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ASSESSMENT OF EARLY DETECTION OF BREAST CANCER IN AL-YARMOKE TEACHING HOSPITAL (BAGHDAD/IRAQ)

***[1]Taymaa Majid Hameed, [2]Khalid Kareem Rajab, [3]Hiba D. Alameri and [4]Bakir M. Shakir**

[1]Baghdad Health Directorate - Al-Karkh, Baghdad, Iraq.
[2]Al Mustanstryia Medical College/Consultant Surgeon Al Yarmouk Teaching Hospital, Baghdad, Iraq.
[3,4]Baghdad Health Directorate - Al-Karkh, Baghdad, Iraq.

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***Corresponding Author: Taymaa Majid Hameed**

Baghdad Health Directorate - Al-Karkh, Baghdad, Iraq.

ABSTRACT

Introduction: Breast cancer is the most commonly diagnosed cancer among women globally, and organized national mammographic screening has been established as the gold standard for early breast cancer detection in the majority of developed countries. **Objectives:** To assess of early detection of breast cancer in Al-Yarmook teaching hospital in Baghdad / Iraq. **Methods:** This cross-sectional study was conducted to evaluate the effectiveness of breast cancer screening programs asymptomatic women. The study population of asymptomatic included 3130 women who attended breast clinic at the Al-Yarmook Teaching Hospital, from June 1, 2022 to June 1, 2023. The screening program asymptomatic included a clinical examination, ultrasound, mammography, and fine needle aspiration (FNA) or core biopsy. **Results**: The total number of participants without symptoms was 3,130. The total number of those clinically examined was 908, with 795 of them having normal results. Among them, 69 had non-tumorous breast diseases, and 44 had follow-up recommendations. Furthermore, the total number of participants who underwent ultrasound examination was 342, with 110 of them having normal findings, and 228 having positive findings. Among those with benign tumors, 208 were classified as BI-RADS [1, 2, 3], while 24 of them were classified as BI-RADS [4, 5], respectively. 4 participants with BI-RADS [4, 5] had clinically suspicions of cancer. The total number of individuals who underwent mammography was 1,880. Out of these, 764 had normal results, and 1,006 had benign disease. Among those with benign results, and 88 were classified as BI-RADS [4, 5]. Of the 88 with BI-RADS [4, 5], 22 were clinically suspicious. Additionally, 17 were referred for FNA (Fine Needle Aspiration), and 9 of them were referred for true cut. 10 individuals among them were confirmed to have breast cancer. **Conclusion:** The implementation of individual opportunistic breast cancer screening programs has resulted in a notable rise in the early detection rate of breast cancer and has improved awareness about breast cancer screening among asymptomatic women.

KEYWORDS: *Breast Cancer, Detection, Assessment, Screening.*

INTRODUCTION

Millions new cases and more than 450,000 deaths occur from breast cancer worldwide per year.[1] It is the most common type of malignancy globally and the most prevalent cancer among women in both developed and developing countries is breast cancer.[2],[3],[4] Efforts made to combat breast cancer through health education programs and medical awareness campaigns worldwide have had a significant impact in reducing the risk of its occurrence or, at the very least, in detecting it early. Early detection facilitates effective control and treatment, minimizing both healthcare and economic costs.[5] One of the most vital strategies adopted by global healthcare institutions to address the escalation of this disease is the establishment of specialized clinics for early detection and screening of cancer. The positive outcomes of such initiatives have been evident in advanced countries like the UK and the US, while breast cancer (BC) is a higher related mortality rate in Iraqi women, as diagnosed in late stage, in comparism to high-income countries.[3] Breast cancer had witnessed a significant increase (p = 0.007) with predominance in the female gender (female to male ratio 29:1) mostly in the adult age group. Lung cancer rate increased significantly from 4.08 to 5.60/100 000 (p = 0.038). It affected males more than females with a ratio of 3:1, and tends to increase with age. The brain cancer trend showed a bimodal pattern (two peaks in 2004 and 2011) with no significant trend change (p =

0.788). Both genders and age groups were similarly affected.[6] The latest issues of Iraqi Cancer The registry show that 4,115 cases of breast cancer were recorded among an estimated population of 32.5 million; accounting 19.5% of newly diagnosed malignancies, 34% among female Cancers and an incidence of 22 per 100,000 females.[6] Previous surveys have shown that the highest recurrence rate of disease is most often presented among women who are younger in their lives in fourth and fifth decades of life who often progress stages at the time of diagnosis.[6],[8],[9] Gaps in awareness of BC-related facts are still present among Iraqi women which are negatively affecting their attitudes and practices towards the early detection of the disease. Women highlighted their concerns regarding losing family support if they were diagnosed with BC those living in rural areas and internally displaced populations face difficulties in reaching specialized health centers.[3] In current medical science, screening is the primary tool for early diagnosis and timely treatment of breast cancer in early stages.[7],[8] Individuals with intrinsic motivation will organize from within and do not allow others and external factors to influence their performance.[9] Appropriate selection of breast cancer screening-related measures and activities is possible by identifying women's motivations and removing barriers. Breast self-examination and clinical examination are accessible, inexpensive, non-invasive method learned and practiced by the individual.[10] A study showed that cancer-related mortality rates were about 20.5 percent lower in women who were regularly examined by a physician than those who were not examined.[11] It should be noted that the most effective method is a combination of different methods.[10] The breast cancer screening is very important and preventive and health beliefs and behaviors in any society are shaped by the social and cultural context of the individuals.

AIM OF THE STUDY: to evaluate of early detection of breast cancer in Al-Yarmook teaching hospital from 1/6/ 2022 - 1/6/ 2023 in Baghdad, Iraq.

MATERIAL AND METHODS

This cross-sectional study was conducted to evaluate the effectiveness of breast cancer screening programs in asymptomatic women. The study population included 3130 women who were screened for breast cancer at the Al-Yarmook Teaching Hospital in Baghdad from June 1, 2022 to June 1, 2023. The screening program included a clinical examination, ultrasound, mammography, and fine needle aspiration (FNA) or core biopsy. Asymptomatic women were defined as those who did not report any symptoms of breast cancer. All cases are graded according BIRADS lexicon. BIRADS category 4 and 5 were followed by cytopathological analysis. The data were collected from records of statistical unit in Al-Yarmook Teaching Hospital. This data was obtained the BI-RADS scores, were organized, coded, and analyzed using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 20.0.

RESULTS

In Table 1, we can see the presentation of the participants' results in the asymptomatic screening program. The total number of asymptomatic participants was 3,130 out of the overall total of 8,528 participants. The total number of those clinically examined was 908, with 795 (87.56%) of them having normal results. Among them, 69 (7.60%) had non-tumorous breast diseases, and 44 (4.84%) had follow-up recommendations. Furthermore, the total number of participants who underwent ultrasound examination was 342 (10.92), with 110 (32.16%) of them having normal findings, and 208 (91.23%) having positive findings, while 24 (7.02%) of them were classified as BI-RADS.[4,5] respectively. The total number of individuals who underwent mammography was 1,880 (60.06%). Out of these, 764 (40.64%) had normal results, and 1,006 (91.96%) had benign disease. Among those with benign results, and 110 (5.85%) were classified as BI-RADS.[4,5] Additionally, 17 (65.38%) were referred for FNA (Fine Needle Aspiration), and 9 (34.62%) of them were referred for true cut. 10 individuals among them were confirmed to have breast cancer.

Table 1: Category of patients who were screening in asymptomatic women, Total n= (3130) of total participants n= (8528) in Baghdad.

Parameters	n (%)
Total No. of Pt's who screened (Asymptomatic)	3130 (36.70)
Total no. of Pts who they were clinically screened.	908 (29.01)
no. of Pts who they were clinically screened with normal finding	795 (87.56)
no. of Pts who they were clinically screened with breast diseases	69 (7.60)
no. of Pts who they were clinically screened with follow up	44 (4.84)
Total no. of Pts who screened with U/S	342 (10.92)
no. of Pts who screened with U/S and they were normal finding	110 (32.16)
no. of Pts who screened with U/S and they were benign results	208 (91.23)
No. of Pts who screened with results of U/S, BIRAD[4, 5]	24 (7.02)
Total no. of Pts who screened with Mammo	1880 (60.06)
no. of Pts who screened with Mammo and they were normal finding	764 (40.64)
no. of Pts who screened with Mammo and they were benign results	1006 (91.96)
No. of Pts who screened with results of Mammography, BIRAD[4,5]	110 (5.85)

No. of Pts who done FNA of 26 pts suspected	17 (65.38)
No. of Pts who done True cut of 26 pts suspected	9 (34.62)
No. of asymptomatic Pts who detected breast cancer of 3130 pts screened	10 (0.32)
BIRAD = [Breast Imaging Reporting and Data System], n= number of samples. Pts= patients, U/S= ultrasound, Mammo= mammography, FNA= fine needle aspiration.	

Table 2 presents the results of those with cancer symptoms. Out of the total of 8,528 participants, 5,398 had cancer symptoms. A total of 782 individuals underwent clinical examination, and 1,565 underwent ultrasound examination. Among those who underwent ultrasound, 85 had normal results, 1,386 had benign tumors, and 94 were suspected of breast cancer. Similarly, 3,051 individuals underwent mammography, with 107 having normal results, 2,783 having benign tumors, and 161 being suspected of breast cancer. A total of 3,621 individuals underwent both ultrasound and mammography. Among them, 405 were referred for FNAC (Fine Needle Aspiration), and 590 were referred for true cut, making a total of 995 individuals who underwent both FNAC and core biopsy. Additionally, 94 of them had confirmed breast cancer.

Table 2: Category of patients who were symptomatic women, Total n= (5398) of total participants n= (8528).

parameters	**n**	**%**
Total No. of Symptomatic Pt's	5398	63.30
Total no. of Pts who they were clinically assessment.	782	14.47
Total no. of Pts who tested with U/S	1565	28.99
no. of Pts who tested with U/S, and they were normal finding	85	5.43
no. of Pts who tested with U/S, and they were benign tumor	1386	88.56
no. of Pts who tested with U/S, and they were suspected malignancy.	94	6.01
Total no. of Pts who tested with Mammo	3051	56.52
no. of Pts who tested with Mammo and they were normal finding	107	3.51
no. of Pts who they were benign tumor	2783	91.22
no. of Pts who they were suspected malignancy	161	5.28
Total no. of Pts who tested with U/S and Mammo	3621	67.08
no. of Pts who they were done FNA	405	7.50
no. of Pts who they were done true cut	590	10.93
Total no. of Pts who they were done FNA and true cut	995	18.43
No. of symptomatic Pts who detected breast cancer of 5398 pts tested	94	9.45
n= number of samples. Pts= patients, U/S= ultrasound, Mammo= mammography, FNA= fine needle aspiration		

Table 3 shows a comparison between the results of screening and non-screening. The total number of individuals clinically examined in screening was 908, while in non-screening, the number was 782. The combined number of individuals who underwent radiological screening with mammography and ultrasound in screening was 2,196, and in non-screening, it was 3,621. Among those who underwent both mammography and ultrasound in screening, 26 were referred for cytological and histological examination, with 17 undergoing FNAC and 9 undergoing core biopsies. In non-screening, the total was 995, with 405 undergoing FNAC and 590 undergoing core biopsies. The p-value of 0.270 indicates no statistically significant relationship between screening and non-screening at a significance level of $p \leq 0.05$.

Table 3: comparing between screening (asymptomatic) and non-screening (symptomatic) patients who their final diagnosis with breast cancer, benign tumor, and normal finding and how they diagnosed, n= 8528.

parameters	**Screening**		**Non-screening**		**p-value**
	n	**%**	**n**	**%**	
Total No. of Pt's who screened and non-screened	3130	(36.70)	5398	(63.30)	0.270
Total no. of pts with normal finding	874	(39.33)	192	(4.16)	
Total no. of pts with benign finding	1322	(59.50)	899	(98.03)	
Total no. of pts with breast cancer	10	(0.33)	94	(0.87)	
Final diagnosis detected by: Clinically: Radiologically (Mammo, U/S): FNA: True cut:	 908 2196 17 9	 (29.01) (70.16) (0.77) (0.40)	 782 3621 405 590	 (14.49) (67.08) (7.5) (10. 93)	
Total	3130	100%	5398	100%	
$p \leq 0.05$, pts=patients, FNA=fine needle aspiration, mammo=mammography, u/s=ultrasound.					

DISCUSSION

Breast cancer is considered one of the most prevalent types of cancer worldwide, in such a way that, millions new cases and more than 450,000 deaths occur from breast cancer worldwide per year.[1] Efforts made to combat breast cancer through health education programs and medical awareness campaigns worldwide have had a significant impact in reducing the risk of its occurrence or, at the very least, in detecting it early. Early detection facilitates effective control and treatment, minimizing both healthcare and economic costs.[5] One of the most vital strategies adopted by global healthcare institutions to address the escalation of this disease is the establishment of specialized clinics for early detection and screening of cancer. The positive outcomes of such initiatives have been evident in advanced countries like the UK and the US. However, in less developed nations, the lack of awareness and knowledge about breast cancer persists, resulting in challenges and limited understanding of this pressing health issue. In Table 1, we can see the presentation of the participants' results in the asymptomatic screening program. The total number of participants without symptoms was 3,130 out of the overall total of 8,528 participants. The total number of those clinically examined was 908, with 795 (87.56%) of them having normal results. Among them, 69 (7.60%) had non-tumorous breast diseases, and 44 (4.84%) had follow-up recommendations. Furthermore, the total number of participants who underwent ultrasound examination was 342 (10.92), with 110 (32.16%) of them having normal findings, and 208 (91.23%) having positive findings, while 24 (7.02%) of them were classified as BI-RADS[4,5], respectively. The total number of individuals who underwent mammography was 1,880 (60.06%). Out of these, 764 (40.64%) had normal results, and 1,006 (91.96%) had benign disease. Among those with benign results, and 110 (5.85%) were classified as BI-RADS.[4,5] Additionally, 17 (65.38%) were referred for FNA (Fine Needle Aspiration), and 9 (34.62%) of them were referred for true cut. 10 individuals among them were confirmed to have breast cancer. By analyzing the data presented in Table 1, we observe that the number of participants seeking cancer screenings without presenting symptoms doubled in a period between 1/6/2022 – 1/6/2023, regarding the previous years. May be that probably reflects the advantage of initiating the National Programs for Early Detection and Research in our country.[2], [12], [13], [14], [15] And this increase provided a greater opportunity for early disease intervention, potentially attributed to awareness programs conducted through social media and other educational initiatives. Previous studies have already emphasized the knowledge, attitudes, and practices gaps among Iraqi women concerning breast cancer.[16], [17] As a result, this facilitated the promotion of a comprehensive national breast cancer control strategy, which relies on public education campaigns and guidelines for early detection and treatment protocols cited in references.[18], [13], [19], [12] And the role of a Cancer Screening Specialist is crucial in increasing public awareness for early detection of cancer. These specialists play a pivotal role in educating the community about the importance of cancer screening, promoting early detection practices, and addressing misconceptions surrounding cancer screenings, through that they are responsible for designing and implementing education and awareness campaigns to inform the public about the significance of regular cancer screenings for early detection[20], also engage in community outreach programs to reach diverse populations, providing information on available cancer screenings, their benefits, and how individuals can access them[21], so as too they identify and address barriers that may prevent individuals from undergoing cancer screenings, such as lack of awareness, financial constraints, or cultural beliefs[22], advocate for policy changes that support increased access to screenings, reduced financial barriers, and the incorporation of screening education into public health initiatives.[23] The results of the cancer screening, as outlined in Table 2, reveal important insights into the prevalence and outcomes associated with cancer symptoms in the studied population. It's crucial to interpret these findings in the context of existing literature and medical knowledge, so the fact that 5,398 out of 8,528 participants exhibited cancer symptoms underscores the significance of identifying and addressing potential cancer cases within the population, so as results 782 individuals undergoing clinical examination, this step serves as an initial assessment.[24] Suggests that clinical breast examination is a valuable tool in cancer detection. And among the 1,565 participants who underwent ultrasound examination, 85 had normal results, while 1,386 had benign tumors, and 94 were suspected of breast cancer. Ultrasound plays a key role in characterizing breast lesions.[25] The 3,051 individuals who underwent Mammography yielded 107 normal findings, 2,783 benign tumors, and 161 suspected breast cancer cases. Mammography is a standard screening tool for breast cancer.[26] The 3,621 individuals who underwent both ultrasound and mammography indicate a comprehensive approach to screening. This aligns with the recommendation that combining imaging modalities enhances breast cancer detection.[27] Fine Needle Aspiration (FNAC) and Core Biopsy: Among those who underwent both FNAC and core biopsy (995 individuals), 94 cases were confirmed to have breast cancer. FNAC and core biopsy are essential for confirming cancer diagnosis.[28] The comparison in Table 3 between the results of screening and non-screening. The total number of individuals clinically examined in screening was 908, while in non-screening, the number was 782. The combined number of individuals who underwent radiological screening with mammography and ultrasound in screening was 2,196, and in non-screening, it was 3,621. Among those who underwent both mammography and ultrasound in screening, 26 were referred for cytological and histological examination, with 17 undergoing FNAC and 9 undergoing core biopsies. In non-screening, the total was

995, with 405 undergoing FNAC and 590 undergoing core biopsies. The p-value of 0.270 indicates no statistically significant relationship between screening and non-screening at a significance level of $p \leq 0.05$. The higher rate of clinical examination in the screening group is expected, as these individuals are specifically targeted for early detection of breast cancer. However, the higher number of radiological examinations and FNAC/core biopsies in the non-screening group is surprising. This could be due to several factors the first is selection bias related with individuals in the non-screening group may have sought medical attention due to pre-existing symptoms or concerns, leading to a higher likelihood of further investigations. And lead time bias screening participants may be diagnosed with cancer at an earlier stage compared to non-screening individuals, potentially requiring fewer invasive procedures. Or may the test characteristics, sensitivity and specificity of the screening tests can impact the referral rate for further investigations. The lack of statistically significant difference between screening and non-screening groups regarding FNAC/core biopsy referrals at a p-value of 0.270 requires cautious interpretation. While it suggests no association at a specific significance level, a larger sample size might reveal a statistically significant difference.

CONCLUSION

Individual opportunistic breast cancer screening programmes have raised early detection rates and asymptomatic women's knowledge of screening. Due to community awareness and health education, the number of patients screened between 1/6/2022 and 1/6/2023 rose over prior years. Meetings and community outreach increased, as did national organisation collaboration. In our culture, many people only seek health centre services after symptoms develop or when they or someone they know has breast cancer. Compared to Al-Yarmook Teaching Hospital's breast clinic, less people are tested. Prevention of advanced and complex breast cancer cases depends on early diagnosis through organised screening programmes. This lowers the expense of chemotherapy and radiation for early-stage cancer patients. The disparities between clinical examinations and ultrasonography and mammography interpretation are also related to reader variance. Different people read ultrasounds and do clinical tests. For precision, readings are generally done on film rather than the computer. Many mammogram interpreters are not radiologists, which can cause differences between mammograms and clinical results.

REFERENCES

1. W. E., "Breast-cancer screening.," *New England J Med.*, 2011; 365: 1025–32.
2. I. (2020a)., "Data visualization tools for exploring the global cancer burden in 2020.," *CANCER TODAY. Lyon: International Agency for Research on Cancer*, 2022.
3. J. J. N. N. A. Mina Maallah, "Barriers Impeding Early Detection of Breast Cancer in Iraq: A Critical Analysis," *Azerbaijan Medical Journal*, 2022; 62(07): 2845-2863.
4. B. G. B. S. J. A. S. S. Sathwara JA, "Sociodemographic Factors and Late-stage Diagnosis of Breast Cancer in India: A Hospital-based Study.," *Indian J Med Paediatr Oncol*, 2017; 38: 277-281.
5. K. N. F. M. D. S. I. A. Rezabeigi davarani E, "Breast self-examination and its effective factors based on the theory of planned behavior among women in Kerman.," *J Educ Community Health*, 2016; 3: 1-8.
6. L. R. Hussain AM, "Cancer Trends in Iraq 2000-2016.," *Oman Med J*, 31 Jan 2021; 36(1).
7. M. S. B. M. Enjezab B, "Barriers and motivators related to cervical and breast cancer screening.," *SSU J.*, 2004; 12: 78-84.
8. R. C. M. J. H. J. R. H. S. P. Ålgars M, "Readiness and motivation for change among young women with broadly defined eating disorders.," *Eating disorders*, 2015; 23: 242-252.
9. C. E. L. A. H. J. Lee J, "Academic Motivation and Psychological Needs as Predictors of Suicidal Risk.," *J Coll Couns*, 2019; 22: 98-109.
10. H. S. S. P. Safizadeh H, "Health Damaged Context: Barriers to Breast Cancer Screening.," *Asian Pac J Cancer Prev*, 2018; 19: 1941.
11. S. H. Z. A. M. A. Abedian K, " Survey of health beliefs of women about performing mammography in the health servic centers of Sari.," *J Mazandaran Univ Med Sci*, 2006; 16: 90-98.
12. M. F. Al-Alwan NAS, "Promoting clinical breast examination as a screening tool for breast cancer in Iraq.," *Iraqi National Journal for Nursing Specialties*, 2014; 27: 76-82.
13. A. NAS, " Breast cancer among Iraqi women: Preliminary findings from a regional comparative Breast Cancer Research Project.," *J Glob Oncol*, 2016; 2: 1-4.
14. ". C. F. V. N. e. a. Yuksekkaya R, "Breast ultrasound findings in patients with mastalgia under the age of fourty.,," *J Breast Health*, 2012; 8: 19-22.
15. M. R. M. G. A. a. K. M. (. i. J. I, "Management of breast disease," *Springer-Verlag, Berlin*, 2010; 69-76.
16. A.-A. W. E. R. A.-M. Z. N. F. Alwan N, "Knowledge, attitude and practice regarding breast cancer and breast self-examination among a sample of the educated population in Iraq.," *East Mediterr Health J*, 2012; 18: 337-345.
17. A.-A. W. A.-M. Alwan NAS, "Baseline needs assessment for breast cancer awareness among patients in Iraq.," *IJSR*, 2017; 6: 2088–2093.
18. A.-A. N, "Establishing guidelines for early detection of breast cancer in Iraq.," *Int J of Advanced Research*, 2015; 3: 539-555.

19. A. N, "Iraqi Initiative of a Regional Comparative Breast Cancer Research Project in the Middle East.," *J Cancer Biol Res*, 2014; 2: 1016-1020.
20. "Interventions to Promote Cancer Awareness and Early," 1 September 2009. [Online]. Available: https://www.nature.com/articles/npre.2009.3815.1.pdf.
21. M. R.-P. I. M.-C. S. P.-M. G. A. L. &. E.-A. V. Rodríguez-Gómez, "Effectiveness of patient-targeted interventions to increase cancer screening participation in rural areas: A systematic review.," *International journal of nursing studies*, 2020; 101: 103401.
22. J. Z. A. R. H. F. &. M.-J. D. G. Karen E Lasser, "Barriers to colorectal cancer screening in community health centers: A qualitative study," *BMC Family Practice*, 27 February 2008.
23. G. G. L. C. A. S. H. M. S. D. S. U. C. J. Clarity C, "Implementation Science Workshop: Barriers and Facilitators to Increasing Mammography Screening Rates in California's Public Hospitals," *J Gen Intern Med*, 2017; 32(6).
24. A. C. Society, "American Cancer Society," Recommendations for the Early Detection of Breast Cancer, 31 12 2023. [Online]. Available: https://www.cancer.org/cancer/types/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html.
25. A. c. o. Radiology, "American college of Radiology," Practice Parameters and Technical Standards, 12 2023. [Online]. Available: https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards.
26. N. C. C. Network, "National Comprehensive Cancer Network," Treatment by Cancer Type, 1 1 2024. [Online]. Available: https://www.nccn.org/guidelines/category_1.
27. N. &. S. P. Houssami, "Overview of the evidence on digital breast tomosynthesis in breast cancer detection.," *Breast (Edinburgh, Scotland)*, 2013; 22(2): 101-108.
28. W. E. Y. H. &. L. Q. Khalbuss, "A practical approach to fine needle aspiration biopsy with special reference to ultrasound guided FNA.," *Methods in Molecular Biology*, 2012; 931: 137=149.