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ORIGINAL ARTICLE

Biochemical and Histophysiological impact of Curcumin on Breast Cancer. A Cross Sectional Clinical Study

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ABSTRACT

Hypothesis: The active anti-carcinogenic compound of Curcuma longa a member of ginger family is curcumin which inhabit the growth of tumor in breast cancer.

Aims and objectives: The aims and objectives of present study were to determine the clinical and preclinical effects of curcumin against breast cancer.

Materials and Methods: 100 women patients with grade**-** I and grade-II breast cancer were treated with 10g/day curcumin powder orally for six months. The tumor markers such as CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA) and CA 125 were measured from blood serum of each patient.

Conclusion: In the present study it was concluded that a significant changes ($p<0.05$) come out after 6 month in blood serum levels of 10mg/day oral curcumin treated group-B and group–D as compared to group-A and group-C regarding tumor markers such as CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA) and CA 125.

Keywords: Curcuma longa, Breast cancer, Carcinoembryonic antigen, Tumor markers, Curcumin

INTRODUCTION

The second most cause of women's deaths in all over the world is breast cancer. Genetically any mutation in BRCA-1 and BRCA-2 genes may cause breast cancer while different gynecological problems like late menopause, late marriages and early menarche etc. can also develop breast cancer [4]. In different studies it has concluded that family history is also a risk factor in the increasing rate of breast cancer among women [3]. Breast cancer is biologically a heterogeneous disease in which progesterone receptors, estrogen receptors and human epidermal growth factor receptor-2 may be present or absent [1]. A study elaborated that 80% breast cancer cases has these three receptors whereas 20% breast cancers have triple receptors negative. The chances of metastatic positioning in breast cancer cases is very common and mostly it spread to the Axillary lymph nodes [5]. The other sites where it can spread are lungs, bones, liver etc.

The treatment of both positive hormone receptor and negative hormone receptor breast cancers treated with different protocols. The cytotoxic and genotoxic effects of breast cancer can be treated with medicinal plants and their efficacy is excellent even metastatic situation may control and treated with the active phytochemicals of these medicinal plants [7]. Curcuma longa L. in common language its name is Turmeric belong to ginger family, the active anticancer ingredient is curcumin which is responsible for number of therapeutic activities [10]. Different researchers described in their studies its chemistry and medical uses they claimed that it has many functional groups which make it specific and effective against different life threating disease [8].

The efficacy of curcumin as anti- breast cancer were tested at different stages of carcinogenesis process like initiation, promotion, and progression, the researchers found in their studies that curcumin has excellent activity against cancer cells of any stage [13]. In number of last fifty years studies, researchers have concluded that curcumin can treat and prevent breast cancer [15]. In a study when the chemo-preventive and chemotherapeutic activities of curcumin were tested in different types of human breast cancer cell lines the results were so effective and preventive [17]. The Preclinical evidences of curcumin efficacy described that it is so effective against breast cancer cells progression and initiation and it resist the process of angiogenesis by which hypoxia and nutrient deficiency may indicated [19].

A study claimed in its results that curcumin indulge the process of apoptosis selectively in breast cancer cells without developing any cellular cytotoxic and bad effect on healthy cells [18]. Curcumin inhibits the transfer activities of MDA-MB-231 cells with decreasing protein expression of NF-kappaBp65o cell lines [20]. When curcumin was tested against multidrug-resistant and hormone dependent and -independent breast cancer cell lines and it has seen that curcumin showed excellent growth inhibition effects and it protect lipid peroxidation [21]. Curcumin plays a significant role in the reinforcement of tumor necrosis factor and increased the IL-2 mechanism. Curcumin resist in the disease reoccurrence by improving cytokines mechanism of healthy cells [11].

MATERIALS AND METHODS

100 women with breast cancer were selected from which 40 women were with grade-I and 60 women with grade-II breast cancer and divided into four groups. In group –A there were 10 patients with grade-I breast cancer and they do not take treatment of curcumin while in group- B 30 patients with grade- I breast cancer were taken treatment of 10g/day curcumin powder orally. Similarly in group-C 20 patients with grade II breast cancer were without curcumin whereas in group-D 40 patients were taken treatment of 10g/day curcumin powder orally. The tumor markers such as CA 15-3, CA 27.29**,** Carcinoembryonic antigen (CEA) and CA 125 are proteins produced by carcinogenic cells found in blood. 5ml blood from vein of each patient was collected for laboratory analysis and blood serum levels of above biomarkers were measured. Professional blood test kits from home health UK were used for all biochemical and physiological tests.

By considering different studies it was summarized that the higher blood serum levels of CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA) and CA 125 means larger tumor stress. Higher blood serum levels are indications of increased in tumor growth and metastatic conditions. Raw data analyzed statistically by ISSP-2021 analysis system and significant ($p<0.05$) regression of different parameters were represented by (mean ± standard deviation). Chi-square test used for comparisons between groups while t-test of one-way ANOVA for correlation [22].

RESULTS

Table 1: Breast cancer grade-I female patients without curcumin treatment n= 10

Biomarkers	Units	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)
		1st month	3rd month	6th month
CA 15-3	U/mL	35.2 ± 1.1	39.2 ± 2.1	42.2 ± 2.2
CA 27.29	U/mL	39.2 ± 2.1	41.12 ± 2.1	49.2 ± 1.2
CEA	ng/mL	5.2 ± 1.3	9.2 ± 2.1	11.21 ± 12.2
CA 125	U/mL	37.2 ± 1.1	40.2 ± 2.1	49.2 ± 12.2

p<0.05

Table 2: Breast cancer grade-I female patients with 10mg/day oral curcumin treatment n= 30

Biomarkers	Units	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)
		1st month	3rd month	6th month
CA 15-3	U/mL	34.2 ± 1.1	29.2 ± 2.1	22.2 ± 2.2
CA 27.29	U/mL	38.2 ± 2.1	31.12 ± 2.1	29.2 ± 1.2
CEA	ng/mL	4.2 ± 1.3	7.2 ± 2.1	5.21 ± 12.2
CA 125	U/mL	38.2 ± 1.1	30.2 ± 2.1	26.2 ± 12.2

p<0.05

Table 3: Breast cancer grade-II female patients without curcumin treatment n= 20

Biomarkers	Units	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)
		1st month	3rd month	6th month
CA 15-3	U/mL	36.2 ± 1.1	44.2 ± 2.1	45.2 ± 2.2
CA 27.29	U/mL	39.2 ± 4.11	45.12 ± 2.1	49.21 ± 1.2
CEA	ng/mL	5.2 ± 1.3	9.2 ± 2.1	12.21 ± 12.2
CA 125	U/mL	39.2 ± 1.1	43.2 ± 2.1	48.2 ± 10.2

p<0.05

Table 4: Breast cancer grade-II female patients with 10mg/day oral curcumin treatment n= 40

Biomarkers	Units	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)	Blood serum levels (Mean ± SD)
		1st month	3rd month	6th month
CA 15-3	U/mL	31.2 ± 1.1	27.2 ± 2.1	22.2 ± 2.2
CA 27.29	U/mL	36.2 ± 2.1	31.12 ± 2.1	25.2 ± 1.2
CEA	ng/mL	4.2 ± 1.3	6.2 ± 2.1	4.21 ± 11.2
CA 125	U/mL	36.2 ± 1.1	30.2 ± 2.1	19.2 ± 1.2

p<0.05

Table 2: Chi-square test for group comparison and t-test of one-way ANOVA for correlation

Biomarkers	Units	Blood serum levels (Mean ± SD) 6th month	Blood serum levels (Mean ± SD) 6th month	Blood serum levels (Mean ± SD) 6th month	Blood serum levels (Mean ± SD) 6th month
		Group- A	Group- B	Group- C	Group- D
CA 15-3	U/mL	42.2 ± 2.2	22.2 ± 2.2	45.2 ± 2.2	22.2 ± 2.2
CA 27.29	U/mL	49.2 ± 1.2	29.2 ± 1.2	49.21 ± 1.2	25.2 ± 1.2
CEA	ng/mL	11.21 ± 12.2	5.21 ± 12.2	12.21 ± 12.2	4.21 ± 11.2
CA 125	U/mL	49.2 ± 12.2	26.2 ± 12.2	48.2 ± 10.2	19.2 ± 1.2

p<0.05

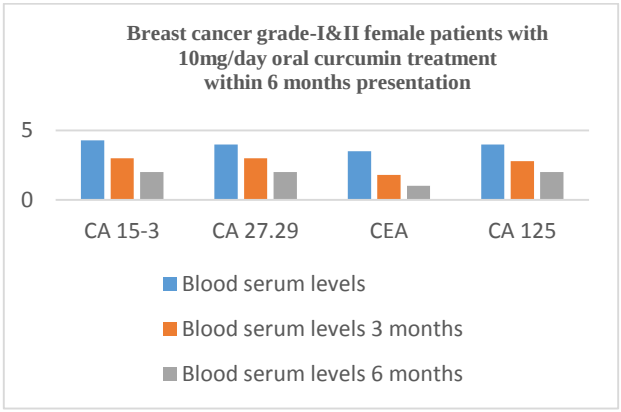

Fig: 1

It has seen that the ubiquitin–proteasome system impaired by curcumin and reverses the exosome-mediated inhibition by which prevent the breast cells progression [23]. In the present study it was concluded that a significant changes (p<0.05) come out in10mg/day oral curcumin treatment groups as compared non-treated groups. When10 mg/day oral curcumin treatment was given to the grade-I breast cancer patients of group-B the blood serum levels of CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA**)** and CA 125 after 6 month were (22.2 ± 2.2, 29.2 ± 1.2, 5.21 ± 12.2, 26.2 ± 12.2) calculated and these results showed a significant (p<0.05) changes as compared to the group-A (42.2 ± 2.2, 49.2 ± 1.2, 11.21 ± 12.2, 49.2 ± 12.2) respectively.

On the other hand when same treatment was given to the grade-II breast cancer patients of group-D the blood serum levels of CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA**)** and CA 125 after 6 month were (22.2 ± 2.2, 25.2 ± 1.2, 4.21 ± 11.2, 19.2 ± 1.2) significant (p<0.05) changes were calculated as compared to the group-C (45.2 ± 2.2, 49.21 ± 1.2, 12.21 ± 12.2, 48.2 ± 10.2) comparatively. Chi-square test for group comparison and t-test of one-way ANOVA for correlation were applied shown in table-1 while the graphical presentation of each group id represented in Fig-1.

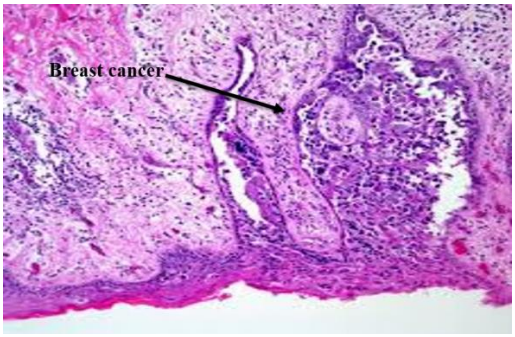

Fig- 2:

DISCUSSION

In the last twenty years about 3000 different studies were conducted for the biological and therapeutic role of curcumin against different types of cancer [12]. Qadir et al., (2016) claimed in their study that anti-inflammatory, antibacterial, antifungal and antioxidant properties of curcumin in biological system were remarkable. Chattopadhyay et al., (2004) was determined and explain the molecular mechanism and cellular target of curcumin against breast cancer cells. They also described the three dimensional orientation and multifaceted molecule of curcumin, because the therapeutic efficacy of these compounds regulate their targets.

In the research conducted by Taheri et al., (2014) they demonstrated that curcumin showed excellent efficacy against carcinogenic cells. The grading in breast cancer cases are given by differentiating the cancer and normal breast cells and by

monitoring the rate of growth of abnormal cells [19]. Sometimes grading of breast cancer recommended after surgery, in grade-1 breast cancer cases the rate of abnormal cells growth is very slow while in cases of grade-2 breast cancer cases the growth rate of carcinogenic cells is high [17].

Different researchers in their preclinical studies claimed that curcumin inhabit the breast carcinogenic cells growth, in some cases it has seen that division and growth of breast cancer cells restricted by the carcinogenic activity of curcumin [7]. Researchers described that the curcumin efficacy against cellular cytotoxicity and genotoxicity in breast cancer cases provide guideline to the medical specialist for treatment [8].

The findings of current study were similar to the previous studies and the results showed, when10 mg/day oral curcumin powder treatment was given to the grade-I and grade-II breast cancer patients of group-B and group-D the blood serum levels of CA 15-3, CA 27.29, Carcinoembryonic antigen (CEA**)** and CA 125 after 6 month were showed significant ($p<0.05$) changes as compared with group-A and group-C respectively. Further research for curcumin powder treatment in cancer patients and its efficacy in other new indications is required in future.

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