Acceptance Towards COVID-19 Vaccination in Breast Cancer Patients: An Analytical Cross-Sectional Study in A Tertiary Care Hospital of Rawalpindi, Pakistan

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ABSTRACT

Objective: To determine the level of COVID-19 vaccine acceptance among patients diagnosed with breast cancer.

Study Design: Analytical cross-sectional.

Place and Duration of Study: The study was conducted in Breast Cancer Outpatient Department located in a tertiary care hospital in Rawalpindi, Pakistan from Nov 2021 to Jul 2022.

Methodology: Validated questionnaire was used to collect data from patients diagnosed with breast cancer. Sample size of n=134 was attained using non-probability consecutive sampling. Data was analyzed using SPSS version 22. A *p*-value of <0.05 was taken as significant. Outcome assessed was whether breast cancer patient's personal level of knowledge, mindset, motivation, and concerns towards getting about COVID-19 vaccination helped or hindered their acceptance of COVID-19 vaccination.

Results: COVID-19 vaccine acceptance was found among 124(92.5%) breast cancer patients. Social media and means of mass communication such as television were significant sources of information for COVID-19 related vaccine information (*p*<0.05). A strong positive correlation was found between Total Vaccine Acceptance Score with domains of Knowledge (r=0.353, *p*<0.000), Mindset (r=0.662, *p*< 0.000), Motivation (r=0.780, *p*< 0.000) and Concerns (r=0.800, *p*< 0.000). Higher awareness with positive motivators and mindset of participants lead to greater acceptance of COVID-19 vaccines despite breast cancer diagnosis.

Conclusion: High vaccine acceptance was found among breast cancer patients. High scores of COVID-19 disease knowledge, positive mindset and high motivation towards COVID-19 vaccines leading to a higher overall vaccine acceptance.

Keywords: Breast cancer; COVID-19; COVID-19 Vaccine; Vaccination; Vaccine Acceptance.

INTRODUCTION

Vaccine acceptance among immunologically compromised oncological patients, such as breast cancer patients, is often overlooked in COVID-19 vaccine related research, which is especially concerning given that breast cancer is the most prevalent cancer globally with 7.8 million women diagnosed in the past 5 years, with 685 000 deaths globally in 2020 alone.[1] In Pakistan, the risk of developing breast cancer has risen over the years, and the consensus among researchers is that one out of nine women in the country is at risk of developing breast cancer.[2] with the rate of age-related breast cancer among 18–35-year-old women also being higher in Pakistan compared to other South Asian countries.[3] Predictive modelling of the impact of the COVID-19 pandemic on breast cancer mortality, in a developed country, like the United States, has revealed that the delay in treatment of symptomatic cases resulted in excess breast cancer deaths between 2020 and 2030 due to disruptions in screening, diagnosis of symptomatic cases, and chemotherapy treatment, compared with usual care having no COVID-19 impact.[4] As a developing country with a healthcare system troubled with triple burden of disease, Pakistan faces the difficulty of increased breast cancer mortality potentially worsened by vaccine hesitancy.[5] Historically, Pakistan has a lower share of vaccination among its population, corresponding with Pakistan still remaining as one of the two countries in the world with endemic polio due to low rates of acceptance for vaccines.[6] Acceptance towards COVID-19 vaccination in Pakistan also remains contentious.[7,8] Vaccination, as a primary prevention, assumes more importance for immunocompromised populations, such as breast cancer patients, who are already at high risk of severe complications and death from COVID-19 co-

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infection.[9,10] Therefore, the aim of this project was to explore the gap that exits in currently existing literature in Pakistan regarding COVID-19 vaccination acceptance among patients diagnosed with Breast Cancer.

METHODOLOGY

A cross-sectional analytical study was conducted in Breast Cancer OPD of a tertiary teaching hospital in Rawalpindi. A sample size of 134 was calculated using Open Epi Version 3, using population size of 25928, a confidence level of 95%, confidence limits of 6% and 14.5 % incidence of breast cancer in Pakistani population.[11] Data was collected from November 2021 to July 2022, using nonprobability consecutive sampling.

Inclusion Criteria: Individuals more than 18 years of age and diagnosed with breast cancer were included in the study.

Exclusion Criteria: Individuals were excluded if they had not been informed by their family of their breast cancer diagnosis or had recently been diagnosed with active, severe COVID-19. Data collection began with approval of Army Medical College Ethics Review Committee (ERC/ID/198, dated 28 April 2022). Informed written consent was obtained from the participants with respect for their privacy and anonymity under strict confidentiality. The questionnaire was based on a validated data collection tool developed by Kumari *et al.*[12] having a Cronbach alpha of 0.86, suggesting good internal consistency. The data collection tool was translated to Urdu and back translated for quality control. It comprised of three sections: first, regarding participant social and demographic characteristics, including their COVID-19 vaccination status, second, comprised of Breast Cancer Health Information and third, encompassed awareness, mindset and beliefs regarding COVID-19 vaccine. Scoring of all statements was done on a Likert Scale. Domain scores were Knowledge = 34 , with a minimum score of 11, indicating participants had no knowledge of the COVID-19 vaccines and a maximum score of 34, indicating that participant possessed good knowledge, Mindset = 33, minimum of 10, indicating negative mindset, and maximum of 33, indicating positive mindset, Motivators = 50, a minimum score of 10 showing low motivation and a maximum score of 50 showing high motivation and Concern =35, minimum score of 7 showing no concern to a maximum score of 35 indicating many concerns. Total

cumulative score was 156. Scores obtained were dichotomized to two categories: those scoring more than 79 ≥ 50%) being Vaccine Accepting and scoring below 78(<50%) being Vaccine Hesitant, using evidence from existing literature.[13] Data entry and analysis was performed using IBM SPSS Statistics, version 23.0. Potential confounders were gender and ethnicity. Breast Cancer has a statistically small probability of occurring in men as evidenced by literature.[14] and no male patients presenting during data collection phase. Efforts were made to collect data from as many ethnicities as feasible which presented within duration of data collection period. Descriptive statistics such as frequencies and proportions were used for categorical variables. Chi square test was applied to determine association between variables of interest, such as demographic variables, stage and grade of breast cancer, and individual statements of data collection tool, and dependent variables, which were vaccine accepting or vaccine hesitant. Pearson's correlation was applied between total and individual domain scores to determine association. The value of the correlation coefficient indicated the strength of the relationship between two variables. A correlation of 0 indicates no relationship at all, a correlation of 1 indicates a perfect positive correlation, and a value of –1 indicates a perfect negative correlation. Weak correlation is shown by r being equal to 0.10 to 0.29, moderate by r being equal to 0.30 to 0.49 and strong by r being equal to 0.50 to 1.0.

RESULTS

Data was collected from 134 patients, who were all female (n=134), mean age 49.40±11.27 years. Majority of participants were married 104(77.6%), of Punjabi ethnicity 99(73.9%) and were housewives 99(73.9%) with no attainment of formal education being reported by 42 participants (31.3%) and having monthly income of Rs. 250001 to 50000 48(35.8%) although none of these factors were statistically significant. Most frequently reported stage of Breast Cancer was Stage 2 65(48.5%), while Grade 2 was the most commonly reported histopathology grade 39(29.1%). Majority 119(88.8%) of the participants had been diagnosed as having breast cancer less than two years ago. Demographic characteristics of sample are shown in Table-I.

No breast cancer disease characteristics were significant for being either vaccine accepting or hesitant, as shown in Table-II.

Table I: Demographic Characteristics of Breast cancer Patients and their Association with Vaccine Acceptance, (n=132)

Demographic Characteristics		Vaccine Hesitant (n=10)	Vaccine Accepting (n=124)	*p*-value (<0.05)
Marital Status	Single	0(0.0%)	9(100.0%)	0.650
	Married	8(7.7%)	96(92.3%)	
	Widowed	2(9.5%)	19(90.5%)	
Ethnicity	Balochi	0(0.0%)	0(0.0%)	0.680
	Pathan	1(5.9%)	16(94.1%)	
	Punjabi	8(8.1%)	91(91.9%)	
	Sindhi	1(20.0%)	4(80.0%)	
	Kashmiri	0(0.0%)	11(100.0)	
	Hazara	0(0.0%)	2(100.0%)	
Monthly Income	Rs. 10 001 to 25 000	1(8.3%)	11(91.7%)	0.779
	Rs. 25001 to 50 000	5(10.4%)	43(89.6%)	

Table-II: Breast Cancer Characteristics of Patients and their Association with Vaccine Acceptance, (n=132)

Breast Cancer Disease Characteristics		Vaccine Hesitant (n=10)	Vaccine Accepting (n=124)	*p*-value (<0.05)
Years Since Diagnosis	3 to 5 Years	0(0.0%)	10(100.0%)	0.506
	Less than 2 years	10(8.4%)	109(91.6%)	
	More than 5 years	0(0.0%)	5(100.0%)	
Stage of Cancer	Patient Did Not Know	2(6.9%)	27(93.1%)	0.811
	Stage 1	0(0.0%)	9(100.0%)	
	Stage 2	5(7.7%)	60(92.3%)	
	Stage 3	3(11.1%)	24(88.9%)	
	Stage 4	0(0.0%)	4(100.0%)	
Grade of Cancer	Patient Did Not Know	6(9.7%)	56(90.3%)	0.758
	Grade 1	0(0.0%)	6(100.0%)	
	Grade 2	2(5.1%)	37(94.9%)	
	Grade 3	1(5.0%)	19(95.0%)	
	Grade 4	1(14.3%)	6(85.7%)	

Figure-1 shows the distribution of type of COVID-19 vaccine used by respondents. Majority 124(92.5%) of participants were accepting COVID-19 vaccination, compared to 10(7.5%) who were not. Mean score of 23.46±4.63 in knowledge domain indicated good level of knowledge in the sample population. However, more vaccine hesitant participants believed that COVID-19 vaccination should not be given to pregnant and lactating women than vaccine accepting ones (*p*=0.000). Vaccine hesitant participants also did not know whether immunocompromised patients such as cancer patients should be vaccinated against COVID-19 (*p*=0.037). Both vaccine accepting and vaccine hesitant groups reported social media as a relevant source of information (*p*=0.035) with television/radio (*p*=0.022) being significant impactful sources for both groups. Both groups reported healthcare workers to be a trusted source of information, however, this was not statistically significant (*p*=0.602). Vaccine hesitant participants 12(21.4%) believed that the COVID-19 vaccines were faulty, or fake compared to vaccine accepting participants 44(78.6%), which was statistically significant (*p*=0.004). Vaccine hesitant participants also believed that they would have some unforeseen future effects of the COVID-19 vaccine 13(22.4%) compared to vaccine accepting participants 45(77.6%) which was statistically significant (*p*=0.001). Figure-2 illustrates these concerns.

Mean score for Mindset domain was 24.07±5.07, which indicated a mostly positive mindset towards COVID-19 vaccination while mean score for Motivation domain was 39.51±9.93, which indicated presence of high motivation towards COVID-19

vaccination. Concerns domain had a mean score of 19.2±5.68, which indicated that participants still had reservations regarding COVID-19 vaccination. Strong positive correlation was found between Total score (156) of the questionnaire with Knowledge score (r=0.594, *p*< 0.001), Mindset score (r=0.818, *p*< 0.001), Motivation score (r=0.883, *p*<0.001) and Concerns score (r=0.800, *p*<0.001) after applying Pearson's correlation, for which Normality was checked, all parameters normally distributed. Higher awareness and positive motivating factors and mindset of participants lead to higher acceptance of the COVID-19 vaccines despite their adverse diagnosis of breast cancer. This is illustrated in Figure-3.
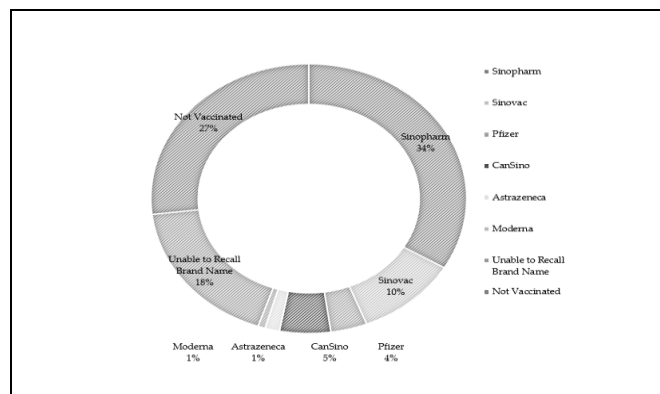

Figure-1: Distribution of COVID-19 Vaccine Usage in Breast Cancer Patients, (n=132)
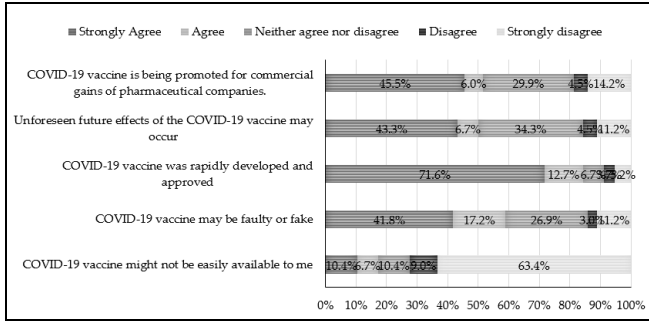
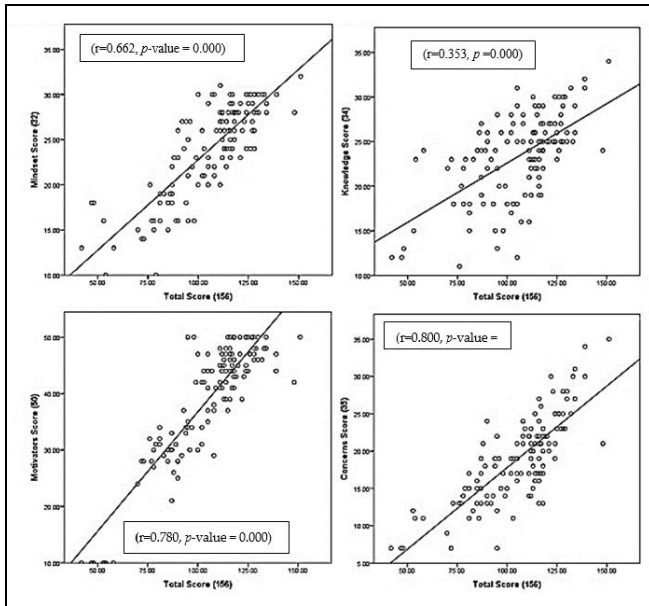**Figure-2: Participant Concerns Regarding COVID-19 Vaccines**

Figure-3:Correlation Between Domain Scores and Total Scores of COVID-19 Vaccine Acceptance

DISCUSSION

The results of this single-center study indicate that breast cancer patients are more vaccine accepting when they possess a good working knowledge about COVID-19 vaccines and have positive motivation and mindset towards COVID-19 vaccination. Concerns were present in both vaccine hesitant and vaccine accepting participants, but they tended to be greater in participants who had low motivation and negative mindsets. Patients could be counselled regarding these concerns, such as fear of encountering side-effects, especially as a recent study in Germany found that very few side-effects were reported in breast cancer patients who underwent COVID-19 vaccination.[15] These fears in the participants could be reflective of the adverse psychological distress they experienced due to their breast cancer diagnosis,[16] along with other social factors such as having no education or being unemployed, which was reported by a similar study in Pakistan.[17] At present, global leading cancer institutions support vaccination for all cancer patients regardless of treatment and stage of cancer as long as no live attenuated vaccines are used.[18] In this study, we found no statistical significance between any demographic variable and vaccine acceptance, similar to a larger study in Wuhan, China, however, owing to their large sample size, they did find significant association of stage of cancer with vaccine acceptance,[19] which was not found in this study, most likely due to having smaller sample size. Another study from Portugal found that demographic variables of low education and rural location of residence were predictive factors for COVID-19 vaccine hesitancy,[20] which was not found to be statistically significant in this project. A study in Mexico also found no demographic variable to be a successful predictor of low vaccine acceptance,[21] similar to this study. Concerningly, many participants in this study felt that the COVID-19 vaccines were rolled out and authorized for use too quickly, in spite of global restrictions in place die to the COVID-19 pandemic. This is a statement often encountered in social media posts associated with vaccine related conspiracy theories,[22] which was also reported among the participants of another study about vaccine hesitancy from Pakistan.[23] Another study also found that people who tend to consume such social media posts also have an increased likelihood to spread it among their social networks, both online and in their day-to-day life.[9] With the increasing spread of social media networks among the general population, vaccine misinformation has the potential of being spread at a faster rate than can be effectively countered by measures to strengthen confidence in vaccine usage. This could worsen growing suspicion towards COVID-19 vaccines as Pakistan unfortunately already struggles with low vaccine acceptance among its general population as evidenced by Pakistan remaining one of the two countries with endemic polio, fueled by misinformation among otherwise highly educated cadres, as found by two studies from Pakistan, such as journalists,[24] and health care workers.[8] This could compromise the quality of vaccination related information they provide to the general population, which like most of the patients in this study, already have low levels of education and rely on healthcare workers sources as trusted sources of information. It is therefore imperative that false information found on social media be restricted in access before it reaches the general population. Social media was an impactful source of information in this

study although the risk of misinformation can be greater if this is a sole medium of information utilized as also reported by other studies,[9,25] While there was limited information available initially, as many COVID-19 vaccine trials did not recruit cancer patients in their cohorts, a significant gap in knowledge in the acceptability of these vaccines for use in cancer patients 16 particularly in the context of South Asia, has emerged which can countered by effective vaccine communication between patients and healthcare providers.

Limitations encountered in this project included language, while collecting data from patients hailing from peripheral areas of Pakistan, who had limited grasp of Urdu, which was the language used in the data collection tool. The findings of this study may not be easily generalized to other populations as the sample size was small and enrolled from a single tertiary level facility using non-randomized enrollment of participants, whose geographic and cultural background vary from others across the country. Future studies with larger sample size enrollment along with multi-center participation from medical oncology and radiation therapy departments would yield more insights regarding COVID-19 vaccine acceptance among breast cancer patients.

CONCLUSION

High COVID-19 vaccine acceptance was found among breast cancer patients at a tertiary care facility in Rawalpindi, Pakistan, with appropriate vaccination knowledge, high motivation and positive mindset being contributing factors. Vaccination information being provided by healthcare providers was a trusted source of information for these patients however social media being a similar source of information among vaccine hesitant participants was concerning. Lack of acknowledgement of participants vaccination concerns and information sources being social media, especially in context of low patient education, can contribute to vaccine misinformation and lead to vaccine hesitancy even among vaccine accepting participants if not addressed in a timely manner.

Conflict of Interest: None.

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under:

AAM : Data acquisition, data interpretation, critical review, approval of the final version to be published.

ZR & SRQN: Study design, data analysis, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MAR & NR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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