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RESEARCH ARTICLE

ANALYTICAL STUDY ON FACTORS AFFECTING THE ATTITUDE AND PERSPECTIVES OF FEMALE PATIENTS ON THE USE OF ARTIFICIAL INTELLIGENCE IN THE ASSESSMENT OF SCREENING MAMMOGRAMS

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Abstract

Background: Breast cancer is one of the most common cancers among Indian women, with an incidence of 25.8 per 100,000 women according to the Ministry of Health and Family Welfare. Late detection is responsible for poor quality of life (QOL), and it is the leading cause of death. Studies have shown that people are positive towards AI performing assessment tasks in healthcare in general and in mammography screening. Moreover, it is challenging to implement strategies based on self-breast inspection or do mammography in rural regions or low and middle income nations for a variety of reasons.

Objective: This study was conducted to assess the perception and attitude of various female patients reporting to the radiology unit of a tertiary care centre regarding the use of Artificial Intelligence in routine mammogram screening.

Study Design: A cross sectional questionnaire based study was conducted female patients attending the radiology unit of a tertiary Care Centre in Central Kerala.

Methods: After obtaining, informed written consent was taken from the study participants. A predesigned, pretested, validated checklist was used to collect the required data. The Knowledge, attitude and practice was ascertained through Likert's scale and scoring done accordingly. Statistical tests of significance was employed to assess the possible associations between various variables with the knowledge, attitude and perceptions regarding Artifical Intelligence based Mammogram

Results: Among the 170 study subjects analysed, 68.6% had a satisfactory knowledge about Artificial intelligence. Among the 170 study subjects analysed, 86% had a good attitude about being screened through AI enabled mammogram techniques. 92% of the total study subjects registered for mammogram had done it based on self choice. The association between age and willingness to get screened was found to be statistically significant. It was also seen that there was a statistically very high significance between Knowledge regarding AI and the independent decision to get screened. There was also a

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statistically significant association between age and scores >60% regarding knowledge and attitude regarding the vaccination among the study subjects.

Conclusions: Majority of the study population was having a satisfactory knowledge regarding AI usage in healthcare.

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Introduction:-

Breast cancer is one of the most common cancers among Indian women, with an incidence of 25.8 per 100,000 women according to the Ministry of Health and Family Welfare. Late detection is responsible for poor quality of life (QOL), and it is the leading cause of death. In metropolitan regions, one in every 22 women will have breast cancer over their lifetime; but in rural areas, one in every 60 women will develop breast cancer as per estimates [1]. Organized mammography screening is routinely done to diagnose and treat multiple cases of Carcinoma Breast [2]. However, in a developing country like India, there have been multiple schools of thought regarding the viability of the same with respect to its cost. Approximately, seventy percent of women are diagnosed with cancer in late stages, which has a negative influence on survival rates because of lower likelihood of survival (25%) than early-stage cancers [3]. Moreover, it is challenging to implement strategies based on self-breast inspection or do mammography in rural regions or low and middle income nations for a variety of reasons, which are- (a) Lack of knowledge, (b). Lack of accessibility for the screening, (c) Lack of skilled human resources (d) Radiation exposure and pain during the screening (biopsy/FNAC) (e) Technology limitations (f) Cultural barriers (g) Performing mammography is expensive, many rural women avoid this screening procedure, leading to an increase in cancer burden in rural regions [4]. Studies have shown that people are positive towards AI performing assessment tasks in healthcare in general and in mammography screening [5].

Hence this study was conducted to assess the perception and attitude of various female patients reporting to the radiology unit of a tertiary care centre regarding the use of Artificial Intelligence in routine mammogram screening.

Methods:-

A cross sectional study was conducted among female positive patients attending the radiology unit of a tertiary Care Centre in Central Kerala. All patients attending the OPDs of clinical Departments or being advised for screening of Breast Cancer during their In-patient stay were included in the study, after taking their informed written consent. Those patients who are on follow-up for Carcinoma Breast or already diagnosed with Carcinoma Breast were excluded from the study. Sample size was calculated using Cochran's formula based on the survey conducted by the DHS, Kerala [6] where prevalence of Breast Carcinoma among females in Kerala was 1.71%. The estimated sample size was 170 study subjects. Informed written consent was taken from the study participants. A predesigned, pretested, validated checklist was used to collect the required data from both electronic and manual records of patients admitted and treated in the Centre during the study period. Cross verification of the data done from the participants through phone and email whenever deemed necessary. The Knowledge, attitude and practice was ascertained through Likert's scale and scoring done accordingly. Statistical tests of significance was employed to assess the possible associations between various variables with the knowledge, attitude and perceptions regarding Artificial Intelligence based Mammogram.

Ethics

The Institutional Ethical Committee has reviewed and approved this study at each stage.

Statistics

All the data was entered into, coded and decoded in MS EXCEL. It was analyzed using SPSS version 20.0 in which statistical significance was determined with Pearson Chi-Square test. A p value less than 0.05 was taken as statistically significant.

Results:-

A total of 170 female patients who either had come in for Mammogram as a screening tool for Carcinoma Breast or were prescribed mammogram as a follow up diagnosis were included in the study. There was an equal distribution of female study subjects aged less than 40 years and above 40 years.

Among the 170 study subjects analysed, 68.6% had a satisfactory knowledge about Artificial intelligence. However, among the 33 study subjects aged > 60, only 12.7% had satisfactory knowledge about Artificial intelligence and its use in health care. Among the 61 study subjects aged 18-50 years, 66% had satisfactory knowledge about AI and its applicability in health care.

Among the 170 study subjects analysed, 86% had a good attitude about being screened through AI enabled mammogram techniques as these would enhance the ability of a doctor to correctly diagnose. However, among the 33 study subjects aged > 60 years, only 12.7% had a good attitude regarding the same. They believed in general that such AI techniques are not fool proof and hence diagnostic decisions are unreliable. Among the 61 study subjects aged 18-50 years, 68.2% had a good attitude regarding AI enhanced Mammogram techniques.

92% of the total study subjects registered for mammogram had done it based on self choice and hence also had a satisfactory level of awareness regarding employability of AI in health care. However, the 8% that had registered for Mammogram owing to spouse / child / peer pressure scored low on the Awareness Likert Scale.

Among the 170 study subjects who had registered for Mammogram, 80 (47.05%) reported that they were pressurized by spouse, friends or family to get screened for Breast Carcinoma. This appeared to the investigators as a matter of serious concern as the awareness regarding breast cancer and the benefits of early detection seemed to be less among the study subjects.

When asked about the reasons for their willingness to get screened, the study subjects revealed numerous reasons, the most prominent being the belief that Mammogram is the best available screening technique for Breast Cancer (74%) followed by the realisation that breast Cancer if not detected could be a fatal disease (41%). 15% of study subjects also quoted that they just agreed upon the views of their family members and health care providers regarding routine screening.

Fig No. 1:- Craniocaudal projection mammogram of right breast showing heterogeneously dense breast which may obscure masses.

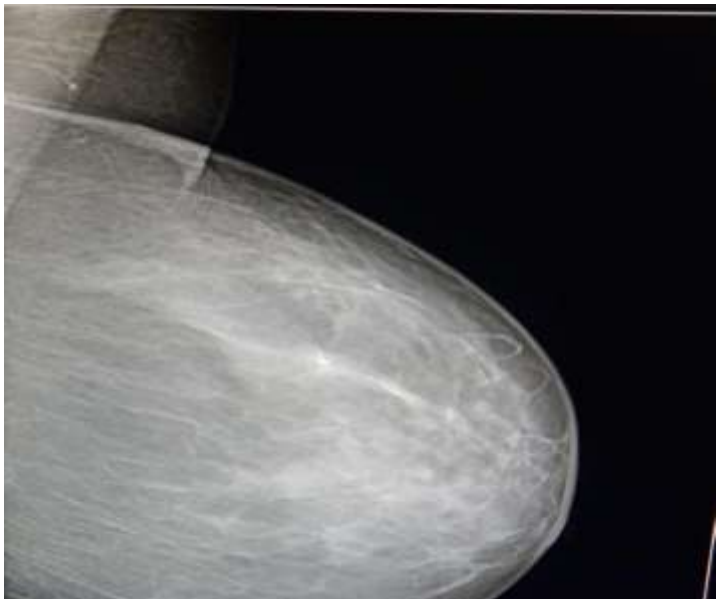

Fig No. 2:- Craniocaudal projection mammogram of left breast showing heterogeneously dense breast which may obscure masses.

When asked about the concept of routine Mammogram as a diagnostic tool, 87.3% of the study subjects reported that they were familiar with it. However, only 21.4% of the study subjects knew or understood the concept of routine mammogram screening. This also could be viewed as a matter of concern, as understanding the concept of routine Mammogram being very effective in ensuring that recurrence is either prevented or diagnosed much earlier is important to enhance post treatment follow up acceptability among the general public.

Out of the total, 90 study subjects (53%) had enrolled for Mammogram screening on their self interest and 80 (47%) due to peer / spouse / child pressure. This association between age and willingness to get screened was found to be statistically significant. It was also seen that there was a statistically very high significance between Knowledge regarding AI and the independent decision to get screened (Chi square value: 71.7337, p value < 0.001) (Table No.2)

It was observed that there was no statistically significant association between Marital status and scores >60% in Knowledge, Attitude and Practice regarding COVID vaccination among the 170 study subjects. However, there was a statistical association between age and scores >60% regarding knowledge and attitude regarding the vaccination among the study subjects. There was also a statistically significant association between scores >60% regarding Education and Knowledge, Attitude and Practice regarding mammogram screening among the 170 study subjects. (Table No.2)

Discussion:-

As a part of the “Make it in India” initiative, Telerad Tech, a global healthcare technology from Bengaluru, has introduced “MammoAssist”, a new AI-powered tool that detects early-stage breast cancer. “MammoAssist” analyses mammograms and processes imaging data to identify radiologic signs of early-stage breast cancer and categorises it for BIRADS Scoring using a fully organised template. This template is then sent to a radiologist, who confirms and validates the mammography results before issuing the formal report. “MammoAssist” has been proved in trials to increase a radiologist's efficiency and output by over 50%[1]. However, the effectiveness of any innovative campaign depends on the population coverage and the acceptance of the general population. So, it is important that the public awareness and attitude towards AI enabled mammogram as a diagnostic and follow up tool is understood beforehand, so that public health officials have the time to design and implement targeted interventions to raise the awareness of general population.

Death rates for female breast and cervical cancers, however, were considerably higher in transitioning versus transitioned countries (15.0 vs 12.8 per 100,000 and 12.4 vs 5.2 per 100,000, respectively) [3]. In our study, out of the 170 study subjects, 112 (65.9%) were either under treatment or had completed treatment for Carcinoma Breast.

Mammography sensitivity has been reported to vary from 64% to 90% and specificity from 82% to 93% [16]. Indian women have more dense breasts, and there is a lack of adequate mammography machines and trained manpower. This may result in false positives and over-diagnosis. Digital mammography uses computer-aided detection software but remains costly. It is due to these reasons that mass-scale routine mammography screening is not a favoured option for a transitioning country like India [4]. In our study too, cost was a major concern for nearly 88.6% study subjects when considering AI enabled Mammography as a diagnostic / follow up modality.

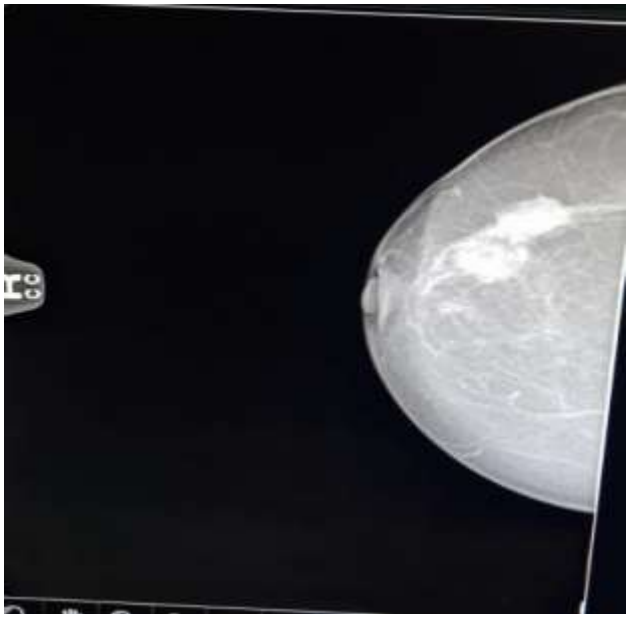

Fig No. 3:- Craniocaudal projection mammogram of right breast showing scattered areas of fibro glandular breast tissue with irregularly shaped radio opaque masses having spiculations.

Fig No. 4:- Craniocaudal projection mammogram of left breast showing scattered areas of fibro glandular breast tissue.

Another issue that adds to the high attrition rates/loss to follow-up of Breast Cancer treatment is an unacceptable out-of-pocket expenditure, which is three times higher for private inpatient cancer care in India. More than half the patients from low-income households spend > 20% of their annual household expenditure on BC treatment, leading to catastrophic results [4]. As per a study conducted in another transitioning country, Egypt, "The most common cause for lun willingness for screening was financial issues (33.1%) followed by "below secondary education" (25.5%) [6]" In our study too, nearly 50% of the study subjects belong to Lower / Lower middle socio economic classifications.

In other studies conducted across the country, participants were generally familiar with AI but were less familiar with clinical AI.A few elderly patients (3–25%) expressed having no concept of AI before the study; and some responded with questioning or uncertainty [5]. In our study too, among the 33 study subjects aged > 60, only 12.7% had satisfactory knowledge about Artificial intelligence and its use in health care. Among the 61 study subjects aged 18-50 years, 66% had satisfactory knowledge about AI and its applicability in health care.

Participants were also concerned with the risk of dependence on technology, with consequences including human deskilling and human job loss, including putting caregivers out of work, a reduced trust in health-care providers, a decrease of caregiver and patient responsibility, and a loss of provider control in care. For example, patients expressed concerns that physicians would rely too much on AI such that they would lose their own diagnostic skills and not be able to recognise obvious mistakes or malfunctioning of the AI [5]. In our study too, apprehensions like overuse of AI and questionable reliability of the results, anxiety regarding loss of Doctor Patient relationship etc were majorly raised by the study subjects who were in visible opposition of AI enabled Mammogram techniques.

As per a study conducted in Cairo- Egypt, most of study participants had correct knowledge about mammography (detects masses which are undetectable by hand, recommended above 40 years, and improves cure opportunity) (93.2%, 85.5%, and 85.3%, respectively). In general, participants had positive attitude towards breast cancer screening by mammography. This was evident as 89.9% agreed that having a mammogram is the best way to find a very small lump in the breast, and 91.4% agreed that women who have regular screening by mammogram have better disease outcome than those who do not screen. [6] In our study too, among the 170 study subjects analysed, 68.6% had a satisfactory knowledge about Artificial intelligence and its use in health care. 92% of the total study subjects registered for mammogram had done it based on self choice

When asked about the concept of routine Mammogram as a diagnostic tool, 87.3% of the study subjects reported that they were familiar with it. However, only 21.4% of the study subjects knew or understood the concept of routine mammogram screening

When asked about the reasons for their willingness to get screened, the study subjects revealed numerous reasons, the most prominent being the belief that Mammogram is the best available screening technique for Breast Cancer (74%) followed by the realisation that breast Cancer if not detected could be a fatal disease (41%).

Among the 170 study subjects who had registered for Mammogram, 80 (47.05%) reported that they were pressurized by spouse, friends or family to get screened for Breast Carcinoma.

Tables

Table No. 1:- Socio -Demographic Data of Study subjects.

Variable	Total Number	Percentages
AGE (in years)		
18-30	48	28.24
31-40	44	25.88
41-50	17	10.00
51-60	28	16.47
>60	33	19.41
TOTAL	**170**	**100.00**
RELIGION		
Hindus	113	66.47

Muslims	47	27.65
Christians	10	05.88
TOTAL	**170**	**100.00**
EDUCATION		
No formal education	05	02.94
Primary school	35	20.59
Middle School	11	06.47
High School	34	20.00
Secondary School/ Diploma	11	06.47
Graduation	58	34.12
Post Graduation / Professional	16	09.41
TOTAL	**170**	**100.00**
OCCUPATION		
Not employed	50	29.41
Home maker	43	25.29
Unskilled worker	04	02.35
Semi skilled worker	15	08.82
Skilled worker	06	03.53
Clerical	23	13.53
Semi professional	10	05.88
Professional	19	11.18
TOTAL	**170**	**100.00**
FAMILY TYPE		
Joint	21	12.35
Three generation	69	40.59
Nuclear	80	47.06
TOTAL	**170**	**100.00**
SOCIO ECONOMIC CLASS		
Upper class	54	31.76
Upper middle class	23	13.53
Middle class	09	05.29
Lower middle class	42	24.71
Lower class	42	24.71
TOTAL	**170**	**100.00**

Table No. 2:- Association between Age, Knowledge regarding AI techniques and Educational Status with willingness to be screened for Carcinoma Breast using AI enhanced methods (N= 170).

Age in completed years	**Willingness for AI enabled screening**		**Total**	**Chi Square**	**p value**
	No	**Yes**			
18-30	09 (18.8%)	39 (81.2%)	48 (100.0%)	**23.3233**	**<0.001**
31-40	11 (25.0%)	33 (75.0%)	44 (100.0%)		
41-50	09 (52.9%)	08 (47.1%)	17 (100.0%)		
51-60	19 (67.9%)	09 (32.1%)	28 (100.0%)		
>60	11 (33.3%)	22 (66.7%)	33 (100.0%)		

Total	59 (34.7%)	111 (65.3%)	**170 (100.0%)**		
Knowledge regarding vaccination	**Willingness for AI enabled screening**		**Total**	**Chi Square**	**P value**
	No	**Yes**			
Poor	27 (54.0%)	23 (46.0%)	50 (100.0%)	**11.6362**	**<0.001**
Good	32 (26.7%)	88 (73.3%)	120 (100.0%)		
Total	59 (34.7%)	111 (65.3%)	**170 (100.0%)**		
Educational Status	**Willingness for AI enabled screening**			**Chi Square**	**P value**
	No	**Yes**	**Total**		
No formal education	02 (40.0%)	03 (60.0%)	05 (100.0%)	**41.31**	**2.5**
Primary school	29 (82.9%)	06 (17.1%)	35 (100.0%)		
Middle School	02 (18.2%)	09 (81.8%)	11 (100.0%)		
High School	07 (50.0%)	27 (50.0%)	34 (100.0%)		
Secondary School/ Diploma	02 (18.2%)	09 (81.8%)	11 (100.0%)		
Graduation	03 (34.2%)	65 (65.8%)	58 (100.0%)		
Post Graduation / Professional	04 (25.0%)	12 (75.0%)	16 (100.0%)		
Total	59 (40.6%)	111 (59.4%)	170 (100.0%)		

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Declarations
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Nil.

Conflict of interest:
The authors have no conflicts of interest associated with the material presented in this paper.

Ethical approval:
Obtained from the Institutional Ethics Committee, Mount Zion Medical College

Author Contributions:
Conceptualization- SM, AR.; Formal analysis-NSN.; Methodology-NSN,AR.; Visualization-SM,AR.; Writing—original draft-SM, AR; Writing—NSN; Review and editing-NSN

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