EFFECT OF DIFFERENT ENVIRONMENTAL RISK FACTORS ON BREAST DISEASES DIAGNOSED BY DIGITAL MAMMOGRAPHY

Submitted By

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M.B.B.Ch., Faculty of Medicine, Ain Shams University, 1993

Master of (Radio Diagnosis), Faculty of Medicine, Ain Shams University, 1999

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

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APPROVAL SHEET

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ABSTRACT

Background:

Breast disease in women encompasses a spectrum of benign and malignant disorders. There are several breast imaging modalities available, mammography remains the cornerstone of breast imaging. Oestrogen mimickers in the form of chemicals (xenoestrogens), and foods and plants (phytoestrogens), mimic the action of oestrogen produced in human body and can alter hormonal activity.

Aim of the work:

This study was conducted to highlight the significant environmental factors that have an impact on breast benign and malignant diseases.

Methods:

The study was designed as a case control study held in Egypt on one hundred female patients (50 cases and 50 control) from March 2015 to November 2016. Patients were subjected to history taking, anthropometric measures, clinical examination, questionnaire, digital mammographic examination and laboratory examination for testing 17b Estradiol hormone.

Results:

Percent of benign breast lesions was 64% of cases, malignant breast lesions in our study were 36% of cases. Occurrence of benign and malignant lesions was significantly associated with environmental estrogens containing items namely; use of diet and soda cans, use of plastic containers, food containing xenoestrogen, use of insecticides, heating plastic containers in microwave, use of detergents and cleaning agents, use of deodorants and use of cosmetics. Other environmental factors affecting benign and malignant lesions are age of the patient,

passive smoking, BMI of the patient, previous mammographic examinations and occupational radiological exposure. Occurrence of benign and malignant lesions was not affected by active smoking, caffeine intake and alcohol intake.

Conclusion and recommendations:

Occurrence of benign and malignant lesions was significantly associated with environmental estrogens containing items, age of the patient, passive smoking, BMI of the patient, previous mammographic examinations and occupational radiological exposure. Recommendations to control occurrence of breast diseases are:

1. Reduce use of soda and diet cans, insecticides and cosmetics.
2. Use natural products instead of chemical deodorants and cleaning agents.
3. Use non plastic container for heating food in microwave.
4. Control body weight and avoid exposure to passive smoking.
5. Avoid excess unnecessary mammographic examinations and Reduce occupational radiological exposure.

INTRODUCTION

Breast diseases in women encompass a spectrum of benign and malignant disorders **(Morrow, 2000)**. Benign breast disease (BBD) has a high prevalence and a noticeable impact on women's quality of life and, for certain histological types, increases breast cancer risk **(Friedenreich *et al.,* 2000)**.

In less-developed countries, breast cancer is the leading cause of cancer death in women; in developed countries, however, it has been surpassed by lung cancer as a cause of cancer death in women. In the United States, breast cancer accounts for 29% of all cancers in women and is second only to lung cancer as a cause of cancer deaths (**Chalasani, 2017)**. Carcinoma of the breast is the most prevalent cancer among Egyptian women and constitutes 29% of National Cancer Institute cases. Median age at diagnosis is one decade younger than in countries of Europe and North America and most patients are premenopausal. Tumors are relatively advanced at presentation **(Omar et al., 2003**). **Emara, (2017**) underscored that the rate of recovery from breast cancer may reach up to 98 percent if the disease is detected in its early stages.

Risk factors for developing breast cancer include having children at an older age, inappropriate breastfeeding, use of oral contraceptives and postmenopausal hormone-replacement therapy, obesity with high body mass index, poor physical activity and excessive alcohol consumption, **(Abo-Elazm *et al.,* 2018).** Increased risk for breast diseases associated with active smoking, passive smoking, caffeine and alcohol intake, endocrine factors, obesity, radiological tissue density may be an important predictor of risk **(Friedenreich *et al.,* 2000)**.

A potential risk factor for breast cancer is exposure to environmental estrogens. Environmental estrogens are group of synthetic substances found in the environment that, when absorbed into a person's system, function in a similar way to estrogen. Estrogen stimulates breast cell growth, and exposure to estrogen over long periods of time, without any breaks, can increase the risk of breast cancer **(Kane, 2013)**. Environmental estrogens are connected to everything from Premenstrual Syndrome (PMS) to cancer and reproductive problems **(Evans, 2009)**.

There are several breast imaging modalities available such as Ultrasound, CT, Digital Mammography, MRI and scintimammography. Mammography remains the cornerstone of breast imaging. Only mammography when correctly performed and interpreted offers the necessary reliability to diagnose the curable forms of breast cancers. Ultrasound, MRI & CT are useful adjuncts once a lesion has been detected by physical examination or by radiographic mammography **(Koshy, 2016)**.

The study rationale was that taking precautions to prevent occurrence of breast cancer is much more beneficial for general health of the population than giving attention – only - to early detection and diagnosis of breast diseases. A considerable number of preventable environmental factors were found to have a remarkable association with breast cancer. Subsequently limitations of exposure to these factors well help having better healthy life.

The research hypothesis is that there is association between breast diseases and some environmental risk factors.

Research questions are:

1- Is there an association between breast diseases and some environmental risk factors?

2- Does the exposure to environmental estrogen have an impact on occurrence of breast diseases?

3- Is the frequency of exposure to different risk factors having a role in on occurrence of breast diseases?

AIM OF THE WORK

The objective of this study is to reduce risk of occurrence of breast cancer as much as possible in order to improve health and quality of life among Egyptian females.

The aim of this study is to detect possible association between occurrence of different breast pathologies and exposure to some environmental risk factors (body mass index as an indicator of obesity of the patient, frequency of alcohol intake, caffeine intake, active and passive smoking, previous mammographic examinations and occupational radiological exposure, exposure to environmental estrogens through diet and soda cans, insecticides, detergents and cleaning agents, deodorants, cosmetics, use of plastic containers, heating plastic containers in microwave and food containing ecoestrogens).

REVIEW OF LITERATURE

1.1 ***BREAST ANATOMY***

The breasts rest on the pectoralis major muscle and are supported by and attached to the front of the chest wall on either side of the sternum by ligaments. Each breast contains 15-20 lobes arranged in a circular fashion. The fat that covers the lobes gives the breast its size and shape. Each lobe comprises many lobules as shown in figure (1), at the ends of which are glands that produce milk in response to hormones (**Chalasani, 2017).**

1.2 ***BREAST PHYSIOLOGY IN WOMEN***

1.2.1 HORMONE RELATED CHANGES IN BREAST MOPHOLOGY

Hormones and growth factors act upon stromal and epithelial cells to regulate mammary gland development, maturation and differentiation **(Russo, 2001)**. Broadly summarized, estrogen mediates development and elongation of ductal tissue; progesterone facilitates ductal branching and lobulo-alveolar development; and prolactin regulates milk protein production. At puberty, estradiol and progesterone levels increase to initiate breast development. A complex tree-like structure results and comprises 5 to 10 primary milk ducts originating at the nipple, 20 to 40 segmental ducts, and 10 to 100 sub-segmental ducts ending in glandular units called terminal duct lobular units (TDLUs) **(Osborne, 2000)**.

During the menstrual cycle the increments in estrogen and progesterone stimulate cell proliferation (Figure1) and during the luteal phase apoptosis occurs **(Going *et al.*, 1988).** As a consequence, the breast can

increase by as much as 15% in size during the luteal phase **(Santen, 2014).**

1.2.2 AGE RELATED CHANGES IN BREAST MORPHOLOGY

The anatomic and histologic structure of the breast undergoes substantial change during the period from early adolescence to menopause. The normal histologic appearance represents a spectrum ranging from a predominance of ducts, lobules, and intra- and inter-lobular stroma to patterns with a predominance of fibrous change and cyst formation, a process called "fibrocystic changes". This new term implies that women with lumpy breasts or non-discrete nodules do not have breast disease **(Santen, 2014)**.

1.2.3 MENOPAUSE

Glandular tissue undergoes atrophic change following the menopause and a greater percentage of the total breast is made up of stroma and fatty tissue (i.e. approximately 97%) than present prior to menopause **(Santen, 2014)**. A simplified drawing of the breast illustrates the important structures and the histologic appearance of common lesions shown in figure (2).