International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 9s, 2025
https://www.theaspd.com/ijes.php

Estimation Of Zinc And Visfatin Levels In Obese And Non-Obese Patients With Breast Cancer

Fatima Jassim Mohammed[1]*,Ban Mahmood Shaker[1]*,Mushtaq Qahtan Mohammed[1]*
[1]College of Medicine, University of Babylon, Babylon, Iraq.

Abstract
This study aimed to estimate serum visfatin and zinc levels among breast cancer patients who are obese and those who are not, in contrast to healthy controls. Elevated visfatin and reduced zinc levels were observed in patients, suggesting potential roles in breast cancer development.
Materials and Procedures
132 Iraqi women aged 20–70 years with a BMI of 18.5–30 kg/m² were included in a case-control study (66 of whom had breast cancer and 66 of whom were healthy controls).. Blood samples were collected and analyzed for visfatin and zinc levels. Data were statistically evaluated using SPSS, with $p<0.05$ considered significant.
Results
Breast cancer patients showed significantly higher visfatin levels (1.54±0.25, $p<0.001$) and lower zinc levels (68.61±21.77) compared to controls. However, when comparing obese to non-obese subgroups, differences in visfatin and zinc levels were not statistically significant.
Conclusion
Higher visfatin and lower zinc levels are associated with breast cancer presence, regardless of obesity status. These markers may be useful in understanding breast cancer pathogenesis, though further research with larger samples is necessary.
Keyword*. cancer, breast cancer, obesity, zinc, visfatin*

Among the numerous prevalent malignant tumors that affect women is breast cancer. A wide range of internal and environmental factors can influence the onset and progression of breast cancer [1–3]. Its prevalence is linked to environmental factors, bad lifestyle choices, and social-psychological factors. Five to ten percent of breast cancers have been found to be caused by genetic mutations and family history, whereas twenty to thirty percent are caused by possibly modifiable variables [4].The cells of the breast are where breast cancer starts. The ability of a collection of cancer cells to invade and destroy nearby tissue is known as a malignant tumor. It may also spread throughout the body. Sometimes changes occur in breast cells that affect their ability to divide or function normally. Cysts and atypical hyperplasia are non-cancerous breast disorders that can result from these changes. Moreover, they may result in benign cancers such intraductal papillomas [5].The incidence of breast cancer, which ranks first globally, has increased over the past few years (17.6% and 15.6%, respectively), despite the fact that both the incidence (36.1/105) and death (8.8/105) are extremely low worldwide. Breast cancer is a significant public health problem since its incidence and burden are rising globally [6]. Significant behavioral/lifestyle, environmental, and genetic factors contribute to the complexity of breast cancer. To better understand the incidence of breast cancer and promote early detection, the current review aimed to investigate the epidemiology and risk factors associated with the disease globally. Breast cancer is mostly caused by genetic factors, especially family history; diet and obesity—Women are growing more and more obese and consuming a diet that tends to be higher in fat as our country's quality of life improves; smoking and drinking; and ionizing radiation. Pregnancy, nursing, and menstruation are additional variables that may also affect the incidence of breast cancer [7].Pre-B-cell colony-enhancing factor (PBEF), another name for the adipocytokine visfatin, is secreted by human peripheral blood cells. A single The enzymatic function of its intracellular form, nicotinamide phosphoribosyl transferase (NAMPT), in the nicotinamide adenine dinucleotide NAD+ salvage pathway has been found [8]. The abnormal expression of visfatin in several forms of cancer The cases in which it was detected in tumors or plasma, as well as the substantial correlation between raised levels of circulating visfatin and an increased risk of cancer, illustrate its clinical significance in the progression of cancer [9].The NF-B pathway was triggered by visfatin's upregulation of Notch1, which, according to one study, also promoted the growth of breast cancers [10].

Furthermore, the effect of visfatin on the growth of MCF-7 and MDA-MB-231 breast cancer cells was greatly reduced by treatment with AKT and ERK1/2 inhibitors [11]. Inducing MCF-7 cell proliferation and increasing intracellular and extracellular NAD concentrations with visfatin was also observed by another group. They showed that by blocking the enzymatic activity of visfatin, the impact could be reversed [12].The role of zinc varies according to the type of cancer. One of the main causes of chromosomal instability in some cancers, telomere attrition, has been found to be reduced by high zinc levels [13]. Additionally, a decline in the occurrence of micronuclei [14], chromosomal fragments used as markers for chromosome instability [13],has been associated with elevated zinc levels. Zinc appears to preserve DNA integrity and may therefore help prevent the spread of cancer. Zinc transporters, which are necessary for cell proliferation, are more active in some cancers, and this has been linked to a poorer prognosis [15]. Zinc-related protein regulation is also influenced by the kind and stage of cancer.

MATERIALS AND METHODS

This investigation was performed at the research facility of Biochemistry Department, College of Medicine, University of Babylon.

The subjected in this prospective case-control study, including a total of 132 Iraqi subjects aged ranged (20-70) years & BMI (18.5-30) Kg/m^2, the (66) patients with breast cancer which considered group one (G1) attended Hilla Teaching Hospital Medical City Consulting clinic of oncology department in Babylon province, Hilla city from April 2024- 5/1/2025. Apparently, healthy control group consists of (66) subjects considered as group two(G2).

Five (5)ml of blood were collected from all groups by venipuncture: -

1. Three (3) ml of blood sample was incubated at 37c for 15 min to clot then centrifuge at 4000 rpm for 10 min, the serum obtained was frozen until analysis.

Statistical analysis :-

Standard deviation (M ± SD) and means are used to describe the data. The SPSS Windows software (SPSS Inc., Chicago, IL) was utilized to compare the phenotypic data between the control and breast cancer groups using the Student T-test. In all statistical analyses, P (two-tailed) values below 0.05 were deemed statistically significant.

RESULT & DISCUSSION

Demographic Characteristics.

Customized samples were collected from 66 breast cancer patients in special centers for cancer patients in Karbala and Babylon.

Table: Comparison of Anthropometric and Demographic Characteristics Between Breast Cancer Patients and Control Group.

	Control	Breast cancer	P value
Body weight (kg)	65.32±6.3	66.32±8.26	0.292^{NS}
	65 (65-69)	68 (66-70)	
Hight (cm)	163.12±4.67	163.32±5.65	0.562^{NS}
	163 (162-165)	165 (164-166)	
BMI	24.54±2.08	24.86±2.94	0.707^{NS}
	24.51 (24.34-24.84)	24.62 (23.88-25.1)	
Age	47.73±11.51	47.44±11.36	0.900^{NS}
	46.5 (41-53)	45.5 (42-50)	

Data presented as median (5-95% confidence interval)

NS: None statistical significance (p>0.05)

Comparison made using Mann-Whitney test.

A body mass index greater than 30 is considered obesity, a chronic illness that is becoming increasingly common worldwide and that causes serious health issues in the majority of nations [16]. According to the World Health Organization, 25% of women worldwide are overweight (BMI of 25 kg/m2), and 15% are obese (BMI of 30 kg/m2). [17] These figures are still on the rise.Although obesity has been shown to be a risk factor, it is generally accepted that it is not a very good predictor of breast cancer [18]. While the incidence of HR-negative breast cancer was constant, that of HR-positive breast cancer rose as BMI rose. During screening and later in life, more tumors were found in obese women, even though the false-negative rate was similar across a wide range of BMIs [19].In a review, Zahmatkesh et al. evaluate the chances ratio of overweight and obesity as risk factors for breast cancer [20]. It has been discovered that being overweight or obese is significantly linked to an elevated risk of breast cancer. The prognosis of patients with triple-negative breast cancer (TNBC) has been evaluated in relation to obesity by Harborg et al. [21].The review's findings suggest that being overweight is linked to a decreased overall and disease-free survival rate for TNBC patients. The findings remain controversial despite the fact that the relationship between BMI and breast cancer risk has generated a lot of interest. [22,23] As a result, the current meta-analysis and systematic review of the association between breast cancer and BMI are in the forefront.

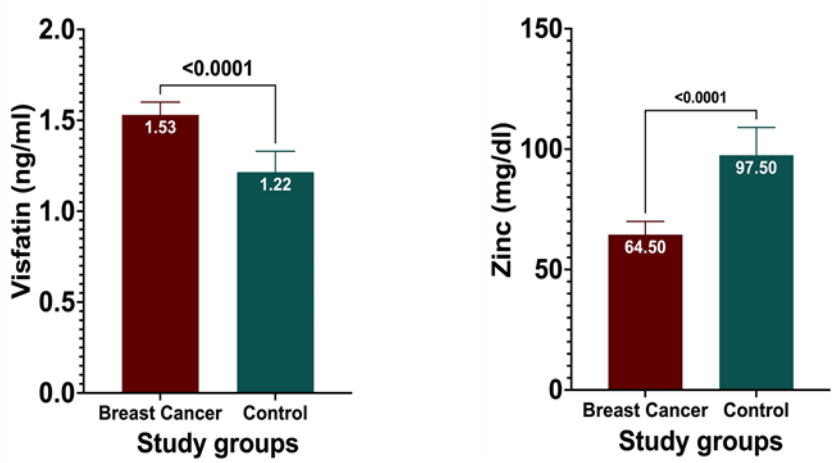
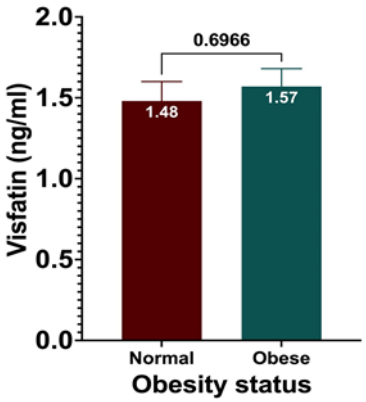
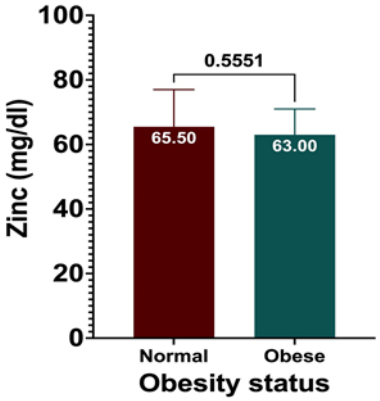


Figure: The Level of Visfatin and Zinc in breast cancer

In our current study of the same patients, we also examined visfatin levels and their relationship to disease. Visfatin levels were elevated in patients compared to healthy women, where (1.54±0.25, P-value <0.001) was present. Because of its essential role in NAD+ synthesis, its role in cellular energy metabolism and cancer biology has been an emerging area of research. Its association with cellular functions, such as DNA repair, cell survival, and metabolic regulation, makes it a potential target for cancer treatment [24]. Recent studies have highlighted how visfatin is involved in glycolysis and oxidative stress resistance, characteristic of cancer cells with altered metabolic pathways[25]. Recent studies suggest that elevated visfatin levels contribute to tumor cell proliferation and survival, especially in cancers like colorectal and breast cancer. It mediates tumor growth by activating key growth-promoting pathways such as PI3K/Akt and MAPK, which are known to regulate cell survival, growth, and angiogenesis[26].Visfatin's role in modulating the inflammatory tumor microenvironment has become increasingly recognized. It influences macrophage polarization, promoting an inflammatory state that supports tumor progression and immune evasion. Furthermore, visfatin contributes to the secretion of pro-inflammatory cytokines that can enhance cancer cell survival [27]. Elevated levels of visfatin have been correlated with poor prognosis in various cancers, including gastric and breast cancer. Studies have shown that visfatin can serve as a potential diagnostic and prognostic biomarker, although further validation in large cohort studies is required to confirm its clinical utility [28].One of the important things that were addressed in the study was measuring zinc levels for both patients and healthy people, where it was found that zinc levels in patients are lower than they are in healthy people, as (68.61±21.77, P-value).Numerous recent investigations of zinc levels in various patient tissues have provided strong evidence of a correlation between serum and tissue zinc levels and breast cancer. Low zinc levels are strongly associated with the

onset and spread of breast cancer, according to early prospective investigations. Adeoti et al. [29] carried out a cross-sectional investigation in Nigeria in 2015.According to a 2016 retrospective in situ investigation by Costello et al., breast invasive ductal carcinoma had lower zinc levels than normal ductal epithelium [30]. A number of meta-analyses that compiled data on zinc deficiency and breast cancer were published. Zinc levels in a variety of tissue samples from female breast cancer patients and healthy controls were evaluated in a 2015 meta-analysis by Wu et al. [31].Although there was no discernible difference in the serum zinc levels of the two groups, the scientists discovered that the zinc levels in the hair samples of breast cancer patients were lower than those in the hair samples of a control group. Zinc levels in breast tissue, plasma, serum, and hair samples from individuals with breast cancer were examined in a 2019 meta-analysis [32].





NAMPT (nicotinamide phosphoribosyltransferase), is an adipokine predominantly secreted by visceral fat, with roles in inflammation, metabolism, and insulin-mimetic activity. In the figure, visfatin levels were higher in the obese group (1.57 ng/mL) versus the normal weight group (1.48 ng/mL), with a p-value of 0.6966, indicating a lack of statistical significance.However, the upward trend aligns with previous literature. *Fukuhara et al. (2005)* first identified visfatin as an adipocytokine with insulin-like effects, and subsequent studies showed elevated levels in obese individuals and those with metabolic syndrome [33]. The absence of statistical significance in this data may be due to limited sample size or individual variability, but the biological relevance remains [34].trace element essential for antioxidant defense, immune function, and enzyme activity. In this figure, zinc levels were slightly lower in the obese group (63.00 mg/dL) compared to the normal weight group (65.50 mg/dL), with a p-value of 0.5551, suggesting no significant difference.Nevertheless, the reduction in zinc levels among obese individuals aligns with existing findings. Obesity has been associated with low-grade inflammation and oxidative stress, both of which may increase zinc utilization or loss. According to *Marreiro et al. (2017)*, zinc deficiency is more prevalent in individuals with obesity and may contribute to metabolic complications by impairing antioxidant mechanisms and insulin signaling [35].reduced tyrosine kinase and zinc levels, and elevated visfatin levels in obese individuals—are consistent with prior research regarding obesity-induced metabolic alterations. While none of the comparisons reached statistical significance, the data supports known physiological pathways linking adiposity with inflammatory and metabolic changes. These findings emphasize the importance of further investigation using larger, more powered cohorts to clarify the role of these biomarkers in obesity-related diseases.

REFERENCE

1. Obeagu EI, Babar Q, Vincent CC, et al. Therapeutic targets in breast cancer signaling: a review. J Pharm Res Int. 2021;33:82–99.
2. Aizaz M, Khan M, Khan FI, et al. Burden of breast cancer: developing countries perspective. Int J Innov Appl Res. 2023;11:31–7.
3. Ibekwe AM, Obeagu EI, Ibekwe CE, et al. Challenges of exclusive breastfeeding among working class women in a teaching hospital South East, Nigeria. J Pharm Res Int. 2022;34:1.

4.Sun YS, Zhao Z, Yang ZN, et al. Risk factors and preventions of breast cancer. Int J Biol Sci. 2017;13:1387–97.
5.Sinha T. Tumors: benign and malignant. Cancer Ther Oncol Int J. 2018;10:555790.
6.Xia C, Dong X, Li H, et al. Cancer statistics in China and the United States, 2022: profiles, trends, and determinants. Chin Med J (Engl). 2022;135:584–90.
7.Mahdavi M, Nassiri M, Kooshyar MM, et al. Hereditary breast cancer; genetic penetrance and current status with BRCA. J Cell Physiol. 2019;234:5741–50.
8.Lin TC. The role of visfatin in cancer proliferation, angiogenesis, metastasis, drug resistance and clinical prognosis. Cancer management and research. 2019 Apr 23:3481-91.
9.Mohammadi M, Mianabadi F, Mehrad-Majd H. Circulating visfatin levels and cancers risk: A systematic review and meta-analysis. Journal of cellular physiology. 2019 Apr;234(4):5011-22.
10. Rajput PK, Sharma JR, Yadav UC. Cellular and molecular insights into the roles of visfatin in breast cancer cells plasticity programs. Life sciences. 2022 Sep 1;304:120706.
11. Rajput PK, Varghese JF, Srivastava AK, Kumar U, Yadav UC. Visfatin-induced upregulation of lipogenesis via EGFR/AKT/GSK3β pathway promotes breast cancer cell growth. Cellular Signalling. 2023 Jul 1;107:110686.
12. Dawid M, Pich K, Respekta-Długosz N, Gieras W, Opydo M, Milewicz T, Froment P, Dupont J, Rak A. Visfatin exerts an anti-proliferative and pro-apoptotic effect in the human placenta cells. Biology of Reproduction. 2024 Nov 19:ioae168.
13. Bendellaa M, Lelièvre P, Coll JL, Sancey L, Deniaud A, Busser B. Roles of zinc in cancers: From altered metabolism to therapeutic applications. International Journal of Cancer. 2024 Jan 1;154(1):7-20.
14. Nersesyan A, Kundi M, Fenech M, Stopper H, da Silva J, Bolognesi C, Mišík M, Knasmueller S. Recommendations and quality criteria for micronucleus studies with humans. Mutation Research/Reviews in Mutation Research. 2022 Jan 1;789:108410.
15. Samavarchi Tehrani S, Mahmoodzadeh Hosseini H, Yousefi T, Abolghasemi M, Qujeq D, Maniati M, Amani J. The crosstalk between trace elements with DNA damage response, repair, and oxidative stress in cancer. Journal of cellular biochemistry. 2019 Feb;120(2):1080-105.
16. Alfaris N, Alqahtani AM, Alamuddin N, Rigas G. Global impact of obesity. Gastroenterology Clinics. 2023 Jun 1;52(2):277-93.
17. Mohajan D, Mohajan HK. Obesity and its related diseases: a new escalating alarming in global health. Journal of Innovations in Medical Research. 2023 Mar 23;2(3):12-23.
18. Engin A. Obesity-Associated Breast Cancer: Analysis of Risk Factors and Current Clinical Evaluation. Obesity and Lipotoxicity. 2024 Sep 18:767-819.
19. Tzenios N, Tazanios ME, Chahine M. The impact of BMI on breast cancer–an updated systematic review and meta-analysis. Medicine. 2024 Feb 2;103(5):e36831.
20. Zahmatkesh BH, Alavi N, Keramat A, et al. Body mass index and risk of breast cancer: a systematic review and meta-analysis in Iran. Int J Cancer Manag. 2017;10. Available at: https://sites.kowsarpub.com/ijcm/articles/5921.html.
21. Harborg S, Zachariae R, Olsen J, Johannsen M, Cronin-Fenton D, Bøggild H, Borgquist S. Overweight and prognosis in triple-negative breast cancer patients: a systematic review and meta-analysis. NPJ breast cancer. 2021 Sep 10;7(1):119.
22. Guo L, Li N, Wang G, Su K, Li F, Yang L, Ren J, Chang S, Chen S, Wu S, He J. Body mass index and cancer incidence: a prospective cohort study in northern China. Zhonghua liu xing bing xue za zhi= Zhonghua liuxingbingxue zazhi. 2014 Mar 1;35(3):231-6.
23. Eichholzer M, Huang DJ, Modlasiak A, Schmid SM, Schötzau A, Rohrmann S, Güth U. Impact of body mass index on prognostically relevant breast cancer tumor characteristics. Breast Care. 2013 Jun 22;8(3):192-8.
24. Navas LE, Carnero A. NAD+ metabolism, stemness, the immune response, and cancer. Signal transduction and targeted therapy. 2021 Jan 1;6(1):2.
25. Rajput PK, Sharma JR, Yadav UC. Cellular and molecular insights into the roles of visfatin in breast cancer cells plasticity programs. Life sciences. 2022 Sep 1;304:120706.
26. Chen K, Li Y, Zhang X, Ullah R, Tong J, Shen Y. The role of the PI3K/AKT signalling pathway in the corneal epithelium: recent updates. Cell death & disease. 2022 May 31;13(5):513.
27. Zhang Z, Xiao K, Wang S, Ansari AR, Niu X, Yang W, Lu M, Yang Z, Rehman ZU, Zou W, Bei W. Visfatin is a multifaceted molecule that exerts regulation effects on inflammation and apoptosis in RAW264. 7 cells and mice immune organs. Frontiers in immunology. 2022 Dec 1;13:1018973.
28. Cybulska AM, Schneider-Matyka D, Walaszek I, Panczyk M, Ćwiek D, Lubkowska A, Grochans E, Rachubińska K, Malewicz K, Chabowski M. Predictive biomarkers for cardiometabolic risk in postmenopausal women: insights into visfatin, adropin, and adiponectin. Frontiers in Endocrinology. 2025 Feb 7;16:1527567.
29. Sugimoto R, Lee L, Tanaka Y, Morita Y, Hijioka M, Hisano T, Furukawa M. Zinc deficiency as a general feature of cancer: a review of the literature. Biological Trace Element Research. 2024 May;202(5):1937-47.
30. Sugimoto R, Lee L, Tanaka Y, Morita Y, Hijioka M, Hisano T, Furukawa M. Zinc deficiency as a general feature of cancer: a review of the literature. Biological Trace Element Research. 2024 May;202(5):1937-47.
31. Sugimoto R, Lee L, Tanaka Y, Morita Y, Hijioka M, Hisano T, Furukawa M. Zinc deficiency as a general feature of cancer: a review of the literature. Biological Trace Element Research. 2024 May;202(5):1937-47.
32. Dutta E, Lewis MG, Dhillon P, Albert S. Risk Factors for Gallbladder Cancer in the High-Burden Regions in India: A Systematic Review and Meta-Analysis. Available at SSRN 5172466.