**Impact of Family Support on Knowledge and Health-Seeking Behavior Practices Among Breast Cancer Patients in Bangladesh**

**Introduction:**

Breast cancer is a primary cause of life-threatening cancer and most common malignancy affecting women across the globe [1]. It is the most prevalent type of cancer among women, two million breast cancer cases were registered in 2020, occupying first place in incidence, with 11.7% of the overall cancer cases worldwide [2]. Although the disease prevalence is higher in developed countries, conversely, breast cancer patients have a higher mortality rate in developing countries than in developed ones [3]. In 2012 nearly 62% of deaths associated with breast cancer occurred in developing countries. An estimate of over 200,000 new breast cancer cases occurred in South Asia in 2012, and approximately 97,500 breast cancer patients died [4]. The prevalence of breast cancer has been 32.8% in Bangladesh for the last 5 years and is responsible for about 69% of women's death [5]. A recent study found the overall incidence of breast cancer was 22.5 per 100,000 women [6]. There were 12,764 new cases had detected only in the year 2018 [7]. A study found that 50% of breast cancer patients have died due to their late presentation with advanced stages [8].

Early breast cancer diagnosis improves outcomes, but delays often lead to advanced-stage detection, resulting in poor prognosis and higher mortality rates, despite lower incidence [9]. Reasons for this delay in seeking care and establishment of early diagnosis with prompt initiation of treatment have been ascribed to lack of awareness, poor healthcare seeking behaviour among women of low socioeconomic status and limited access to effective healthcare and referral services for management of the disease [10]. Good health literacy about breast cancer which promotes ‘breast awareness’ defined as ‘a woman becoming familiar with her own breasts and the way that they will change throughout her life’ helps the women to seek early medical care involving changes in her breast. [11]. Similarly, knowledge about breast cancer positively influences the screening behavior of women and encourages them to seek medical help at the time of detecting the initial signs and symptoms [12]. Evidence suggests limited knowledge and various sociodemographic factors contribute to delayed medical seeking behavior if initial signs and symptoms of breast cancer go undetected [13]. It is, therefore, essential to assess females’ knowledge of breast cancer and understand the factors that might prevent women from seeking early medical attention when encountering suspicious symptoms.

Information concerning the epidemiology, biology, and different environmental backgrounds of breast cancer are scarce in South Asia [14]. The lack of knowledge, limited access to proper treatment, and negligence of community towards breast cancer are also responsible for the higher mortality rates of breast cancer in Bangladesh. Adequate knowledge and awareness about the signs and symptoms and early breast cancer detection through breast self-examination (BSE) or clinical breast examination (CBE) or mammogram, is crucial to reducing breast cancer-related morbidity and mortality. Despite being a burden on society, this disease is getting less discussed among the people. As a result, they have reported possessing improper knowledge regarding the causes and associated risk factors [15]. Furthermore, communities are unaware of the self‐diagnosis and available treatment of breast cancer which caused a delay in starting treatment. In addition, unfriendly society and surroundings, make it difficult for women to discuss any initial symptoms or changes in their breasts with others. For that reason, delay in presentation in the advanced stage is very common in Bangladesh [5].

Several cross-sectional studies on Knowledge, Attitude and Practice (KAP) of breast cancer have been conducted among the Bangladeshi women , female university students in Jordan [12], Uganda [4], Yemen [13], Saudi Arabia [17-18] and health workers in Turkey [19]. However, very little is known about knowledge, attitudes, and practice regarding BC and BSE among Bangladeshi female university students. Only one study was found where the researcher investigated the knowledge level and practices regarding only BSE [20]. To the best of our knowledge, no studies were found regarding knowledge level on different aspects of BC e.g. etiology and prognosis, risk factors, signs of BC, practices of BSE etc. in Bangladesh. Therefore, the objectives of this study were to 1) assess the existing knowledge on different aspects of BC among the female university students; 2) evaluate the practices of BSE among the students and 3) assess the difference of the knowledge scores among the female university students based on their socio-demographic characteristics. This study is important in providing information on knowledge and BSE practice among female university students in Bangladesh. This study may be useful to the governmental and non-governmental organizations in the design of interventions aimed at effective prevention of breast cancer at the national level.

It is important to assess the existing knowledge and practices related to breast cancer and its screening in the general population in order to design and initiate effective health promotion strategies for protecting and reducing mortality against breast cancer arising from erroneous health seeking behaviour and poor of screening services. The objective of the present study was to evaluate the knowledge and practices concerning screening for breast cancer among adult urban women in Delhi, India and to ascertain the proportion of those women doing breast self-examination.

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' [16]. There were 7 knowledge and practice assessment questions with a reliability coefficient above 70% respectively which was calculated using Cronbach’s alpha [17].

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 [18]. 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 [19]. 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 [20]. 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 [21]. 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 [22].

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] M.O. Abbas, M. Baig, Knowledge and Practice Concerning Breast Cancer Risk Factors and Screening among Females in UAE, Asian Pac J Cancer Prev 24 (2023) 479. https://doi.org/10.31557/APJCP.2023.24.2.479.

[2] H. Sung, J. Ferlay, R.L. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal, F. Bray, Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries, CA Cancer J Clin 71 (2021) 209–249. https://doi.org/10.3322/CAAC.21660.

[3] R.A. da Costa Vieira, G. Biller, G. Uemura, C.A. Ruiz, M.P. Curado, Breast cancer screening in developing countries, Clinics (Sao Paulo) 72 (2017) 244–253. https://doi.org/10.6061/CLINICS/2017(04)09.

[4] E.M. Ferlay J, Soerjomataram I, GLOBOCAN 2012: Estimated Cancer Incidence, Mortality and Prevalence Worldwide in 2012 v1.0, 2013. http://globocan.iarc.fr. (accessed January 25, 2025).

[5] T. Shamsi, Burden of breast cancer in Bangladesh-current and future and financing treatment with link to willingness to pay, International Journal of Community Medicine and Public Health Shamsi T. Int J Community Med Public Health 8 (2021) 5525–5528. https://doi.org/10.18203/2394-6040.ijcmph20214295.

[6] M.N. Amin, M.G. Uddin, M.N. Uddin, M.Z. Rahaman, S.A. Siddiqui, M.S. Hossain, M.R. Islam, M.N. Hasan, S.M.N. Uddin, A hospital based survey to evaluate knowledge, awareness and perceived barriers regarding breast cancer screening among females in Bangladesh, Heliyon 6 (2020). https://doi.org/10.1016/J.HELIYON.2020.E03753.

[7] WHO supports early detection and control of cervical and breast cancer in Bangladesh, (n.d.). https://www.who.int/bangladesh/news/detail/10-11-2020-who-supports-early-detection-and-control-of-cervical-and-breast-cancer-in-bangladesh (accessed January 25, 2025).

[8] H.S. Steiness, M. Villegas-Gold, H. Parveen, T. Ferdousy, O. Ginsburg, Barriers to care for women with breast cancer symptoms in rural Bangladesh, Health Care Women Int 39 (2018) 536–554. https://doi.org/10.1080/07399332.2018.1446958.

[9] L. Caplan, Delay in Breast Cancer: Implications for Stage at Diagnosis and Survival, Front Public Health 2 (2014) 87. https://doi.org/10.3389/FPUBH.2014.00087.

[10] A. Gupta, K. Shridhar, P.K. Dhillon, A review of breast cancer awareness among women in India: Cancer literate or awareness deficit?, Eur J Cancer 51 (2015) 2058–2066. https://doi.org/10.1016/J.EJCA.2015.07.008.

[11] N. Dahiya, S. Basu, M.C. Singh, S. Garg, R. Kumar, C. Kohli, Knowledge and Practices Related to Screening for Breast Cancer among Women in Delhi, India, Asian Pac J Cancer Prev 19 (2018) 155. https://doi.org/10.22034/APJCP.2018.19.1.155.

[12] V.G. Vogel, Breast cancer prevention: A review of current evidence, CA Cancer J Clin 50 (2000) 156–170. https://doi.org/10.3322/CANJCLIN.50.3.156.

[13] S.B. Abdel-Aziz, T.T. Amin, M.B. Al-Gadeeb, A.I. Alhassar, A. Al-Ramadan, M. Al-Helal, M. Bu-Mejdad, L.A. Al-Hamad, E.H. Alkhalaf, Perceived barriers to breast cancer screening among Saudi women at primary care setting, J Prev Med Hyg 59 (2018) E20–E29. https://doi.org/10.15167/2421-4248/JPMH2018.59.1.689.

[14] M.S. Hossain, S. Ferdous, H.E. Karim-Kos, Breast cancer in South Asia: a Bangladeshi perspective, Cancer Epidemiol 38 (2014) 465–470. https://doi.org/10.1016/J.CANEP.2014.08.004.

[15] F. Mehejabin, M.S. Rahman, Knowledge and perception of breast cancer among women of reproductive age in Chattogram, Bangladesh: A cross‐sectional survey, Health Sci Rep 5 (2022) e840. https://doi.org/10.1002/HSR2.840.

[16] G. Mehiret, A. Molla, A. Tesfaw, 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 22 (2022). https://doi.org/10.1186/S12905-022-01768-0.

[17] M. Tavakol, R. Dennick, Making sense of Cronbach’s alpha, Int J Med Educ 2 (2011) 53. https://doi.org/10.5116/IJME.4DFB.8DFD.

[18] M. Harris, H. Thulesius, A.L. Neves, S. Harker, T. Koskela, D. Petek, R. Hoffman, M. Brekke, K. Buczkowski, N. Buono, E. Costiug, G.J. Dinant, G. Foreva, E. Jakob, M. Marzo-Castillejo, P. Murchie, J. Sawicka-Powierza, A. Schneider, E. Smyrnakis, S. Streit, G. Taylor, P. Vedsted, B. Weltermann, M. Esteva, How European primary care practitioners think the timeliness of cancer diagnosis can be improved: a thematic analysis, BMJ Open 9 (2019) e030169. https://doi.org/10.1136/BMJOPEN-2019-030169.

[19] M.N. Hasan, M. Abdul Baker Chowdhury, J. Jahan, S. Jahan, N.U. Ahmed, M.J. Uddin, Cesarean delivery and early childhood diseases in Bangladesh: An analysis of Demographic and Health Survey (BDHS) and Multiple Indicator Cluster Survey (MICS), PLoS One 15 (2020) e0242864. https://doi.org/10.1371/JOURNAL.PONE.0242864.

[20] M.N. Hasan, M.R. Babu, M.A.B. Chowdhury, M.M. Rahman, N. Hasan, R. Kabir, M.J. Uddin, Early childhood developmental status and its associated factors in Bangladesh: a comparison of two consecutive nationally representative surveys, BMC Public Health 23 (2023) 1–13. https://doi.org/10.1186/S12889-023-15617-8/TABLES/4.

[21] M.N. Hasan, S. Tambuly, K.F. Trisha, M.A. Haque, M.A.B. Chowdhury, M.J. Uddin, Knowledge of HIV/AIDS among married women in Bangladesh: analysis of three consecutive multiple indicator cluster surveys (MICS), AIDS Res Ther 19 (2022) 1–10. https://doi.org/10.1186/S12981-022-00495-8/TABLES/3.

[22] M.A. Islam, M.N. Hasan, T. Ahammed, A. Anjum, A. Majumder, M.N.E.A. Siddiqui, S.K. Mukharjee, K.F. Sultana, S. Sultana, M. Jakariya, P. Bhattacharya, S.A. Sarkodie, K. Dhama, J. Mumin, F. Ahmed, Association of household fuel with acute respiratory infection (ARI) under-five years children in Bangladesh, Front Public Health 10 (2022) 985445. https://doi.org/10.3389/FPUBH.2022.985445/BIBTEX.

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

