Breast Cancer among Female in Saudi Arabia; Understanding the Current and Predicting the Future

Muteb. H. Alshammari[1]

[1]Assistant Professor, Department of Health Informatics, College of Public Health and Health informatics, University of Ha'il, Kingdom of Saudi Arabia

ABSTRACT

Background and objective: Female breast cancer is global health problem. Breast cancer is the most prevalent malignant tumor among female in Saudi Arabia. The majority of cases are accidentally discovered during routine examination. The primary aim of this paper is to determine the pattern and predict future incidence of breast cancer among female in Saudi Arabia.

Materials and methods: a registry-based analysis of registry reports published between the 1999/2000 and 2004. The future incidence then predicted using least square fit method. Predicated incidence is calculated until 2013.

Results: Breast cancer reached its highest incidence in 1999/2001 then sharply declined by almost 50% in 2001. However, following the sharp decline, the incidence continued to increase. Least square fit regression showed that the incidence breast cancer as well as female cancer and overall cancer incidence is expected to increase.

Conclusion: The anticipated increase in breast cancer incidence among female necessitates collaborative activities to install proper preventive measure.

Keywords: Female breast cancer, Saudi Arabia

INTRODUCTION

Female breast cancer is a global health burden. It negatively impacts the physical, social, and psychological well-being of patients and their immediate circle of family and friends. Breast cancer is the most prevalent malignancy cancer among female world-wide [1,2]. It ranks the fifth cause of death among all cancer types and the most leading cause of cancer death in developing and developed countries [3,4]. The global incidence of breast cancer is expected to increase regardless its stable rate in developed communities [5]. The risk for breast cancer increases among female living in low socioeconomic status communities, female with positive family history of breast cancer or any other cancer type, delayed childbearing, decreased breast feeding, obesity, and consumption of fat-

rich diet [3,5]. The prognosis of breast cancer is largely dependent on its stage at time of diagnosis. The earlier the detection is, the better the prognosis [2,6].

Cancer in Saudi Arabia is the more prevalent among female. Breast cancer is the most common type of cancer among female in Saudi Arabia [7]. Breast cancer in Saudi Arabia affects female between the ages of 40-50 years old. The majority of cases were observed in Riyadh, capital city of Saudi Arabia [7]. Breast cancer usually accidentally discovered and in late stage, infiltrating duct carcinoma is the most reported breast cancer category [2,7]. Despite increasing incidence of breast cancer in Saudi Arabia, it still remains lower than that of Western countries [7]. The level of public awareness is still below satisfactory [2]. The majority of female in Saudi Arabia are

aware of the self-examination method. However, only few are aware of mammography [2]. Regardless the benefits of mammography, female in Saudi Arabia are reluctant to accept performing the procedure due to social and cultural reasons, lack of education, and most importantly lack of encouragement from the physician [7,8,9].

Between the period of 1999/2000 and 2004, the Saudi Cancer Registry released reports on cancer incidence in Saudi Arabia. Breast cancer was the most prevalent among female and female were slightly more affected by cancer than male [7]. Since then number of educational campaigns had been organized to increase the level of public awareness. Educational campaigns focused on breast cancer among female are often organized by personal efforts by medical students under guidance of their mentors. These campaigns still off-target mainly because of lacking of solid understanding of the pattern of breast cancer in Saudi Arabia. This paper aims to determine the pattern of breast cancer in Saudi Arabia and predict future incidence. Understanding the pattern of breast cancer in Saudi Arabia allows to determine the disease behavior which in turn helps to organize a target educational and preventive programs, and examine the efficacy of educational campaigns that had been previously organized. Predicting future incidence allows to determine future demand and establish a strategic scheme for prevention and management.

MATERIALS AND METHODS

A registry-based analysis performed to address started objective. The source data is registry reports that are released by the Saudi Oncology Society, and the Saudi Cancer registry between the period 1999/2000 and 2004. Reports were available online for public and professionals. No reports were available beyond 2004.

Information on frequency of overall cancer cases, female cancer cases and cases of breast cancer among Saudi female were extracted from registry reports released between 1999/2000 and 2004. The mean age within each category for each respective time period was determined as well.

The pattern of breast cancer among Saudi female examined by understanding the frequency of occurrence against the overall cancer frequency and frequency of cancer affecting female in Saudi Arabia. The percentage of occurrence during each time point at the report then calculated to further investigate the pattern and determine how common breast cancer among female in Saudi Arabia is. This process was executed at the national and regional levels. Determining the frequency of female breast cancer at regional level allows to rank region at descending order with respect to frequency of occurrence of breast cancer among female at the region. Furthermore, that should help to estimate the demand for care, predict the future risk and design proper educational and screening campaigns. Yet, the behavior of breast cancer among female in Saudi Arabia were further analyzed by calculating the percentage change (%change).

$$\% \, change = \left(\frac{current \, year}{previous \, year} - 1 \right) \times 100$$

Maple software version 16 (Maplesoft Inc., Waterloo, ON, Canada) was used to determine the prediction model. Due to the nature of the data and in order to obtain the best fit, the second degree square fit was utilized. In least square fit model, the data is approximated to fit into the regression line in order to produce a model that satisfy the equation for second degree least square fit

$$y = ax^2 + bx + c$$

Where *b* is slope that explains the change in the outcome (*y*) by the change in independent variable (*x*), *c* is the intercept which explains the value of the initial outcome, and *a* is a constant that its sign determines the direction of the relationship.
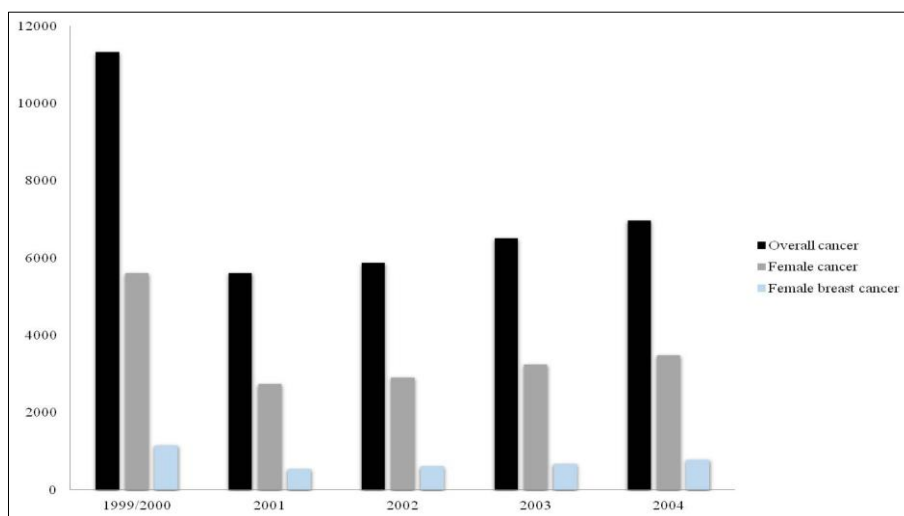
RESULTS

Figure 1: Relative frequency of cancer across the study categories

Table1: Frequency of occurrence of cancer, female cancer and breast cancer among female in Saudi Arabia between 1999/2000 and 2004

Year	Overall cancer	Mean age[a]	Female cancer	Mean age[b]	Female breast cancer	Mean age[c]
1999/2000	11330	52	5617	47	1157	49
2001	5615	50	2741	48	545	48
2002	5876	54	2915	49	614	48
2003	6516	53	3253	48	676	48
2004	6969	59	3491	49	783	47

[a]: respective mean age for overall cancer category, [b]: respective mean age for female cancer category,
[c]: respective mean age for female breast category

Table2: Percentage of breast cancer cases in relation to overall cancer cases and to female cancer cases

Year	In relation to overall cancer cases	In relation to female cancer cases
1999/2000	10.21%	20.59%
2001	9.71%	19.88%
2002	10.45%	21.06%
2003	10.37%	20.78%
2004	11.24%	22.43%

Table 3: Frequency of breast cancer among female in top 5 provinces

Year	Province	Frequency[*]
2001	Makkah	135
	Riyadh	159
	Eastern province	131
	Madina	33
	Qassim	34
2002	Makkah	145
	Riyadh	173
	Eastern province	134
	Madina	28
	Qassim	28
2003	Makkah	196
	Riyadh	153
	Eastern province	166
	Madina	29
	Qassim	33
2004	Makkah	227
	Riyadh	202
	Eastern province	159
	Madina	36
	Qassim	34

[*]: Ranking was based on overall frequency

The total number of cancer cases between the period of 1999/2000 and 2004 is 36306 cases. A total of 18017 cases were observed among female in Saudi Arabia across the study period and total of breast cancer cases among female in Saudi Arabia is 3775 cases. The highest frequency of cases was observed during 1999/2000 (11330 total cancer cases, 5617 cancer cases among female, 1157 breast cancer cases among female). The frequency then sharply declined in during the year of 2001 then rose again between 2002 and 2004. The mean age ranges between 52 and 59 years all in general. The mean age of female with cancer and/ or breast cancer ranges between 47 and 49. Table 1 summarizes the frequency of occurrence of cancer in Saudi Arabia across the three study categories. The percentage of breast cancer cases among female in Saudi Arabia in relation to the overall cancer cases and to the female cancer cases remained relatively constant with minor decrease or increase (~10% and ~20% respectively). Table 2 summarizes the

breakdown of percentage of breast cancer cases among female in Saudi Arabia in relation to overall cancer cases and female cancer cases. Figure 1 illustrates the relative frequency of the three study category (overall cancer cases, female cancer cases, and breast cancer among female in Saudi Arabia).
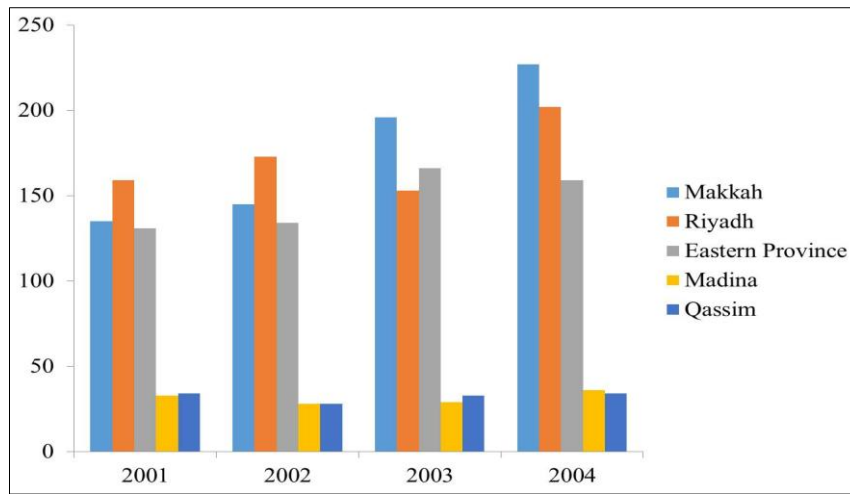

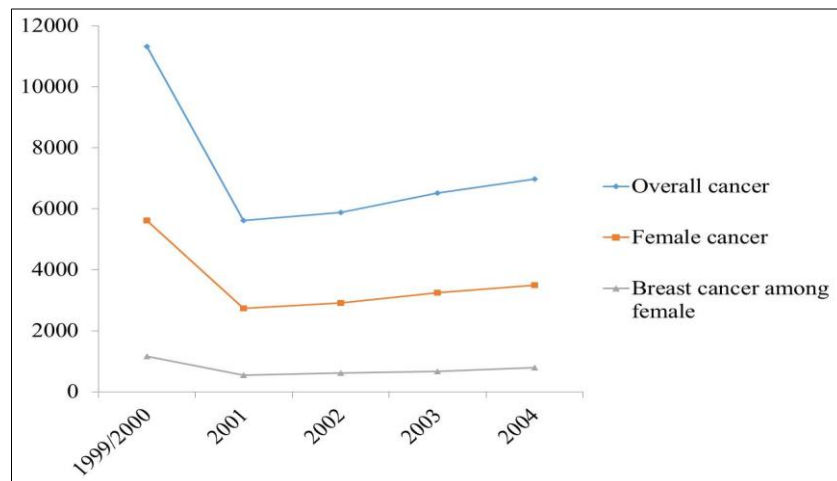**Figure 2: Frequency of breast cancer among female in top 5 provinces**

Figure 3: Pattern of cancer, female cancer and breast cancer among female between the period of 1999/2000 and 2004
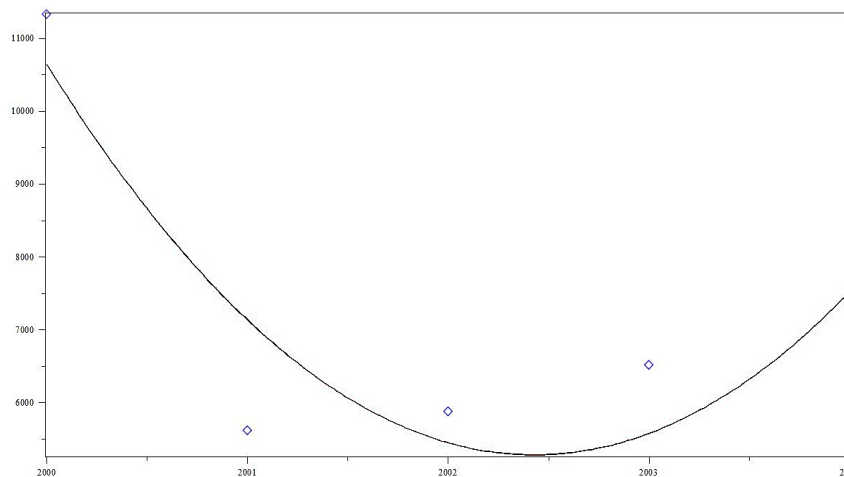

Figure 4: Second degree least square fit model for overall cancer cases between 1999/2000 and 2004
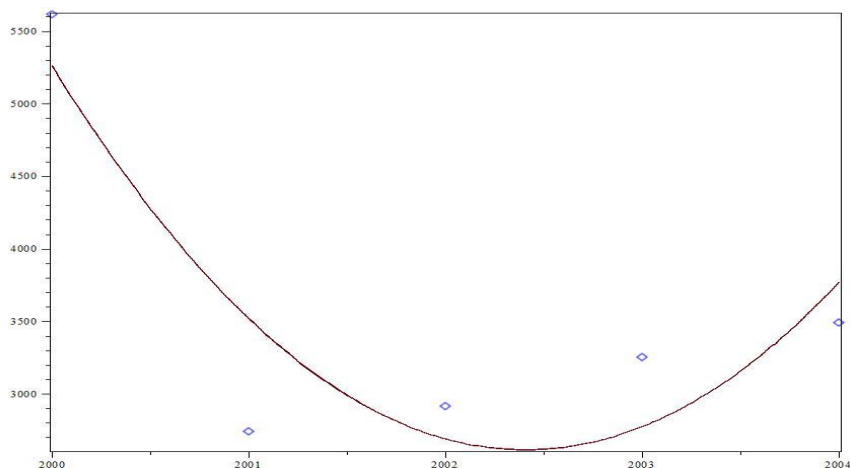
Figure 5: Second degree least square fit model for female cancer cases between 1999/2000 and 2004
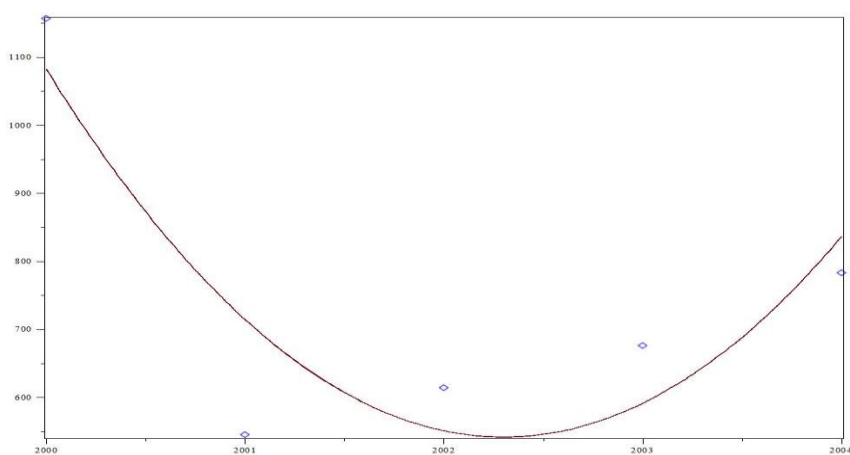

Figure 6: Second degree least square fit model for female breast cancer cases between 1999/2000 and 2004

Table 4: Pattern of cancer, female cancer and breast cancer among female in Saudi Arabia

Year	% change in overall cancer	%change in female cancer cases	%change in breast cancer cases among female
Between 1999/2000 and 2001	-50.44%[*]	-51.20%	-52.89%
Between 2001 and 2002	4.65%	6.35%	12.66%
Between 2002 and 2003	10.89%	11.59%	10.09%
Between 2003 and 2004	6.95%	7.32%	15.83%

Table 5: Predicted incidence for overall cancer in Saudi Arabia

Year	Predicted incidence
2005	11270
2006	16843
2007	24231
2008	33435
2009	44455
2010	57291
2011	71942
2012	88409
2013	106692

Table 7: Predicted incidence for female breast cancer in Saudi Arabia

Year	Predicted value
2005	1285
2006	1938
2007	2796
2008	2859
2009	5125
2010	6596
2011	8272
2012	10151
2013	12236

Table 6: Predicted incidence for female cancer in Saudi Arabia

Year	Predicted value
2005	5676
2006	8497
2007	12231
2008	16877
2009	22437
2010	28909
2011	36895
2012	44593
2013	53804

There were no data available on frequency of cases across different provinces in the reports for the study year 1999/2000. Between the period of 2001 and 2004, the top five provinces with respect to the overall frequency of breast cancer remained the same. The top five provinces

are Makkah, Riyadh, Eastern Province, Madina, and Qassim. Table 3 summarizes the frequency of breast cancer at the top five provinces. Figure 2 illustrates the relative frequency of breast cancer at the top five provinces.

The overall pattern of cancer in Saudi Arabia as well as the pattern of cancer among female and breast cancer among female in Saudi Arabia was determined by calculating the percentage change within each category. Table 4 summarizes the percentage change of all three categories. The incidence of cancer, female cancer and breast cancer among female reached its peak during the study year 1999/2000. However, it sharply declined in 2001 by approximately 50%. The incidence then rose again in 2002. During the study year 2003, the overall incidence of cancer and the incidence of female cancer slightly increased in contrast to the incidence of breast cancer among female which slightly decreased. The reverse is applied to the study year 2004 when the overall incidence of cancer and incidence of female cancer had slightly decreased in contrast to the slight increase in the incidence of breast cancer among female. Figure 3 illustrates the pattern of cancer, female cancer and breast cancer among female during the study period. Generally, after the sharp decrease in the overall incidence of cancer, incidence of female cancer and incidence of breast cancer among female in Saudi Arabia, incidence continued to gradually increase at a slower rate.

Second-degree least square fit was performed to predict future incidence of cancer in Saudi Arabia. Figure 4 illustrates the regression model for the overall cancer incidence in Saudi Arabia. The model is explained by the equation:

$$y = 3.64 \times 10^9 - 3.64 \times 10^6 x + 907.86 x^2$$

Regression model showed that the incidence of cancer in Saudi Arabia is expected to be increasing. Predicted values are calculated until 2013 and summarized in

table 5. The future incidence of female cancer in Saudi Arabia and breast cancer among female in Saudi Arabia are also predicted after determining the regression model utilizing least square fit model. The regression model for female cancer in Saudi Arabia and breast cancer among female in Saudi Arabia are illustrated in figure 5 and 6 respectively. The future incidence can be predicted for the female cancer from the model:

$$y = 1.83 \times 10^9 - 1.83 \times 10^6 x + 456.43 x^2$$

Future incidence of breast cancer among female in Saudi Arabia can be predicted from the model:

$$y = 4.09 \times 10^8 - 4.09 \times 10^5 x + 102.19 x^2$$

Table 6 summarizes the predicted incidence of female cancer in Saudi Arabia until the year 2013 and table 7 summarizes the predicted incidence of female breast cancer in Saudi Arabia until the year 2013.

DISCUSSION

Breast cancer among female in Saudi Arabia as well as female cancer and over all cancer incidence follow the same pattern. Despite the sharp decline in the incidence in the year of 2001, the incidence then continued to gradually increase across the three categories. Registry reports were limited to present incidence of cancer for the report year. However, reports hold no comparison between the incidence between the period 1999/2000 and 2004. Moreover, they did not cover risk factors, access to care, and role of awareness campaign. We hypothesize that the high incidence across the study category during the study year 1999/2000 is mainly due to accidental discovery during routine medical examination and because it combines the incidence of two consecutive years. However, the sharp decline in 2001 might be explained by the organization of a national campaign that aims to elevate the level of public awareness with respect to

breast cancer as a result of Her Excellency the former US first lady Mrs. Lura Bush visit to Saudi Arabia and her effort to highlight the importance of breast cancer prevention. The educational campaigns that increased after her visit may have led to increase the public awareness and more female sought mammography screening [8]. The gradual increase following 2001 can be hypothetically explained by the reduction in the educational activities.

Registry reports did not provide information on why certain provinces reported a higher incidence than others. Theoretically, the top five provinces are heavily populated and most of the residents are professionals. The majority of residents is middle- or upper-middle class and has proper access to medical care. Top five provinces had a central tertiary and quarterly care health institutions. Studies indicated that tertiary care institution in Saudi Arabia is receiving an increasing number of cancer cases [6]. In contrast to the 2004 findings we reported that based on overall incidence of breast cancer, Makkah not Riyadh is ranked number one among provinces with high breast cancer incidence [7].

We expect the incidence of breast cancer among female as well as the overall incidence of cancer in Saudi Arabia to increase. This supports findings of studies that concluded that unless drastic breast cancer screening measure, breast cancer my affect the vast majority of female population in Saudi Arabia and may lead to serious consequences at the medical and social scales [2,6]. Building capacity, developing evidence, removing barriers, and promoting advocacy are the major preventive strategy to mitigate the incidence of breast cancer among female [3]. It is important to recognize that the level of awareness despite the awareness campaign remained below satisfactory [2]. The majority of female in Saudi Arabia thinks that cancer is idiopathic or it's the God will [2]. The reluctance of female in Saudi Arabia to seek medical care is related to social reasons and fear from discovering a cancerous mass [2]. Media had played a major role in manipulating the public opinion. Furthermore, with the revolution of social media, the spread of misconception becomes faster [8].

CONCLUSION

Breast cancer is the most prevalent cancer among female in Saudi Arabia. Although the incidence declined initially, it increased afterward and expected to be increasing. The total number of breast cancer in 2013 is expected to reach 12236 cases. Implementation of mandatory screening program is necessary to face the upcoming threat of breast cancer.

REFERENCES
1. Parkin DM, Bray F, Ferlay J, Psiani P. Global cancer statistics, 2002 CA. Cancer J Clin 2004;55:74-108
2. Dandash KF, Almohaimeed A. Knoweldge, attitudes, and practice surrounding breast cancer and screening in female teachers of Buraidah, Saudi Arabia. IJHS 2007;1(1):61-71
3. Bridges JFP, Anderson BO, Buzaid AC, Jazieh AR, Niessen LW, et al. Identifying important breast cancer control strategies in Asia, Latin America, and the Middle East/North Africa. Health Service Research 2011;11:227
4. Feerlay J, Shin HR, Bray F, Forman D, Mathers C, et al. GLOBOCAN 2008 v1.2. Cancer incidence and mortality worldwide. IARC CancerBase No.10 Lyon: International Agency for Research on Cancer 2010 [www.globocan.iarc.ft/]
5. Ginsburg OM, Love RR. Breast cancer: a neglected disease for the majority of affected women worldwide. Breast J 2011;17(3):289-95
6. Alrikabi A, Husain S. Increasing prevalence of breast cancer among Saudi patients attending a tertiary referral hospital: a retrospective epidemiological study. CMJ 2012;53:239
7. Saudi Cancer Registry Repot 2004
8. Abulkhair OA, Altahan FM, Young SE, Musaad SMA, Jazeih RM. The first national public breast cancer screening

program in Saudi Arabia. Ann Saudi Med 2010;30(5):350-7

9. Jazieh AR, Soora I. Mammography utilization pattern throughout the State of Arkansas: A challenge for the future. J Community Health 2001;26:249-55

10. O'Malley MS, Earp JA, Hawley ST, Schell MJ, Mathews HF. The association of race/ ethnicity, socioeconomic status and physician recommendation for mammography: who gets the message about breast cancer screening? Am J Public Health 2001;91:49-54

******