**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 will be 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 will survey 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 will be conducted by previously trained interviewers who are 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 'poor knowledge'. There were 6 knowledge and practice assessment questions with a reliability coefficient above 70% respectively which was calculated using Cronbach’s alpha (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4205511/).

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 delays (https://bmjopen.bmj.com/content/9/9/e030169). 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 different types of delays. Binary and multivariable logistic regression was utilised to identify associated risk factors. Initially, bivariable analysis assessed the relationship between delays and 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. In this study, three models were utilised to identify associated risk factors of patient delay, provider delay, and total diagnosis delay, designated as Model 1, Model 2, and Model 3, respectively. 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 (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0242864). 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 (https://link.springer.com/article/10.1186/s12889-023-15617-8). At this stage, all variables were incorporated into the model since the VIF values for each variable were below 4.00.

Model performance

We utilised 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 (https://link.springer.com/article/10.1186/s12981-022-00495-8). 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 (<https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.985445/full>).

Results

Study population

In a study involving 355 participants, it was found that a significant majority lacked awareness and proactive behaviors 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 engagement 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 limited awareness and engagement with practices pertaining to breast cancer compared to other age demographics. Geographically, the highest concentration of participants, comprising 43.95%, hailed 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 were 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 (88.44%), while primary education was predominant among spouses (37.11%), similarly correlating with limited awareness (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 practice (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/or 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 better knowledge and/or practices. These findings underscore the multifaceted influences on breast cancer awareness and engagement, necessitating targeted interventions to address socio-demographic disparities and improve overall healthcare outcomes (Table 2).

Access to portable electronic devices, such as mobile phones (83.38%), smartphones (85.63%), and computers (0.85%), was nearly common among patients, however, 76.69% mobile phone users, 74.51% smartphone users, 100.00% computer users had low knowledge and practices on breast cancer, rest of patients had good knowledge and practices. However, 89.86% of patients use any kinds of portable devices, among them, 75.86% had low knowledge and practices. Moreover, 0.85%, 39.15%, 6.20% of participants had access to social media, television, and newspaper, respectively. Among them, 66.67%, 75.54%, and 78.38% of patients had low knowledge and practice of breast cancer. 40.56% of patients had access any kind of mass media and 75.69% of patients had low knowledge and practice among them (Table 2).

The medical history of the patients is presented in Table 3. A majority (88.45%) of patients reported lump symptoms as their initial clinical presentation they identify as a breast cancer. Among them, 95.12% patients had low knowledge and practices on breast cancer. 26.20%, 5.63%, 4.23%, 3.38%, 11.83, breast pain, nipple discharge, skin changes, bone pain, and other symptoms as the clinical presentation and also, they identify them as a symptoms of breast cancer, respectively. However, among them, breast pain, nipple discharge, skin changes, bone pain, and other symptoms presented patients had 74.19%, 80.00%, 73.33%, 50.00%, and 78.57% low level of knowledge and practices, respectively. In addition, 92.11% patients experienced any types of symptoms and among them, 75.84% had low level of knowledge and practices. The majority of patients visited for their first checkup at a medical facility when their cancer was in stage II (48.82%), followed by 44.09% in stage III. A smaller percentage visited during stage I and stage IV, accounting for 3.94% and 3.15%, respectively. However, a large number of patients from stage-III had lower level of knowledge and practices (8.36%), followed by stage-II (70.97%).

The majority of patients experienced discomfort in the breast (52.06%), followed by 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%). In regards of knowledge and practices,

According to the findings presented in Table 4, the predominant reason for delaying seeking medical attention was the perception that the problem would disappear spontaneously (79.14%) of participants. Negligence or carelessness was similarly prevalent, with 75.54% of participants attributing their delay to this factor. Financial constraints were reported by 65.47% of participants, while competing life priorities, such as familial responsibilities, were mentioned by 54.68% of participants. Embarrassment about breast examinations was noted by 44.60% of participants, followed by being too busy with other commitments (41.01%) and fear of potential cancer diagnosis or treatment (38.13%). Additional factors contributing to patient delay included difficulties in arranging transportation to medical facilities (27.34%) and a lack of information about available healthcare resources (24.46%). Moreover, 21.58% of participants encountered delays in securing appointments with healthcare providers, and 20.14% cited miscellaneous reasons not captured by the options provided above.

Appointment delay contributes significantly to patient delay, particularly among individuals with a previous family history of breast cancer, where it reaches its peak at 13.33%. Conversely, the lowest patient delay rate, at 8.06%, is observed among those who experience embarrassment regarding breast examinations and also with a previous family history of breast cancer. Moreover, factors such as having a family history of breast cancer with being too busy, and lacking information emerge as predominant reasons for patient delay, with rates reaching their highest at 11.11% and 11.76% among participants. Additionally, competing life priorities, such as taking care of family, and the fear associated with cancer diagnosis and/or treatment, also emerge as dominant factors contributing to patient delay, particularly evident among individuals with a family history of breast cancer.

Different types of delay and its associated factors

Table 5 presents the prevalence and risk factors associated with patient delay, as determined through crosstabs, chi-square tests, and the logistic regression model. Notably, among the various risk factors assessed, the patient's household monthly income, access to portable electronic devices, and presence of breast pain symptoms as significant factors associated with patient delay. The socio-economic profile of patients experiencing patient delay revealed higher prevalence rates among those who were illiterate (47.59%), had a household monthly income below 5,000 BDT (50.44%), lacked access to portable electronic devices (60.00%), and did not have access to mass media (43.94%) compared those who were not delayed. Moreover, among patients with no history of breast pain, the prevalence of patient delay was notably elevated at 44.13% compared to those who were not delayed. In the adjusted analysis, the patient's education level, family income, and presence of breast pain demonstrated associations with patient delay. Upon further examination using adjusted logistic regression modelling, it was observed that the odds of patient delay were nearly twice as high (Adjusted Odds Ratio [AOR]: 1.96, 95% Confidence Interval [CI]: 1.04-3.74) among illiterate patients compared to those with secondary or higher education levels. Additionally, patients with a monthly family income ranging from 5,000 to 10,000 BDT exhibited 1.45 times (AOR: 1.45, 95% CI: 1.22-1.90) higher odds of experiencing patient delay compared to those with incomes exceeding 20,000 BDT. On the contrary, patients experiencing breast pain exhibited 45% (AOR: 0.55, 95% CI: 0.32-0.94) lower odds of experiencing patient delay compared to those who did not report breast pain.

Table 6 outlines the significant factors influencing provider delay, with geographic location, area of residence, and the presence of nipple discharge symptoms emerging as notable contributors. The socio-economic analysis of patients experiencing provider delay revealed higher prevalence rates among those originating from the Rangpur division (64.29%) and rural areas (29.51%) compared to their non-delayed counterparts. Furthermore, among patients presenting with nipple discharge symptoms, the prevalence of provider delay notably increased to 45.00% compared to those without delay. In the adjusted analysis, the patient's geographic location, area of residence, and the symptoms of nipple discharge demonstrated associations with provider delay. Further examination via adjusted logistic regression modelling revealed that patients from the Rangpur division exhibited over 4 times (AOR: 4.60, 95% CI: 1.11-7.52) higher odds of experiencing provider delay compared to those from the Barisal division. Additionally, patients residing in rural areas demonstrated 3.07 times (AOR: 3.07, 95% CI: 1.49-6.98) higher odds of experiencing provider delay compared to their urban counterparts. Conversely, patients presenting with nipple discharge demonstrated 2.92 times (AOR: 2.92, 95% CI: 1.04-8.06) higher likelihood of experiencing provider delay compared to those without nipple discharge symptoms.

Table 7 elucidates the significant factors influencing total diagnosis delay, encompassing geographic location, area of residence, current marital status, patient education level, family monthly income, access to portable electronic devices, access to mass media, and the presence of breast pain, nipple discharge, and bone pain as notable contributors. The socio-economic analysis of patients experiencing total diagnosis delay reveals the highest prevalence rates among those originating from the Rangpur division (92.86%), residing in rural areas (60.48%), being unmarried (64.91%), and having an education level of illiterate (60.96%). Additionally, patients with lower family monthly incomes (64.60%), no access to portable electronic devices (68.00%), and no access to mass media (55.78%) exhibited higher prevalence rates compared to their non-delayed counterparts. Furthermore, among patients experiencing total diagnosis delay, the prevalence of breast pain, nipple discharge, and bone pain were notably elevated at 50.00%, 70.00%, and 41.67%, respectively, compared to those without delay.

In adjusted analysis, the patient's geographic location, area of residence, current marital status, patient education level, access to mass media, and the presence of breast pain, nipple discharge, and bone pain demonstrated associations with total diagnosis delay. Further examination via adjusted logistic regression modeling revealed that patients from the Rangpur division exhibited over 6 times (AOR: 6.07, 95% CI: 1.76-8.02) higher odds of experiencing total diagnosis delay compared to those from the Barisal division. Additionally, patients residing in rural areas demonstrated 2.04 times (AOR: 2.04, 95% CI: 1.17-3.61) higher odds of experiencing total diagnosis delay compared to their urban counterparts. Unmarried patients demonstrated 1.46 times (AOR: 1.46, 95% CI: 1.14-2.94) higher odds of experiencing total diagnosis delay compared to their married counterparts. Illiterate and primary-educated patients demonstrated higher odds of experiencing total diagnosis delay compared to secondary or higher-educated patients, with 1.59 times (AOR: 1.59, 95% CI: 1.18-3.05) and 1.51 times (AOR: 1.51, 95% CI: 1.17-2.95), respectively. Patients with access to portable electronic devices had 2% lower odds of experiencing total diagnosis delay compared to their counterparts (AOR: 1.55, 95% CI: 1.18-2.52). Patients presenting with breast pain (AOR: 1.60, 95% CI: 1.34-2.05), nipple discharge (AOR: 2.19, 95% CI: 1.75-7.52), and bone pain (AOR: 1.37, 95% CI: 1.09-2.30) demonstrated higher odds of experiencing total diagnosis delay compared to their counterparts (Table 7).

The three models employed in this study successfully passed the Hosmer and Lemeshow goodness-of-fit test, indicating a good fit. The classification accuracy was also acceptable, with AUC values of 62.43%, 58.92%, and 68.87% for Model 1, Model 2, and Model 3, respectively (Tables 8 and Figure 3). Notably, among the three models, Model 3 exhibited higher accuracy compared to the other two variables.

References

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/or Practice | | | |
| Characteristics | Good | Low | 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 | 0 (0.00) | 3 (100.00) | 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 (Symptoms they identify)** |  |  |  |  |
| 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 5: Prevalence of patient family support by knowledge and practice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Knowledge and Practice | | | |
| Characteristics | Good | Low | Total |  |
|  | n (%) | n (%) | n (%) | P-value |
| **Family a 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) |  |
| Neighbor | 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 | 1.33 (0.67-2.82) | 0.435 |
| Yes |  |  |
| No | Reference |  |
| Smartphone | 1.21 (0.59-2.35) | 0.585 |
| Yes |  |  |
| No | Reference |  |
| Personal computer |  |  |
| Yes | - | - |
| 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 | Unadjusted 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 8: 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 |
| Model 1 | 6.01 | 8 | 0.646 | 62.43% | 59.80%-72.05% | <0.001 |

Figures

Figure 1: Breast cancer treatment delays at various stages

Figure 2: Physical presentations of the patients

Figure 3: Model evaluations using the receiver operating characteristic curve (ROC curve) for adjusted model