



Changes in Anemia profile in newly diagnosed breast cancer patients in southern part of Rajasthan, India.

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Abstract

Quality of life issues have become increasingly important as the number of newly diagnosed patients with cancer increases and survival improves. Breast cancer is the most common type of invasive cancer in Women. The authors carried out a study on 50 newly diagnosed cancer patients with the objective of investigating the changes in anemia profile and how to protect from future risk. we conducted a case control study at oncology department of geetanjali medical college and hospital, Udaipur during the period from April, 2016 to February, 2017 and it included a total of 50 newly diagnosed breast cancer patients and 50 healthy controls. Anemia profile (iron, ferritin, TIBC, vitamin B-12) done by cobas-6000 fully automated analyzer. The mean serum level of iron (66.46 ± 3.97), ferritin (37.04 ± 7.43), TIBC. (323.56 ± 26.04) is higher than the control group (29.35 ± 1.48), (23.05 ± 2.55), (219.28 ± 21.93) respectively. The mean vitamin B-12 level in cases (183.64 ± 29.38) is lower than the controls (183.64 ± 29.38). Our study indicates the significant changes in serum vit- B12, ferritin and iron and TIBC in newly diagnosed breast cancer patients. A significant changes in these parameters will be suggested for further risk of breast cancer in women, so it's necessary to aware women for the same, so in future can improve their survival.

Key words: iron, vitamin B12, ferritin, TIBC, breast cancer

Abbreviations:

TIBC- total iron binding capacity

vit-B12- vitamin B12

Introduction- Cancer has recently become one of the most obsessing issues in the world, since both its incidence and impact on world economy has become enormously huge. This life threatening disease in its many forms have affected a lot of human lives since it not only disturbs the physical and physiological function of the human cells but also its effects extend to seriously damaging the patient's quality of life. Breast cancer is potentially life threatening malignancy that develops in one or both breasts. Breast cancer begins in breast tissue, which is made up of glands for milk production, called lobules, and the ducts that connect lobules to the nipple. Most types of tumors that form in the breast are benign; that is, they are not cancerous. Although benign breast tumors are abnormal growths, they do not grow uncontrollably or spread, and is not life threatening [1]

Iron is an essential element for blood production about 6 percent of body iron is a component of certain proteins, essential for respiration and energy metabolism, and as a component of enzymes. Iron also is needed for proper immune function. Iron, ferritin and transferrin are significantly associated with carcinogenesis, more so, with carcinoma breast.^[2] Ferritin is an iron storage protein found in all living organisms. The levels of ferritin are also found to be raised in malignancies. Secretion of ferritin is stimulated by cytokines. Cytokines play an important role in causation of cancer and ferritin plays a prominent role in cytokine response. T.I.B.C. (total iron binding capacity) measures the amount of transferrin in the body^[3]

B12, also known as cobalamin, is essential for the formation of myelin, a protective substance which helps nerve cells communicate with one another. B12 is sometimes called the "energy vitamin" because one of its most important functions is to aid in digestion, food absorption, and metabolism of both fat and carbohydrates. Vitamin B12 also helps in the absorption of iron, in nervous system function and growth, and in the formation of red blood cells. It is necessary for proper adrenal hormone production, and for neurological (i.e. brain) health. It is also vital for Immune system function and reproductive health^[4]

Till now, very few studies have been undertaken in southern part of Rajasthan, India on the changes in anemia profile towards their risk in breast cancer. We therefore conducted a hospital based case-control study to examine the Changes of anemia profile with breast cancer.

Material and methods - 5 ml Blood sample was collected by vein puncture using an aseptic technique. Samples were collected in plain vial for iron, ferritin, TIBC and vitamin B12. A total of 100 female (mean age 20 to60) was selected for the study and was divided into two groups. Group I: - It was consist of healthy females control subjects (n=50). Group II: - It was consist of newly diagnosed breast cancer females subjects (n=50).

By routine examination and tests, we ensured that all the subjects were healthy and there are no signs and symptoms or history of breast tumor and diseases. Exclusion criteria of study were Patients have any major systemic illness, other than breast cancer. Already diagnosed patient of breast cancer, patient are taking chemotherapy Terminal stage patients, metastasis patients

Sample collection-Informed consent was obtained from all subjects for participating in the study. Anemia Profile was done on fully automated auto analyzer cobas 6000. ^[5,6,7,8,9] Microsoft office Excel 2007 was used for all calculations and SPSS software version 11.5 was used for statistical analysis. One way ANOVA was used to analyze all statically data. P- Value less than 0.05 (P<0.05) was considered statically significant (S).

Results- In this study table shows changes in iron, T.I.B.C. , ferritin, vitamin B-12, respectively in cases and control. We have found more cases (n=33) in age group 41-60years. Our study shows significant changes in anemia profile in newly diagnosed patients.

Table: 1 one way Anova between cases and control for changes in anemia profile

S.NO	Parameters	Controls		Cases		df	f-test	p-value
		21-40yr n=23	41-60yr n=27	21-40 yr n=17	41- 60yr n=33			
1.	Iron($\mu\text{g/dL}$)	68.05 \pm 4.53	65.63 \pm 3.44	29.27 \pm 1.63	29.44 \pm 1.31	3	1355.93	0.0001 S
2.	T.I.B.C($\mu\text{g/dL}$)	309 \pm 17	330.69 \pm 27.19	217.40 \pm 26.54	221.47 \pm 15.16	3	171.060	0.000 S
3.	Ferritin(ng/ML)	37.76 \pm 5.39	36.66 \pm 8.35	22.94 \pm 2.91	23.17 \pm 2.12	3	52.070	0.0001 S
4.	VIT-B12(pg/ML)	186 \pm 25	182 \pm 31.61	327 \pm 81.52	316.82 \pm 68.55	3	48.70	0.0001 S

S- Significant

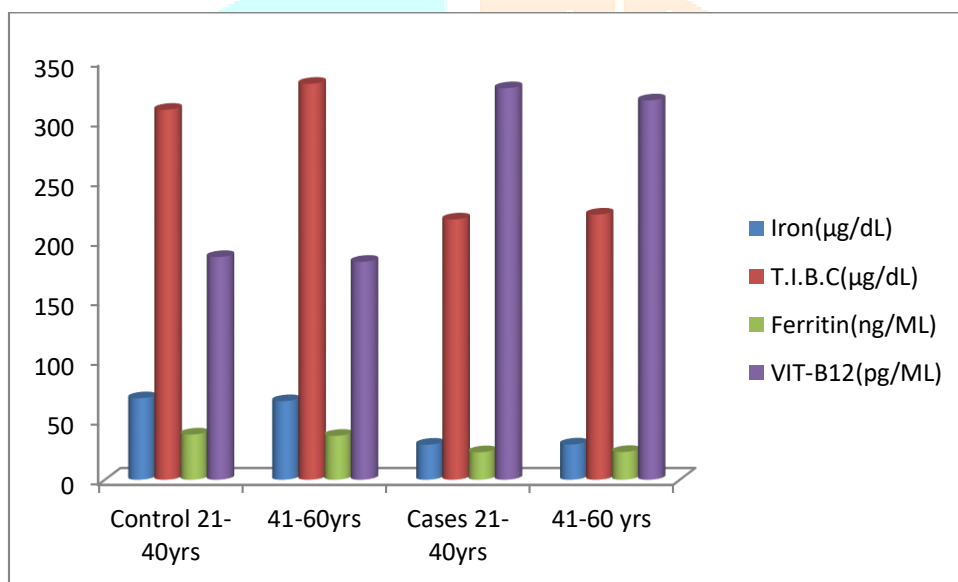


Figure I- shows anemia profile between cases and control

Discussion- In this study table 1 shows the mean serum level of iron, ferritin and T.I.B.C. in age group (21-40 years) in cases are (68.05 \pm 4.53), (37.76 \pm 5.39), (309 \pm 17) and in control are (29.27 \pm 1.63), (22.94 \pm 2.91), (217.40 \pm 26.54) as compared to age group (41-60 years) the levels of iron, ferritin, T.I.B.C and vitamin B-12 in cases are (65.63 \pm 3.44), (36.66 \pm 8.35), (330.69 \pm 27.19), (182 \pm 31.61) and in control are (29.44 \pm 1.31), (23.17 \pm 2.12), (221.47 \pm 15.16), (316.82 \pm 68.55). Present study shows higher level of iron, ferritin, T.I.B.C. in cases in comparisons to controls, while we have found lower level of vitamin B12 in cases in comparison to controls. In our study we have found more cases (n=33) in age group of 41-60 years. Reason behind of this may be that cancer develops in older people simply because of their prolonged exposure to carcinogens such as sunlight, radiation, environmental chemicals, and substances in the food we eat. Mutations also occur as a result of random errors when a

cell's DNA is copied before it divides. As a result, our cells accumulate more mutations the longer we live. In addition, changes in tissues and organs with advancing age render cells' microenvironment more favorable to the development of cancer. Other age-related factors that may play a role in cancer's high incidence as we age include the long-term effects of chronic inflammation, cancer-promoting DNA changes caused by oxygen free radicals, less-effective DNA damage-repair mechanisms, and weakening of the immune system so it's less efficient in detecting and attacking cancer cells.^[10] In line with this Chang Vc et al reported that levels of iron, ferritin, and T.I.B.C. are raised in breast cancer patients compared with the controls. The increased levels of TIBC, which is a measure of transferrin, and ferritin might be a reflection of impairment in iron metabolism seen in breast carcinoma.^[11] In line with this Essen A, et al reported that low folate and vitamin B-12 intake may increase the risk factor for breast cancer. Folate is involved in nucleotide synthesis and DNA and RNA methylation. There is consistent evidence that low folate intake may have procarcinogenic effects. Adequate folate intake is necessary for the conversion of homocysteine into methionine for DNA methylation via methionine synthase. This enzyme requires vitamin B12 as a cofactor to convert homocysteine into methionine and determines the methylation capacity of the cell. The protective effect of high folate intake on breast cancer risk may therefore be of greater significance in individuals with adequate intake of vitamin B12.^[12]

Conclusions: Our study indicates the significant changes in serum vit- B12, ferritin and iron and TIBC in newly diagnosed breast cancer patients. A significant changes in these parameters will be suggested for further risk of breast cancer in women, so it's necessary to aware women for the same, so in future can improve their survival. Intake of vitamin B12 and folate should be included in regular diet of women.

Limitation-This is a cross sectional prospective study, so no number of death and other outcome of breast cancer patients are clear. The referred data sources for tracking cancer trend are the age specific. Study should be longitudinal prospective type, so we can clear the outcome of these patients.

References

1. Ghoncheh M, Pournamdar Z, Salehiniya H. Incidence and Mortality and Epidemiology of Breast Cancer in the World. *Asian Pac J Cancer Prev*. 2016; 17 (S3): 43-6 (PMID: 27165206).
2. Jacobs A, Jones B, Ricketts C, Bulbrook R.D, and Wang. D.Y, Serum ferritin concentration in early breast cancer, *Br J Cancer*, 1976 ; vol. 34 : 286-289 (PMID: 974002)
3. Touvier M, Kesse E, Clavel-Chapelon F, Boutron-Ruault MC. Dual association of beta-carotene with risk of tobacco-related cancers in a cohort of French women. *J Natl Cancer Inst*. 2005; 97:1338–1344 (PMID: 16174855).
4. Zhang S, Hunter DJ, Hankinson SE, et al. A prospective study of folate intake and the risk of breast cancer. *JAMA*. 1999 ; 281:1632–1637 (PMID:10235158)
5. De Jong G, von Dijk IP, van Eijk HG. The biology of transferrin. *Clin Chim Acta* 1990; 190:146. (PMID: 2208733)
6. Roche Iron Gen.2 package insert.
7. Cobas® Ferritin Package Insert, 2016-06, V 7.0.
8. Cobas C311 UIBC Method Sheet.
9. Roche Vitamin B12 assay package insert, 2007-08, V 4.
10. Why Does Cancer Risk Increase As We Get Older? May 18,2017. <https://blog.dana-farber.org/insight/2016/06/why-does-cancer-risk-increase-as-we-get-older/>
11. Chang VC, Cotterchio M, Khoo E. *BMC Cancer*. Iron intake, body iron status, and risk of breast cancer: a systematic review and meta-analysis. Epub 2019 Jun 6; 19(1):543. (PMID: 31170936)
12. Essén A, Santaolalla A, Garmo H et al. Baseline serum folate, vitamin B12 and the risk of prostate and breast cancer using data from the Swedish AMORIS cohort. *Cancer Causes Control*. 2019 Jun ;30 (6): 603-615. (PMID: 31020446)