WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 7, 2502-2516. Research Article ISSN 2277– 7105

PHYSIOLOGICAL RISK FACTORS AND CLINICO HISTOPATHOLOGICAL CHARACTERISTICS AMONG BREAST CANCER PATIENTS (WOMEN POPULATION) IN QASSIM PROVINCE, SAUDI ARABIA

Dr. Saleh A.E.F AL Gabbany ABFM, JBFM*[1], Dr. Mohammad Ali Al Habdan[2] Ph.D, Dr. Paul Faustin Seke Etet[3], PhD, Dr. Ghada Farouk Khaki[4] MBBCh,EBR EDBi, Dr. Lorella Vecchio[5], Ph.D, Dr.K.Chandra Sekhar[6], M.D., Dr. Mohmaad Farhna[7] Ph.D.

[1]Conducted the study. Presently working as Public Health Supervisor for Training and Family Medicine. Ex. Director at Saudi Board Family Medicine Program and Consultant Family Medicine at Qassim Region Training Centre & Ex. Executive Director of Breast Cancer screening program al qassim region up to 2015. Al Qassim region, Saudi Arabia.
[2]Guided and co author of the study. Ex executive director of breast screening program Al Qassim region up to 2010. Presently at General Director of Health affairs in Aseer region, MOH.
[3]Ex.Assistant Professor Neuroscience/Physiology, Department of Basic Health Sciences, College of Applied Medical Sciences Qassim University, Buraydah, 51452, Al-Qassim, Saudi Arabia.
[4]Consultant Radiologist, Breast Cancer Screening Unit, King Fahad Specialist Hospital, Buraidah, Al Qassim region, Saudi Arabia.
[5]Helped in edit of study, Center for Sustainable Health and Development, Garoua,Cameroon.
[6]Professor of Community Medicine at Family Medicine Academy, Qassim Province, Saudi Arabia. Helped in systematic preparation of the study.
[7]Ex. Assistant Professor Neuroscience/Physiology, Department of Basic Health Sciences, College of Applied Medical Sciences Qassim University.

Article Received on
21 May 2020,
Revised on 10 June 2020,
Accepted on 01 July 2020,
DOI: 10.20959/wjpr20207-18021

***Corresponding Author**
Dr. Saleh A.E.F AL Gabbany ABFM, JBFM
Public Health Supervisor for Training and Family Medicine, General Directorate of Health Affairs, Qassim Province, Ministry of Health, Saudi Arabia.

ABSTRACT

Background: Breast cancer is most common cancer in the world including developing and developed world. It accounts 1.7 million cases diagnosed globally in the year 2012 and it accounts 25% of all cancers in women. (https://www.wcrf.org) **Objectives:** To find the physiological risk factors and histopathological characteristics among the Breast cancer patients of women aged between 35 to 60 yrs in Qassim province. **Methodology:** We performed a retrospective study of the baseline and clinico histopathological features of the asymptomatic cases detected between January 2007 and December 2014 by the digital mammography Screening program of Qassim region, central Saudi Arabia. These features were further investigated by immunohistochemistry in the young women diagnosed (35 to 40 years old) and compared to older (41-45 yrs and more than 45 yrs).

Results: Numerous women were sensitized about breast cancer and mammography, up to 47% of the cases detected were younger than 45 years (yrs). Breast cancer severity score decreased with the age at first pregnancy and increased with the age at diagnosis, the age at menarche and the body mass index (BMI). Up to 49% of cases were diagnosed with invasive ductal carcinoma. The location of mammography signs changed with the age at diagnosis. **Conclusions:** Based on the study results, Breast cancer awareness campaigns were successful in central province of Saudi Arabia. The occurrence of many asymptomatic cases before the age of 45 yrs underlines the need for screening women from earlier age and to implement mammography screening programs all over Saudi Arabia considering the benefits of early detection of breast cancer and benefit of reduction of treatment cost. Need large sample similar studies are required to substantiate the present study results.

KEYWORDS: Age, Breast cancer, Cancer Severity, Clinico pathological characteristics, Qassim.

INTRODUCTION

Breast cancer is the most common cancer in women worldwide. Mammography is the gold standard option for screening and early detection of breast solid tumours, particularly in asymptomatic women. Mammography screening programs and breast cancer awareness strategies are less developed than needed in Saudi Arabia and neighbouring countries. For instance, although breast cancer incidence and mortality rates have been growing, the participation of women to breast cancer screening campaigns would remain low in Qatar, partly due to the complexity of values, beliefs, and attitudes that influence the health seeking behaviour of Arab women.[1]

In an earlier study assessing breast cancer knowledge and the practice of breast self-examination among young female teachers (34.7 ± 5.4 years) working in female schools in Buraidah city way back 2007 (central Saudi Arabia), more than 50% of participants showed a little poor knowledge.[2] Other reports also emphasized the need for culturally appropriate educational programs and strategies as poor knowledge and misinformation were pointed out as the main drivers of adverse attitudes towards mammography screening in the Middle East, particularly in religious communities.[2-5] This is particularly alarming considering that middle east women are likely to develop breast cancer at least a decade before their western counterparts.[6;7]

On this basis, our study assessed the effectiveness of Qassim mammography program screening and awareness campaigns in Saudi participants. Breast cancer prevalence and socioeconomic and clinico pathological features of the asymptomatic cases diagnosed between January 2007 and December 2014, were studied as well. Mammographic differences between the younger cases (diagnosed before 41 yrs) and cases diagnosed after 45 yrs were also explored. Breast cancer cases further studied severity of the disease by Jimenez - Lee's Breast cancer Severity scoring system and clinico histopathological characteristics of breast cancer patients.

MATERIALS AND METHODS

A retrospective descriptive study was conducted during the period from 1st January 2007 to December 2014 among the age group of 35 yrs to 60 yrs of asymptomatic individuals. Suspicious cases confirmed by core needle biopsy (detected cases) were referred to Prince Faisal Oncology Center, King Fahd Specialist Hospital, Buraidah, reports collected from Central executive office. Patients also referred to other specialized hospitals in Saudi Arabia (as per patient request) for disease staging, treatment and follow up. Based on evidence sustaining breast cancer occurrence at least a decade earlier in the Middle East[6;7], participants as young as 35 yrs were accepted. To upset the low uptake and high recall rates observed at the beginning of the program[8], both hospital- and community-based sensitization campaigns on the advantages of breast cancer and early detection programs were performed in the Qassim region.

Data collection strategy

About 16,842 asymptomatic female participants were screened in the Qassim region. Only Arab descent participants were considered in the present study. Demographic and relevant physiological information was collected from mammography referral forms of the asymptomatic cases detected between January 1st, 2007 and December 31st, 2014. For comparison, information was also obtained from mammography referral forms of a representative sample of the female general population in the geographic area screened including 908 healthy participants obtained by systematic random selection of healthy participants. The information collected included mainly the age at diagnosis, the age at menarche, the age at first pregnancy, the gravidity and parity, weight and height, history of metabolic disease, cancer, or OCP use, the occupation, the education level, and the civil status.

Results of further analyses aimed at characterizing the breast cancer cases detected (core needle biopsy followed by histopathology and immunohistochemistry, ultrasonography and MRI) and further investigations and treatment details were obtained from different treating hospitals in Buraidah from the patient records. All data were inserted in a relational database, retrieved, and anonymized by authorized medical personnel to protect the privacy of healthy participants and cases detected. The present descriptive retrospective study received approval from Qassim Regional Ethical Committee. Necessary statistical tests were applied.

Breast cancer severity score (BCSS)

For each of the cases detected, the clinico pathological characteristics were used to determine the breast cancer severity score (BCSS)on the basis of the diameter and number of nodes involved, and the hormone receptor status, as described by Jimenez-Lee and colleagues (2003).[13] A multiple regression analysis assessing the effect of breast cancer physiological risk factors on BCSS was performed.

Age and mammographic signs

The types of mammographic signs (mass, calcifications, architectural distortion, associated findings) and their locations revealed by both medio-lateral oblique (MLO) and cranial-caudal (CC) views of left and right breasts were determined in three age groups: women between 35 yrs and 40 yrs (<41), between 41 yrs and 45 yrs (41-45 yrs), and older than 45 yrs (>45). For precise localization of breast insults, mammographic CC view was divided in media, central and caudal areas, while MLO view was divided in proximal (superior), central, and distal (inferior) areas. Frequencies of occurrence of insults at various sites were compared between the age groups using χ^2 test. The side, shape, margins, and density of breast masses were also compared between age groups.

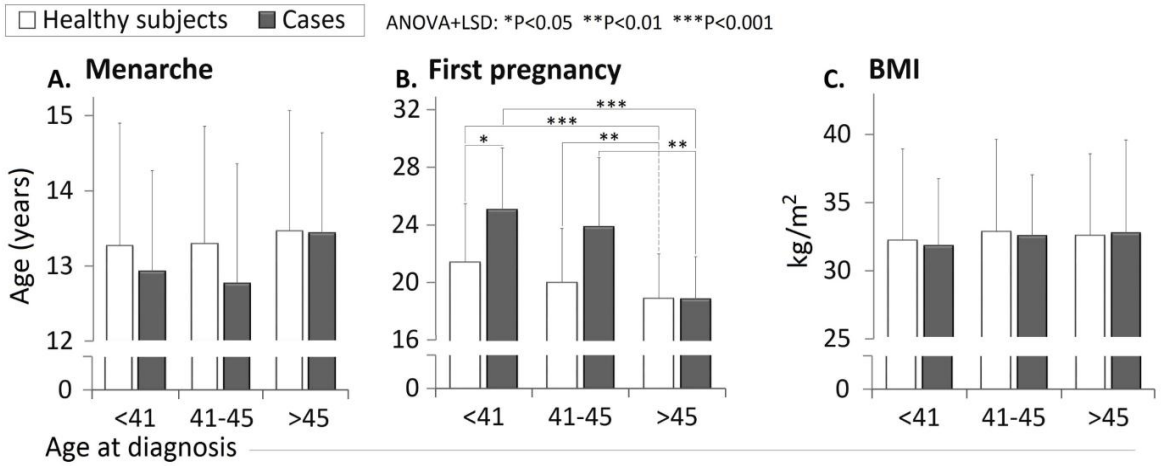
Data analysis and factors

Data wrangling was performed using an Structured Query language (SQL) data base and MATLAB (Matrix laboratory) software (Math Works, Natick, MA, USA) where parameters were compared through multifactorial ANOVA and descriptive statistics obtained. Pearson Chi-square (χ^2) test, regression analysis, and one-way ANOVA were performed to further assess differences and relationships, using SPSS software (IBM, USA) and Microsoft Excel VBA modules. Differences with $P< 0.05$ were considered significant. Data were expressed as mean±SEM.

RESULTS

The mean values of the body mass index (BMI) and the age at diagnosis, at menarche, and at first pregnancy, were not significantly altered in cases detected, compared to the healthy participants screened. Up to 26.5% of diagnosed cases were younger than 41, while 20.6% were between 41 yrs and 45 yrs, and 52.9% were older than 45 yrs. More cases had their menarche between 12 and 13(48.1% against 61.3% in healthy participants, $p<0.05$), and less cases after 14 yrs. A significantly higher number of cases had their first pregnancy after 30 yrs (7.9% against 2.4% in the general population, $p<0.05$). Moreover, a significantly higher fraction of cases was obese compared to the general population (73.6% against 56.3%, $p<0.05$).

Figures 1A-C show the repartition of age at menarche (Figure 1A), age at first pregnancy (Figure 1B), and BMI (Figure 1C) of cases according to groups of age at diagnosis(<41, 41-45, >45yrs)and compare these factors with healthy participants in the same age groups. The asymptomatic cases diagnosed before 45yrs had menarche earlier (12.33±0.1 yrs) than the cases diagnosed after 45 yrs (13.41±0.26 yrs, P = 0.02),but also compared to healthy participants younger than 45 yrs (13.12±0.12 yrs, P = 0.039) (Figure 1A).Notably, healthy participants younger than 41yrs also had their menarche earlier than healthy participants older than 45 yrs (13.12±0.12 vs. 13.47±0.26 yrs, P = 0.015)(Figure 1A).



In both healthy participants and cases, the age at first pregnancy was higher in women younger than 41 (20.95±0.37 years, $P < 0.001$ for healthy participants, 24.57±1.58 years, $P< 0.001$ for cases) or between 41 and45 (20.34±0.33 years, P= 0.005 for healthy participants, 23.77±1.82 years, P = 0.0013 for cases), compared with cases diagnosed after 45 (19.37±0.19 years for healthy participants, 18.68±0.61 years for cases) (Figure 1B). Cases diagnosed with

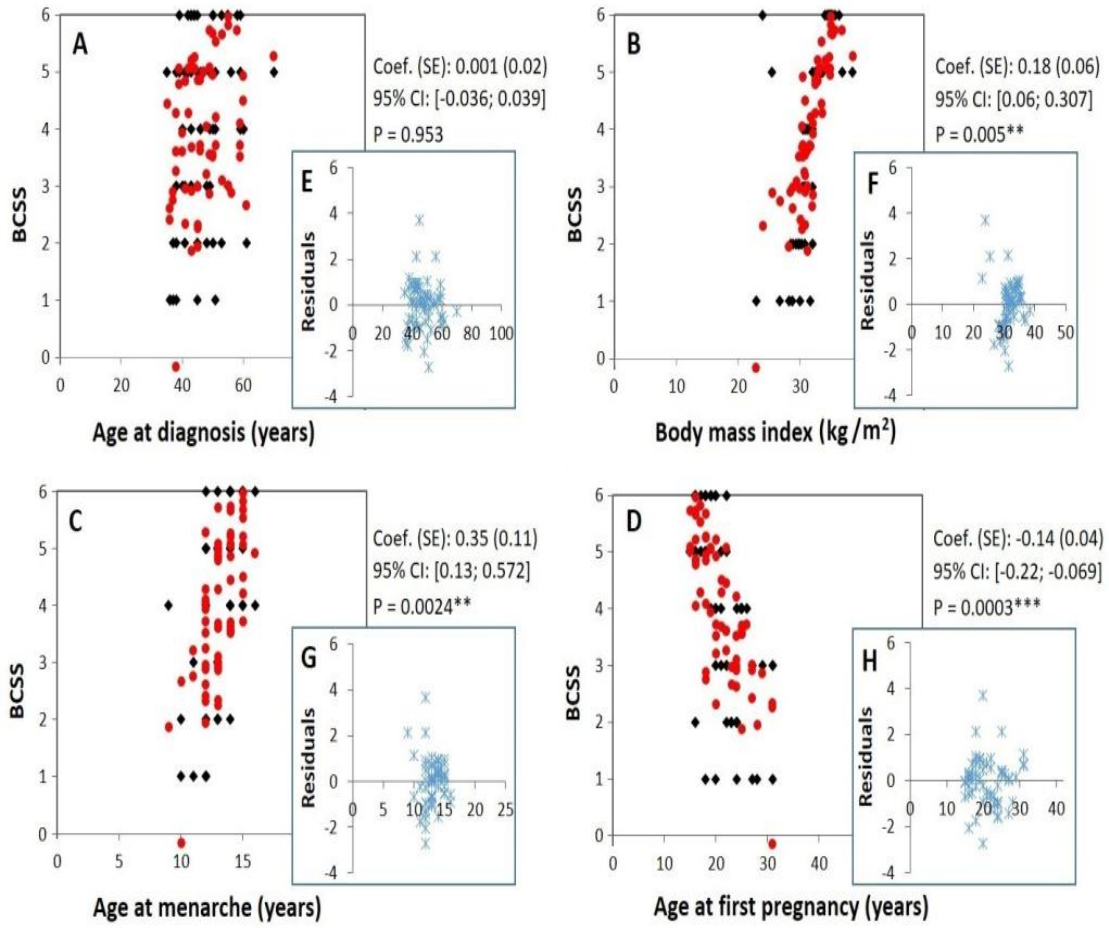
breast cancer before 41 also had their first pregnancy later than their healthy counterparts (23.77±1.82 vs. 20.34±0.33 years, P = 0.042) (Figure 1B).

Participants and cases of all age groups had their average BMI index between 31 and 33, which is markedly higher than the normal 18.5-24.9 value(Figure 1C). No significant difference was observed between these groups for this index (Figure 1C).

Clinico pathological characteristics of cases detected:

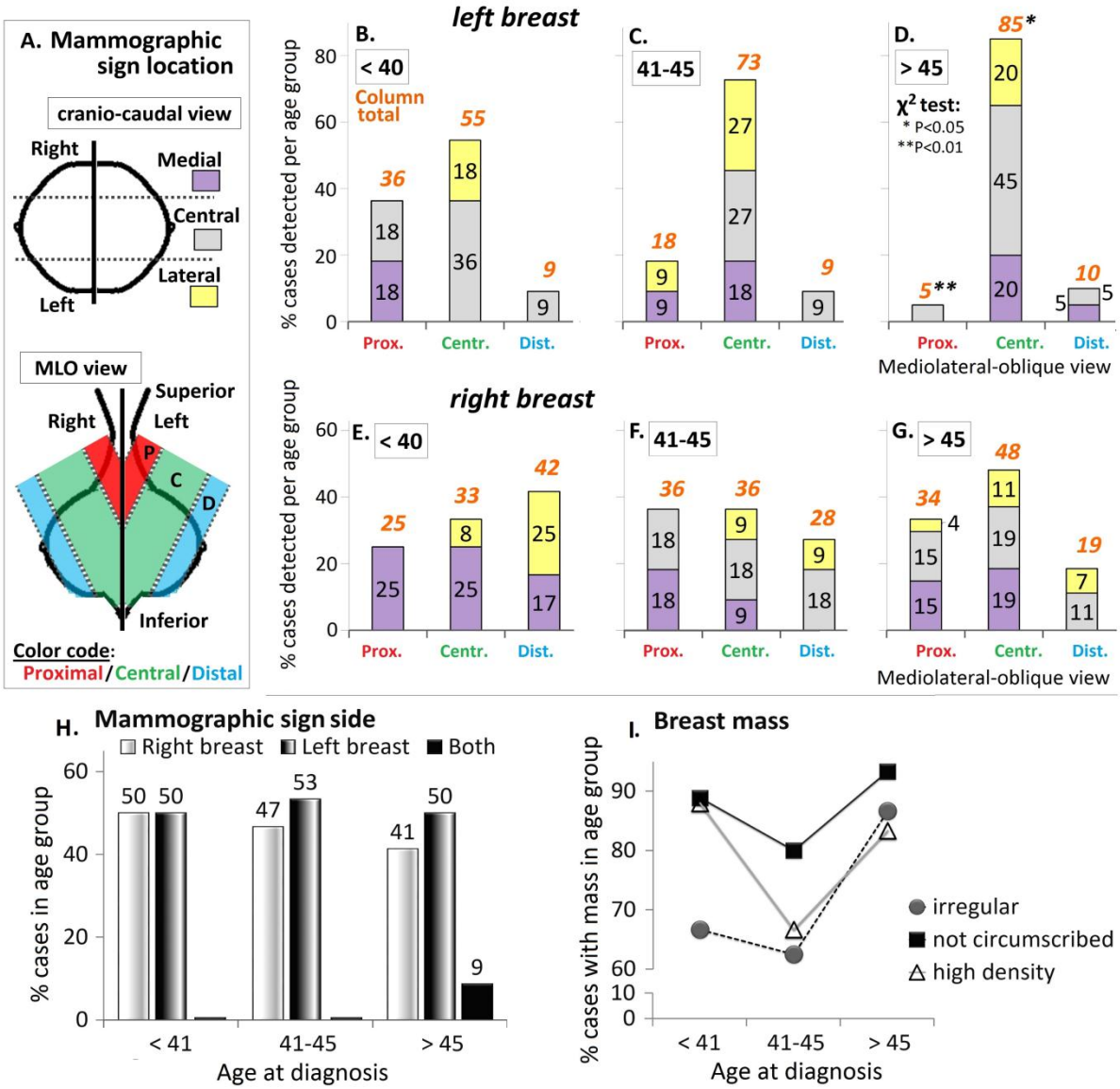
Up to 29% of cases have suspected signs at physical examination. Mammography revealed high breast density in 81.1% of cases, breast masses in 80.3%, micro calcifications in 22.7%, with architectural distortion in up to 48.5% of cases. Axillary adenopathy was the most common breast associated finding (66.7%). Histopathological analysis and further evaluations led to the following diagnoses: ductal carcinoma in situ (DCIS)(19.1% of cases), invasive ductal carcinoma (IDC) (72.1% of cases), invasive lobular carcinoma (ILC) (5.9% of cases), and metastatic carcinoma (2.9%of cases).

Multiple regression analysis suggested a strong predictive power of the BMI (P<0.01), the age at menarche (P<0.01), and the age at first pregnancy (P<0.001) over the BCSS score (R^2 = 0.87, F = 71.96, P < 0.0001,N = 63). Figures 2A-D show the line fit plots of BCSS in function of the age at diagnosis (Figure 2A), the BMI (Figure 2B), the age at menarche (Figure 2C), and the age at first pregnancy (Figure 2D). The predicted BCSS and the actual BCSS in function of each of these parameters fitted significantly, except for the age at diagnosis that fitted poorly(P = 0.953) (Figures 2A-D). Figures 2E-H show plots of residuals of age at diagnosis(**E**),BMI (**F**), age at menarche (**G**), and age at first pregnancy (**H**) in the assessment of the predictive power of these factors over BCSS score. Each of these parameters were randomly distributed around a central value, on both sides if value 0 (Figures 2E-H), validating the regression analysis results.



Mammographic signs and age at diagnosis

The locations of mammographic signs with the age at diagnosis are shown in Figures 3B-G.In the left breast, mammographic signs were more common in MLO proximal area and less common in MLO central area in women younger than 41yrs compared to women over 45yrs (36% against 5%, $p < 0.01$ and 85% against 55%, $p<0.05$, respectively)(Figures 3B-D). Such marked differences were not observed for mammographic sign location in MLO areas in the right breast, where mammography signs were more homogenously distributed in the age groups (Figure 3E-G).On the other hand, mammographic signs were more common in CC central areas of both left breast (Figure 3B-D, grey colour) and right breast (Figure 3F,G) in all age groups, with the exception of females younger than 41 where no insult was observed in CC central area of the right breast (Figure 3E).



An equal frequency of mammographic signs was observed in the left and in the right breast(50%) in cases diagnosed earlier than 41 (Figure 2H). These signs were 3-10% more common in the left breast of cases diagnosed from 41 onward (Figure 2H). Mammographic signs occurred in both breasts only in cases diagnosed after 45 (9%) (Figure 2H). Compared to cases older at diagnosis, cases younger than 45 had less breast masses with high density (62-67% against 86%), with irregular shapes (70% vs. 85%), and lacking circumscribed margins (80-89% against 94%) (Figure 2I).

Table 1: Breast Cancer Severity in Study population (Jimenez - Lee's Breast cancer Severity scoring).

Parameters	Criteria	Number of points
Number of positive nodes	1 to 3 nodes	1
	4 to 10 nodes	5
	> 10 nodes	10
Tumour Diameter	0.1 to 1 cm	1
	1.1 to 2 cm	2
	2.1 to 5 cm	3
	> 5.1 cm	4
Estrogen/Progesterone receptors *	Either Receptors absent	1
	Both Receptors absent	2

* Immunohistochemistry

Table 2: Physiological risk factors in cases detected and among the general population.

Variables	Healthy participants (n-908)	Breast cancer Cases (n-70)	χ^2 test (P-value)
Age at Menarche <12	9.8%	6.5%	0.3903
12-13	48.1%	61.3%	0.0466*
14-15	34.9%	27.4%	0.2322
>15	7.2%	4.8%	0.4912
Median**(min;max)**	13 (10; 25)	13 (9; 17)	
Age at first pregnancy			
<18	28.5%	25.4%	0.6028
18-25	60.0%	57.1%	0.6586
26-30	9.1%	9.5%	0.9093
>30	2.4%	7.9%	0.0115*
Median**(min;max)**	19 (12; 38)	20 (14; 42)	
Body mass index (Kg/mtr^2)			
Normal (18.5- 24.9)	23.0%	11.3%	0.0486*
overweight (25-29.9)	20.7%	15.1%	0.3307
obese (>30)	56.3%	73.6%	0.01434*
Median**(min;max)**	32.7 (18.7; 54.1)	32.7 (21.5; 51.7)	

Min, minimum; **max**, maximum. * -Statistically significant.

Table 3: Clinico pathological characteristics of the breast cancer cases in study population.

Variables	Number	Percentage
Mammography	Breast mass	55
High breast density	55	81.1
Micro calcifications	15	22.7
Architectural distortion	33	48.5
Breast associated findings		
Skin thickening	6	8.3
Nipple retraction	17	25
Axillary adenopathy	45	66.7
Histopathology		
Ductal Carcinoma in situ (DCIS)	13	19.1
Invasive Ductal Carcinoma (IDC)	49	72.1
Invasive Lobular Carcinoma (ILC)	4	5.9
Metastatic Carcinoma	2	2.9

DISCUSSION

In the present study, earlier menarche and later age at first full term pregnancy were more common in cases, and breast cancer severity increased with the age at diagnosis and the BMI index. Notably, high BMI was relatively common in both the general populations and cases detected, as reported all over Saudi Arabia and in other Arabian Gulf countries[7;11;12] and many affluent societies in the world. Comparable abnormally high BMI index was observed in women older than 45 and in younger women. Thus, in addition to its participation as major player to breast cancer development[11;14-18], a lifestyle favouring obesity-associated metabolic syndrome may also contribute to the occurrence of breast cancer at earlier age in Arab women observed both in the present and in previous studies.[6;7;10]

This hypothesis was also sustained by the significantly high predictive power of BMI index over breast cancer severity score (BCSS). Also in support of lifestyle as major risk factor for breast cancer development, later age at first full term pregnancy also had a high predictive power over BCSS score. Interestingly, in our study the age at menarche also had a high predictive power over BCSS score, supporting at least partly a genetic involvement in risk for developing breast cancer in younger Arab women. Considering that various epidemiological studies addressing the effect of the ethnicity on the prevalence of breast cancer performed within[19-22] and out of Middle East[23-25] suggested a role for genetic factors in the earlier occurrence of breast cancer in Arab women, it is probable that the now well-established high

prevalence of breast cancer in younger Arab women may emerge from a deleterious combination of genetic factors with a change in lifestyle in the Middle East. For instance, nowadays a high number of women are obese, have a sedentary life, and have a later age at first pregnancy compared to previous generations.

Moreover, clinico pathological and mammographic evidence suggests that younger women breast cancer could be a different pathophysiological entity than older women breast cancer. Notably, studies in Europe and USA revealed that young women breast cancer may even require different therapeutic approaches.[10;26,27] On this basis, we compared the mammographic characteristics of breast insults observed in the cases detected based on age groups. Evidence of difference between younger and older women breast cancer in our study included an equal frequency of cases with left or right breast affection in women younger than 41, contrary to older women who displayed cancer in both breasts or mainly in the left breast.

Although breast masses were more common (and micro calcifications less common) in all age groups, cases younger than 45 had less masses with high density, irregular and lobular shapes, or lacking circumscribed margins compared to cases older at diagnosis. In addition, in the left breast mammographic signs were more common in MLO proximal area (and CC lateral and central areas) in women younger than 41, while older women had more insults in MLO central area (and CC central area).In the right breast, instead, despite an almost homogenous distribution of mammography signs in MLO view, insults were more common in CC central area in women older than 41 yrs, while in younger women insults were commonly observed in CC medial and lateral areas. These observations suggest that breast cancer in women younger than 41 yrs and older than 45 yrs may be two different clinical entities. Further studies in larger cohorts addressing this issue may provide more insights in the pathophysiology of these two entities, allowing to understand better their causative factors, with possible therapeutic implications.

An improvement in the participation to the Qassim mammography program was observed following hospital and community-based campaigns of sensitization. Screening findings suggest that such campaigns may improve drastically the early detection of breast cancer in Saudi Arabia (thus, the odds of early therapeutic interventions) if implemented at national levels. Comparable observations were reported by an earlier study performed in Riyadh, the capital city of Saudi Arabia.[9] Alarmingly, in the present study, about 47.1% of cases

detected were younger than 45, the age recommended for regular mammography screening in Western countries.[28] In agreement with recent reports in other regions of Saudi Arabia[10, 29], clinico pathological studies revealed that most detected cases had severe and advanced forms of breast cancer (invasive ductal carcinoma in more than 70% of cases). Therefore, the implementation of large scale breast screening program is urgently needed in Saudi Arabia and neighboring Arab countries, with routine screening including Arab women as younger than 41 (the youngest case detected in Qassim region screening was 35).

CONCLUSIONS

Overall, 27% of cases were between 35 yrs and 40 yrs old, 47% were younger than 45, and 49% were diagnosed with invasive ductal carcinoma. These observations encourage the multiplication of campaigns of sensitization and the establishment of large scale mammography programs in Saudi Arabia and neighbouring Arab countries that will include women younger than age 40. The high prevalence of obesity in Arab communities and other genetic and lifestyle factors like early menarche, late first full-term pregnancy appeared as major risk factors for breast cancer development in Arab communities. Therefore, approaches reducing the incidence of obesity and improving the lifestyle should also be implemented to reduce breast cancer burden, particularly in young women. On the whole, need many similar studies are required to support the present study findings.

Source of funding: General Directorate of Health Affairs, Qassim region, Ministry of Health, Kingdom of Saudi Arabia.

Conflict of interest: None.

ACKNOWLEDGEMENTS

Special gratitude towards Hospital staff and mobile clinic staff, secretaries sister MarcellRosty and sister NylaBalleto for their great help and General Directorate of Health Affairs, Qassim region, Ministry of Health, Kingdom of Saudi Arabia. All logistics supplies support for program received from General Directorate of Health Affairs al Qassim region, Kingdom of Saudi Arabia between 2007 to 2014.

REFERENCES

1. Donnelly,T.T.; Al Khater,A.H.; Al-Bader,S.B.; Al Kuwari,M.G.; Al-Meer,N.; Malik,M.; Singh, R.; Chaudhry, S.; Fung,T. Beliefs and attitudes about breast cancer and screening practices among Arab women living in Qatar: a cross-sectional study. BMC. Womens Health, 2013; 13: 49.
2. Dandash,K.F.; Al-Mohaimeed,A. Knowledge, attitudes, and practices surrounding breast cancer and screening in female teachers of buraidah, saudi arabia. Int. J. Health Sci. (Qassim), 2007; 1: 61-71.
3. Karadag,G.; Gungormus,Z.; Surucu,R.; Savas,E.; Bicer,F. Awareness and practices regarding breast and cervical cancer among Turkish women in Gazientep. Asian Pac. J. Cancer Prev, 2014; 15: 1093-1098.
4. Erbil,N.; Bolukbas,N. Beliefs, attitudes, and behavior of Turkish women about breast cancer and breast self-examination according to a Turkish version of the Champion Health Belief Model Scale. Asian Pac. J. Cancer Prev, 2012; 13: 5823-5828.
5. Hatefnia,E.; Niknami,S.; Bazargan,M.; Mahmoodi,M.; Lamyianm,M.; Alavi,N. Correlates of mammography utilization among working Muslim Iranian women. Health Care Women Int, 2010; 31: 499-514.
6. Chouchane,L.; Boussen, H.; Sastry,K.S. Breast cancer in Arab populations: molecular characteristics and disease management implications. Lancet Oncol, 2013; 14: e417-e424.
7. Corbex,M.; Harford,J.B. Perspectives on breast cancer in Arab populations. Lancet Oncol, 2013; 14: e582.
8. Akhtar,S.S.; Nadrah,H.M.; Al-Habdan,M.A.; El Gabbani, S.A.; El Farouk,G.M.; Abdelgadir,M.H.; Al-Saigul,A.M. First organized screening mammography programme in Saudi Arabia: preliminary analysis of pilot round. East Mediterr. Health J, 2010; 16: 1025-1031.
9. Almutairi,K.M.; Ahmad,M.; Vinluan,J.M.; Almutairi,A. Random Cross-Sectional Determination of the Level of Awareness Among Female Saudi Patients About Breast Cancer. J. Cancer Educ, 2015.
10. Albasri,A.; Hussainy,A.S.; Sundkji,I.; Alhujaily,A. Histopathological features of breast cancer in Al-Madinah region of Saudi Arabia. Saudi. Med. J, 2014; 35: 1489-1493.
11. Bhandari,R.; Kelley,G.A.; Hartley,T.A.; Rockett,I.R. Metabolic syndrome is associated with increased breast cancer risk: a systematic review with meta-analysis. Int. J. Breast Cancer, 2014; 2014: 189384.

12. Alokail,M.S.; Al-Daghri,N.; Abdulkareem,A.; Draz,H.M.; Yakout,S.M.; Alnaami,A.M.; Sabico,S.; Alenad,A.M.; Chrousos,G.P. Metabolic syndrome biomarkers and early breast cancer in Saudi women: evidence for the presence of a systemic stress response and/or a pre-existing metabolic syndrome-related neoplasia risk? BMC. Cancer, 2013; 13: 54.
13. Jimenez-Lee,R.; Ham,B.; Vetto,J.; Pommier,R. Breast cancer severity score is an innovative system for prognosis. Am. J. Surg, 2003; 186: 404-408.
14. Kruk,J. Overweight, obesity, oxidative stress and the risk of breast cancer. Asian Pac. J. Cancer Prev, 2014; 15: 9579-9586.
15. Padoan,M.; Ferrante,D.; Pretti,G.; Magnani,C. Study of socio-economic characteristics, diagnosis and outcome of women participating or not participating in mammogram screening. Ann. Ig, 2014; 26: 518-526.
16. Rahman,M.M.; Ahsan,M.A.; Monalisa,N.N.; Rahman,K. Influence of socioeconomic status and BMI on the quality of life after mastectomy in Bangladeshi breast cancer patients in a public hospital. Jpn. J. Clin. Oncol, 2014; 44: 1150-1157.
17. Kruk,J. Lifestyle Components and Primary Breast Cancer Prevention. Asian Pac. J. Cancer Prev, 2014; 15: 10543-10555.
18. Djiogue,S.; Nwabo Kamdje,A.H.; Vecchio,L.; Kipanyula,M.J.; Farahna,M.; Aldebasi,Y.; Seke Etet,P.F. Insulin resistance and cancer: the role of insulin and IGFs. Endocr. Relat Cancer, 2013; 20: R1-R17.
19. Fathallah,R.M.; Dajani,R. Comparison of population based cancer incidence rates among Circassians, Chechans and Arabs in Jordan (1996-2005). Asian Pac. J. Cancer Prev, 2013; 14: 6035-6040.
20. Karakas,B.; Colak,D.; Kaya,N.; Ghebeh,H.; Al-Qasem,A.; Hendrayani,F.; Toulimat,M.; Al-Tweigeri,T.; Park,B.H.; Aboussekhra,A. Prevalence of PIK3CA mutations and the SNP rs17849079 in Arab breast cancer patients. Cancer Biol. Ther, 2013; 14: 888-896.
21. Zubor,P.; Caliskan,M.; Kajo,K.; Soybir,G.; Topuzlu,C.; Danko,J. Ethnic disparities in breast cancer between Central Europe Caucasian women of Slavic origin and Middle East Turkish subjects. Neoplasma, 2013.
22. Zubor,P.; Caliskan,M.; Kajo,K.; Soybir,G.; Topuzlu,C.; Danko,J. Ethnic disparities in breast cancer between Central Europe Caucasian women of Slavic origin and Middle East Turkish subjects. Neoplasma, 2013.
23. Hirko,K.A.; Soliman,A.S.; Banerjee,M.; Ruterbusch,J.; Harford,J.B.; Chamberlain,R.M.; Graff,J.J.; Merajver,S.D.; Schwartz,K. Characterizing inflammatory breast cancer among

Arab Americans in the California, Detroit and New Jersey Surveillance, Epidemiology and End Results (SEER) registries (1988-2008). Springerplus. 2: 3; 2013.

24. Williams,K.P.; Roman,L.; Meghea,C.I.; Penner,L.; Hammad,A.; Gardiner,J. Kin KeeperSM: design and baseline characteristics of a community-based randomized controlled trial promoting cancer screening in Black, Latina, and Arab women. Contemp. Clin. Trials, 2013; 34: 312-319.
25. Obeidat,R.F.; Lally,R.M.; Dickerson,S.S. Arab American women's lived experience with early-stage breast cancer diagnosis and surgical treatment. Cancer Nurs, 2012; 35: 302-311.
26. Bodmer,A.; Feller,A.; Bordoni,A.; Bouchardy,C.; Dehler,S.; Ess,S.; Levi,F.; Konzelmann,I.; Rapiti,E.; Steiner,A.; Clough-Gorr,K.M. Breast cancer in younger women in Switzerland 1996-2009: A longitudinal population-based study. Breast, 2014.
27. Escarela,G.; Perez-Ruiz,L.C.; Nunez-Antonio,G. Temporal trend, clinicopathologic and sociodemographic characterization of age at diagnosis of breast cancer among US women diagnosed from 1990 to 2009. Springerplus, 2014; 3: 626.
28. El Fakir,S.; Abda,N.; Bendahhou,K.; Zidouh,A.; Bennani,M.; Errihani,H.; Benider,A.; Bekkali,R.; Nejjari,C. The European Organization for Research and Treatment of Cancer quality of life questionnaire-BR23 Breast Cancer-Specific Quality of Life Questionnaire: psychometric properties in a Moroccan sample of breast cancer patients. BMC. Res. Notes, 2014; 7: 53.
29. Khabaz,M.N. Immunohistochemistry subtypes (ER/PR/HER) of breast cancer: where do we stand in the West of Saudi Arabia? Asian Pac. J. Cancer Prev, 2014; 15: 8395-8400.