symptoms |  |  |  |  |
| Yes | 9 (21.43) | 33 (78.57) | 42 (11.83) | 0.855 |
| No | 71 (22.68) | 242 (77.32) | 313 (88.17) |  |
| Any symptoms |  |  |  |  |
| Yes | 79 (24.16) | 248 (75.84) | 327 (92.11) | 0.036 |
| No | 1 (3.57) | 27 (96.43) | 28 (7.89) |  |
| Cancer stage |  |  |  |  |
| Stage I | 4 (40.00) | 6 (60.00) | 10 (3.94) | 0.209 |
| Stage II | 36 (29.03) | 88 (70.97) | 124 (48.82) |  |
| Stage III | 22 (19.64) | 90 (80.36) | 112 (44.09) |  |
| Stage IV | 3 (37.50) | 5 (62.50) | 8 (3.15) |  |
| **Discomfort experience** |  |  |  |  |
| Arm pain |  |  |  |  |
| Yes | 29 (24.58) | 89 (77.38) | 118 (34.81) | 0.686 |
| No | 50 (22.62) | 171 (77.38) | 221 (65.19) |  |
| Breast pain |  |  |  |  |
| Yes | 46 (25.99) | 131 (74.01) | 177 (52.06) | 0.111 |
| No | 33 (20.25) | 130 (79.75) | 163 (47.94) |  |
| Itching |  |  |  |  |
| Yes | 28 (24.35) | 87 (75.65) | 115 (33.82) | 0.728 |
| No | 51 (22.67) | 174 (77.33) | 225 (66.18) |  |
| Lump |  |  |  |  |
| Yes | 37 (23.87) | 118 (76.13) | 155 (45.86) | 0.842 |
| No | 42 (22.95) | 141 (77.05) | 183 (54.14) |  |
| Nipple discharge |  |  |  |  |
| Yes | 11 (26.83) | 30 (73.17) | 41 (12.13) | 0.577 |
| No | 68 (22.90) | 229 (77.10) | 297 (87.87) |  |
| Shape changes |  |  |  |  |
| Yes | 25 (23.58) | 81 (76.42) | 106 (31.36) | 0.950 |
| No | 54 (23.28) | 178 (76.72) | 232 (68.64) |  |
| Skin changes |  |  |  |  |
| Yes | 12 (27.91) | 31 (72.09) | 43 (12.72) | 0.453 |
| No | 67 (22.71) | 228 (77.29) | 295 (87.28) |  |
| Ulcer or sore skin |  |  |  |  |
| Yes | 11 (28.21) | 28 (71.79) | 39 (11.5) | 0.443 |
| No | 68 (22.67) | 232 (77.33) | 300 (88.5) |  |

Table 4: Prevalence of patient family support by knowledge and practice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Knowledge and Practice | | | |
| Characteristics | Good | Low | Total |  |
|  | n (%) | n (%) | n (%) | P-value |
| **Family support** |  |  |  |  |
| The person you talked to first about your health problem |  |  |  |  |
| Husband | 46 (24.73) | 140 (75.27) | 186 (54.55) | 0.422 |
| Mother | 2 (11.11) | 16 (88.89) | 18 (5.28) |  |
| Neighbor | 4 (25.00) | 12 (75.00) | 16 (4.69) |  |
| Son or daughter | 18 (28.57) | 45 (71.43) | 63 (18.48) |  |
| Other | 10 (17.24) | 48 (82.76) | 58 (17.01) |  |
| Recommended you to consult with a doctor |  |  |  |  |
| Herself | 10 (50.00) | 10 (50.00) | 20 (5.88) | 0.031 |
| Husband | 35 (25.18) | 104 (74.82) | 139 (40.88) |  |
| Neighbour | 6 (21.43) | 22 (78.57) | 28 (8.24) |  |
| Son or daughter | 15 (22.39) | 52 (77.61) | 67 (19.71) |  |
| Other | 14 (16.28) | 72 (83.72) | 86 (25.29) |  |
| Fear or uncomfortable to talk about the problem to your spouse |  |  |  |  |
| Yes | 15 (27.78) | 39 (72.22) | 54 (18.95) | 0.373 |
| No | 51 (22.08) | 180 (77.92) | 231 (81.05) |  |
| Receive support from spouse after diagnosis |  |  |  |  |
| Yes | 57 (24.26) | 178 (75.74) | 235 (83.63) | 0.315 |
| No | 8 (17.39) | 38 (82.61) | 46 (16.37) |  |
| Receive support from social circle |  |  |  |  |
| Yes | 57 (24.89) | 172 (75.11) | 229 (70.46) | 0.433 |
| No | 20 (20.83) | 76 (79.17) | 96 (29.54) |  |

Table S1: Association between patient socioeconomic characteristics with knowledge and practice

|  |  |  |
| --- | --- | --- |
| Characteristics | Unadjusted model | |
| COR (95% CI) | P-value |
| **Socioeconomic characteristics** |  |  |
| Age at presentation (years) |  |  |
| <40 | 1.07 (0.43-2.93) | 0.889 |
| 40-59 | 0.93 (0.39-2.48) | 0.881 |
| ≥60 |  |  |
| Geographic location |  |  |
| Chittagong | 1.15 (0.33-4.63) | 0.830 |
| Dhaka | 1.95 (0.69-6.98) | 0.145 |
| Khulna | 2.16 (0.64-8.65) | 0.137 |
| Mymensingh | 1.76 (0.48-7.34) | 0.405 |
| Rajshahi | 1.29 (0.27-6.21) | 0.740 |
| Rangpur | 2.20 (0.44-11.14) | 0.326 |
| Sylhet | 1.38 (0.06-13.00) | 0.798 |
| Barisal | Reference |  |
| Area of residence |  |  |
| Rural | 0.82 (0.48-1.44) | 0.477 |
| Urban | Reference |  |
| Current marital status |  |  |
| Single | 1.04 (0.52-1.98) | 0.900 |
| Married | Reference |  |
| Patient education level |  |  |
| Illiterate | 0.23 (0.12-0.46) | <0.001 |
| Primary | 0.72 (0.39-1.33) | 0.293 |
| Secondary/Higher | Reference |  |
| Spouse education level |  |  |
| Illiterate | 0.46 (0.23-0.88) | 0.022 |
| Primary | 0.48 (0.26-0.87) | 0.018 |
| Secondary/Higher | Reference |  |
| Household monthly income (BDT) |  |  |
| <5000 | 0.28 (0.13-0.56) | <0.001 |
| 5000-10000 | 0.50 (0.25-0.97) | 0.042 |
| 10001-20000 | 0.53 (0.22-1.20) | 0.133 |
| >20000 | Reference |  |
| First health facility visits after symptoms |  |  |
| General Govt. Hospital | 0.62 (0.19-2.40) | 0.449 |
| Private clinic/hospital | 0.98 (0.32-3.67) | 0.976 |
| Others | Reference |  |
| Alternative remedy |  |  |
| Yes | 0.50 (0.27-0.90) | 0.023 |
| No | Reference |  |
| Any diagnosis delay |  |  |
| Yes | 0.53 (0.32-0.88) | 0.015 |
| No | Reference |  |
| **Portable electronic devices** |  |  |
| Mobile phone |  |  |
| Yes | 1.33 (0.67-2.82) | 0.435 |
| No | Reference |  |
| Smartphone |  |  |
| Yes | 1.21 (0.59-2.35) | 0.585 |
| No | Reference |  |
| Personal computer |  |  |
| Yes | 1.89 (0.18-8.26) | 0.723 |
| No | Reference |  |
| Any portable electronic devices |  |  |
| Yes | 3.50 (1.21-14.83) | 0.031 |
| No | Reference |  |
| **Mass media access** |  |  |
| Social media |  |  |
| Yes | 1.73 (0.08-18.26) | 0.653 |
| No | Reference |  |
| Television |  |  |
| Yes | 1.20 (0.72-1.98) | 0.486 |
| No | Reference |  |
| Newspaper |  |  |
| Yes | 2.07 (0.80-5.03) | 0.116 |
| No | Reference |  |
| Any mass media access |  |  |
| Yes | 1.18 (0.71-1.96) | 0.510 |
| No | Reference |  |

Table S2: Association between patient socioeconomic characteristics with knowledge and practice

|  |  |  |
| --- | --- | --- |
| Characteristics | Unadjusted model | |
|  | COR (95% CI) | P-value |
| **Medical history of the patients** |  |  |
| Lump |  |  |
| Yes | 6.44 (1.92-14.15) | 0.011 |
| No | Reference |  |
| Breast pain |  |  |
| Yes | 1.28 (0.73-2.20) | 0.380 |
| No | Reference |  |
| Nipple discharge |  |  |
| Yes | 0.85 (0.24-2.40) | 0.780 |
| No | Reference |  |
| Skin changes |  |  |
| Yes | 1.26 (0.34-3.81) | 0.696 |
| No | Reference |  |
| Bone pain |  |  |
| Yes | 3.64 (1.11-11.94) | 0.029 |
| No | Reference |  |
| Other symptoms |  |  |
| Yes | 0.93 (0.40-1.96) | 0.855 |
| No | Reference |  |
| Any symptoms |  |  |
| Yes | 8.60 (1.79-15.65) | 0.036 |
| No | Reference |  |
| Cancer stage |  |  |
| Stage I | 1.11 (0.16-8.07) | 0.914 |
| Stage II | 0.68 (0.16-3.46) | 0.613 |
| Stage III | 0.41 (0.09-2.11) | 0.142 |
| Stage IV | Reference |  |
| **Discomfort experience** |  |  |
| Arm pain |  |  |
| Yes | 1.11 (0.65-1.87) | 0.686 |
| No | Reference |  |
| Breast pain |  |  |
| Yes | 1.38 (0.83-2.31) | 0.111 |
| No | Reference |  |
| Itching |  |  |
| Yes | 1.10 (0.64-1.85) | 0.728 |
| No | Reference |  |
| Lump |  |  |
| Yes | 1.05 (0.63-1.74) | 0.842 |
| No | Reference |  |
| Nipple discharge |  |  |
| Yes | 1.23 (0.57-2.53) | 0.577 |
| No | Reference |  |
| Shape changes |  |  |
| Yes | 1.02 (0.58-1.74) | 0.950 |
| No | Reference |  |
| Skin changes |  |  |
| Yes | 1.32 (0.62-2.65) | 0.453 |
| No | Reference |  |
| Ulcer or sore skin |  |  |
| Yes | 1.34 (0.61-2.77) | 0.443 |
| No | Reference |  |

Table S3: Association between patient socioeconomic characteristics with knowledge and practice

|  |  |  |
| --- | --- | --- |
| Characteristics | Unadjusted model | |
|  | COR (95% CI) | P-value |
| **Family a support** |  |  |
| The person you talked to first about your health problem |  |  |
| Husband | 1.58 (0.76-3.53) | 0.239 |
| Mother | 0.60 (0.09-2.59) | 0.537 |
| Neighbor | 1.60 (0.39-5.76) | 0.486 |
| Son or daughter | 1.92 (0.81-4.74) | 0.143 |
| Other | Reference |  |
| Recommended you to consult with a doctor |  |  |
| Herself | 5.14 (1.80-14.95) | 0.002 |
| Husband | 1.73 (0.88-3.54) | 0.119 |
| Neighbor | 1.40 (0.45-3.96) | 0.535 |
| Son or daughter | 1.48 (0.66-3.37) | 0.340 |
| Other | Reference |  |
| Fear or uncomfortable talking about the problem with your spouse |  |  |
| Yes | 1.36 (0.68-2.62) | 0.373 |
| No | Reference |  |
| Receive support from spouse after diagnosis |  |  |
| Yes | 1.52 (0.70-3.68) | 0.315 |
| No | Reference |  |
| Receive support from social circle |  |  |
| Yes | 1.26 (0.72-2.28) | 0.433 |
| No | Reference |  |

Table 5: Association between patient socioeconomic characteristics with knowledge and practice

|  |  |  |
| --- | --- | --- |
| Characteristics | Adjusted model | |
|  | AOR (95% CI) | P-value |
| Geographic location |  |  |
| Chittagong | 1.01 (0.19-5.58) | 0.998 |
| Dhaka | 1.51 (0.38-6.88) | 0.572 |
| Khulna | 1.66 (0.30-9.72) | 0.565 |
| Mymensingh | 1.61 (0.28-9.86) | 0.595 |
| Rajshahi | 0.74 (0.10-4.96) | 0.753 |
| Rangpur | 5.56 (1.54-9.50) | 0.045 |
| Sylhet | 0.49 (0.01-12.24) | 0.685 |
| Barisal | Reference |  |
| Patient education level |  |  |
| Illiterate | 0.13 (0.03-0.53) | <0.001 |
| Primary | 0.84 (0.30-2.37) | 0.733 |
| Secondary/Higher | Reference |  |
| Spouse education level |  |  |
| Illiterate | 1.60 (0.41-6.61) | 0.502 |
| Primary | 0.84 (0.29-2.47) | 0.755 |
| Secondary/Higher | Reference |  |
| Household monthly income (BDT) |  |  |
| <5000 | 0.47 (0.16-0.74) | 0.049 |
| 5000-10000 | 0.66 (0.23-1.83) | 0.423 |
| 10001-20000 | 0.97 (0.25-3.59) | 0.958 |
| >20000 | Reference |  |
| Alternative remedy |  |  |
| Yes | 0.46 (0.18-0.97) | 0.039 |
| No | Reference |  |
| Any diagnosis delay |  |  |
| Yes | 0.57 (0.26-0.84) | 0.015 |
| No | Reference |  |
| Any portable electronic devices |  |  |
| Yes | 1.36 (0.18-9.21) | 0.800 |
| No | Reference |  |
| Newspaper |  |  |
| Yes | 0.53 (0.10-2.42) | 0.426 |
| No | Reference |  |
| Lump |  |  |
| Yes | 6.46 (2.76-11.06) | 0.014 |
| No | Reference |  |
| Bone pain |  |  |
| Yes | 5.26 (1.89-8.68) | 0.018 |
| No | Reference |  |
| Any symptoms |  |  |
| Yes | 1.25 (0.03-49.58) | 0.899 |
| No | Reference |  |
| Cancer stage |  |  |
| Stage I | 0.84 (0.05-14.06) | 0.901 |
| Stage II | 0.28 (0.03-2.93) | 0.259 |
| Stage III | 0.15 (0.10-0.56) | 0.009 |
| Stage IV | Reference |  |
| Breast pain |  |  |
| Yes | 1.56 (0.72-3.44) | 0.260 |
| No | Reference |  |
| The person you talked to first about your health problem |  |  |
| Husband | 1.82 (0.34-9.94) | 0.481 |
| Mother | 0.66 (0.02-8.04) | 0.767 |
| Neighbor | 3.37 (0.16-125.38) | 0.452 |
| Son or daughter | 4.55 (1.68-7.56) | 0.012 |
| Other | Reference |  |
| Recommended you to consult with a doctor |  |  |
| Herself | 6.54 (1.99-9.15) | 0.005 |
| Husband | 2.78 (1.62-4.67) | 0.019 |
| Neighbor | 1.84 (0.17-10.10) | 0.645 |
| Son or daughter | 1.45 (0.24-8.89) | 0.683 |
| Other | Reference |  |

Table 6: Goodness of fit test and classification accuracy of the final models

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Hosmer and Lemeshow's goodness of fit test | | | Area Under Receiver Operating Characteristic Curve | | |
|  | X-squared | DF | P-value | AUC scores | 95% CI | P-value |
| Adjusted Model | 7.34 | 8 | 0.500 | 80.97% | 74.46%-87.48% | <0.001 |

Figures

Figure 1: Family Support



Figure 2: Model evaluations using the receiver operating characteristic curve (ROC curve) for adjusted mode

