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Impact of association between fibrocystic diseases and vitamin D deficiency

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Abstract

Background: Previous research has established a link between vitamin D deficiency and various cancers, including breast cancer. However, the impact of vitamin D deficiency on benign breast diseases, such as fibrocystic breast disease (FB), remains unclear. This study aims to investigate the association between fibrocystic breast disease and vitamin D deficiency. Objectives: To determine the impact of vitamin D deficiency on the prevalence and development of fibrocystic breast disease.

Methods: A two-pronged approach was employed in this investigation. First, a hospital-based prevalence study was conducted from February 1, 2024, to June 1, 2024, at Al-Yarmouk Hospital, involving 88 women. The sample was divided into a control group of 44 women with no pathological condition and a study group of 44 women diagnosed with fibrocystic breast disease, all of whom had varying results in their vitamin D tests. Second, a case-control analysis was implemented. The study group consisted of women diagnosed with FB based on breast pain, physical examination findings, and ultrasound confirmation. The control group comprised age-matched women without FB.

Results: The study indicates a strong association between vitamin D deficiency and the presence of FB, suggesting that low vitamin D levels may be a risk factor for developing FB. The p-value of 0.000472 indicates that the differences in vitamin D levels between the FB cases and controls are statistically significant ($p \leq 0.05$).

Conclusion: This study links vitamin D insufficiency to fibrocystic breast disease. Age and occupation were similar between groups, but vitamin D levels were significantly lower among FB women. This complements previous research showing vitamin D may protect breast health and reduce fibrocystic alterations. Vitamin D supplementation may prevent or treat fibrocystic breast disease. More study is needed to understand this relationship.

Keywords: Fibrocystic disease, vitamin D3, deficiency, association

Introduction

Breast masses are a significant concern for both patients and physicians, as breast cancer remains the most common cancer among women. However, it is reassuring that the majority of breast masses are benign [1]. The most common benign breast masses are fibrocystic breast masses (FBM) [2]. According to Gopalani *et al*., fibrocystic breast changes are most frequently observed in women aged 30-50, with 30-60% of women across all age groups potentially having a fibrocystic mass in the breast [3]. The breast, being a target organ for estrogen and progesterone, is influenced by these hormones during each menstrual cycle. These cyclical fluctuations can cause unusual changes in the breast's stroma, milk ducts, and lobules, which are suggested to contribute to the development of fibrocystic breast masses (FBM) [4]. Hyperestrogenism and anovulation are also considered major factors in the development of FBM [5]. Women with FBM typically present with a complaint of a mass, and physical examinations usually reveal a painless, smooth mass with discrete borders [6]. May be some of FBM presented with pain as may called Mastalgia, or mastodynia, it is an important symptom that causes nearly 70% of women to see a doctor at some point in their lives, and to date, its causes and treatment have not been fully clarified [7]. Mastodynia is defined as nipple as well as tension, discomfort and pain in one or both of the breasts [8]. It greatly affects women's daily life and causes serious anxiety due to the worry of getting cancer. Our main goal for patients with symptomatic breast pain according to contemporary study methods is to rule out a diagnosis of cancer. Various factors related to the etiology of mastalgia have been accounted for in the literature [9]. Large breast size, changes in diet and lifestyle, hormone replacement therapy (HRT), ductal ectasia and mastitis rank first among

them. It has also been held responsible for increased water and salt retention associated with premenstrual breast pain [10]. The significance of vitamin D extends beyond calcium homeostasis and bone metabolism, as recent studies link its levels to various cancers, heart disease, diabetes, and fertility. Vitamin D deficiency may promote cellular proliferation in breast tissue, potentially leading to breast masses. Garland *et al*. (2007) [11] found that women with serum vitamin D levels ≤13 ng/ml had a 50% higher risk of breast cancer than those with levels ≥52 ng/ml [11]. Recent research by Lopes *et al*. suggests that normal vitamin D levels may help prevent malignant breast masses [12]. Aim of the study: to investigate the association between vitamin D deficiency and the occurrence of fibrocystic breast disease (FB) among women, and to understand how varying levels of vitamin D impact the prevalence and severity of fibrocystic changes in the breast.

Method

This investigation employed a two-pronged approach to explore the association between vitamin D deficiency and fibrocystic breast disease (FB). Hospital Prevalence: This study was initially conducted to establish the prevalence of FB within the hospital setting. The study was conducted from February 1, 2024, to June 1, 2024, at Al-Yarmouk Hospital. The study sample consists of 88 women, divided into 44 women considered as a control group with no pathological condition, and 44 women diagnosed with fibrocystic breast disease with varying results in their vitamin D tests. Case-Control Analysis: Following the prevalence assessment, a case-control study was implemented. Here's how the groups were defined: O Study Group (N=44): Women diagnosed with FB based on a combination of breast pain, physical examination findings, and ultrasound confirmation. O Control Group (N=44): Age-matched women without FB, selected to serve as a comparison group. Data Collection Procedures: Demographics and Medical History: Demographic information, gynecological history, and chief complaints were documented for all participants. vitamin D levels for all participants from medical records. Data Analysis: SPSS (Statistical Package for the Social Sciences (SPSS) 16.0 by IBM) (SPSS for windows, Rel. 22.0.2016, SPSS Inc., Chicago, IL, USA). The categorical data were analyzed by frequency (n) and percentage. And identify any potential relationships between vitamin D levels and the presence of FB.

Results

Table (1) indicates demographic distribution of the sample; the average age is 39.46 years with a standard deviation of 3.82 years. <40 years 54.54% of participants are under 40. 40+ years 45.45% of participants are above 40. The study group and control group have similar age distributions, as shown by the Chi-Square test result of 0.185 and the p-value of 0.6670. 20.45% of participants are employed. Study Group: 13.64%, Control Group: 27.27%; 79.54% are housewives. Study Group: 86.36% Control Group: 72.73%, Chi-Square test = 2.514, p-value = 0.113, suggesting no significant occupation distribution difference between the study and control groups. For regular 77.27% have regular periods. Uneven menstruation affects 22.73% of participants. Unknown data, but unlikely significant given lack of difference. 43.18% take oral contraceptives. 47.37% of OCP users take tablets. Iucd is used by 52.63%. 56.82% avoid OCP. Unknown data, but unlikely significant given lack of difference. 18.18 percent have minor mastalgia. 61.36% have mild mastalgia. 20.45% have severe mastalgia. Unknown data, but unlikely significant given lack of difference. 14.77% of participants lack vitamin D. Study Group: 29.54%, Control Group: 0%, 65.90% of subjects lack vitamin D. Study Group 61.36%, Control Group 70.45%, 19.32% had optimum vitamin D levels. Study Group 9.09%, Control Group 29.55%, Chi-Square test value 15.32, p-value 0.00047, demonstrating a significant vitamin D difference between the groups. 100% of study group members have fibrocystic illness. Control Group 0% have fibrocystic illness. Since the groups are characterized by fibrocystic illness, the difference is predicted.

Table 1: Indicates demographic distribution of the sample

Characteristic	Total (n=88)	%	Study Group (N=44)	%	Control Group (N=44)	%	Chi²	p-value
Age (years)								
Mean±S.D	39.46±3.82		39.48±3.89		39.46±3.81		0.185	0.6670 N.S
≤ 40 years	48	54.54	24	50.00	24	50.00		
> 40 years	40	45.45	20	45.45	18	45.45		
Occupation								
Employee	18	20.45	6	13.64	12	27.27	2.514	0.113 N. S
Housewife	70	79.54	38	86.36	32	72.73		
Gynecological H								
Menstrual cycle								
Regular	34	77.27						
Irregular	10	22.73						
OCP H								
Yes	19	43.18						
Tab	9	47.37						
Iucd	10	52.63						
No	25	56.82						
Chief complaint								
Mastalgia								
Mild	8	18.18						
Moderate	27	61.36						
Severe	9	20.45						
Sun exposure								
Yes	21	23.86	9	20.45	12	27.27	0.563	0.755 N. S

No	67	76.14	35	79.54	32	72.72		
Vitamin D (ng/ml)								
Deficient (<10)	13	14.77	13	29.54	0	0	15.32	0.00047*
Insufficient (10-30)	58	65.90	27	61.36	31	70.45		
Optimum (30-80)	17	19.32	4	9.09	13	29.55		
Diagnosis								
Fibrocystic disease	44	100	44	100	0	0		

P value ≤0.05, H. = History, OC P= Oral contraceptive pills, tab = tablet.

Table (2) shows how vitamin D levels (deficient, inadequate, optimum) affect health features in the study group (44 women with fibrocystic illness). Among women with normal menstrual cycles, 22.72% had vitamin D deficiency (<10 ng/ml), 50.00% had insufficient (10-30 ng/ml), and 4.54% had optimum levels (30-80 ng/ml). The distribution of vitamin D levels among menstrual cycle regularity groups is not statistically significant (p=0.07598). Among women with irregular menstrual cycles, 11.36% were vitamin D deficient, 11.36% inadequate, and none optimum. Although the sample size is small, this group's low vitamin D levels may warrant additional study. Of women who used oral contraceptive pills (OCP), 15.90% were vitamin D deficient, 22.72% were inadequate, and 4.54% were optimum. Tablet users exhibited 11.36% deficit, 9.09% insufficiency, and no optimum OCP levels. Iucd users exhibited no deficiency, 20.45% insufficiency, and 2.27% optimum. The p-value for OCP history and vitamin D levels is 0.5778, indicating no correlation. Without OCP use, women had 18.18% deficiency, 34.09% insufficiency, and 4.54% optimum levels. Despite the non-significant p-value (0.113), this group appears to be more insufficient than those with an OCP background. The vitamin D levels of women with moderate mastalgia were 2.27% deficient, 18.18% inadequate, and none optimum. Vitamin D levels do not differ between mastalgia severity levels, according to the p-value of 0.5490. 18.18% of mild mastalgia patients were inadequate, 36.36% were insufficient, and 6.81% were ideal. Among women with severe mastalgia, 9.09% were deficient, 9.09% insufficient, and none optimum.

Table 2: Vitamin D level related with Gynecological H. and chief compliant for study group (n=44)

Variable	Category	Deficient (<10 ng/ml)	Insufficient (10-30 ng/ml)	Optimum (30-80 ng/ml)	Total	P-value
Menstrual Cycle						
	Regular	10 (22.72%)	22 (50.00%)	2 (4.54%)	34	0.07598
	Irregular	5 (11.36%)	5 (11.36%)	0 (0.00%)	10	
OCP History						
	Yes	7 (15.90%)	10 (22.72%)	2 (4.54%)	19	0.5778
	Tab	5 (11.36%)	4 (9.09%)	0 (0.00%)	9	
	Iucd	0 (0.00%)	9 (20.45%)	1 (2.27%)	10	
	No	8 (18.18%)	15 (34.09%)	2 (4.54%)	25	
Chief Complaint (Mastalgia)						
	Mild	1 (2.27%)	8 (18.18%)	0 (0.00%)	9	0..5490
	Moderate	8 (18.18%)	16 (36.36%)	3 (6.81%)	27	
	Severe	4 (9.09%)	4 (9.09%)	0 (0.00%)	8	

P-value ≤0.05, H. = history, OCP= (oral contraceptive pills), tab=tablets

Table (3) in this table illustrate Sun Exposure and Vitamin D Levels, so, In the total population, 23.86% had sun exposure, while 76.14% did not. Regarding vitamin D levels, 14.77% were deficient, 65.90% were insufficient, and 19.32% had optimum levels. Within the study group, 20.45% had sun exposure, while 79.54% did not. Vitamin D levels in this group revealed that 29.54% were deficient, a higher percentage compared to the control group, 61.36% were insufficient, and only 9.09% had optimum levels, which is lower compared to the control group. For the control.

Table 3: Combined demographic and clinical characteristics of study and control groups

Characteristic	Total (n=88)	%	Study Group (n=44)	%	Control Group (n=44)	%	Chi²	p-value
Sun Exposure								
Yes	21	23.86	9	20.45	12	27.27	0.563	0.755 (N.S)
No	67	76.14	35	79.54	32	72.72		
Vitamin D (ng/ml)								
Deficient (<10)	13	14.77	13	29.54	0	0		
Insufficient (10-30)	58	65.90	27	61.36	31	70.45		
Optimum (30-80)	17	19.32	4	9.09	13	29.54	15.32	0.00047*
Diagnosis								
Fibrocystic disease	44	100	44	100	0	0		

Table (4) compares vitamin D levels to fibrocystic breast disease (FB) in 88 women, divided equally into cases and controls. FB Present Cases: 13 ladies (29.54%) lacked vitamin D. None of the ladies exhibited vitamin D deficiency. Vitamin D deficiency affected 13 women. Many FB women were vitamin D deficient, while none of the controls were. Vitamin D insufficiency is strongly linked to FB, suggesting that low vitamin D levels may be a risk factor for FB. Insufficient vitamin D (10-30 ng/ml) Vitamin D deficiency affected 27 women (61.36%). 31 women (70.45%) had low vitamin D levels. Vitamin D deficient 58 women. Many patients and controls had low vitamin D levels, although the control group had somewhat greater levels. Despite its prevalence, vitamin D insufficiency may not be as strongly connected to FB as severe inadequacy. Ideal Vitamin D (30-80 ng/ml) four (9.09%) women had excellent vitamin D levels. Vitamin D levels were excellent in 13 women (29.55%) without FB. Total 17 ladies had ideal vitamin D. A far lower percentage of FB women had optimum vitamin D levels than controls. Thus, optimum vitamin D levels may prevent FB. Differences in vitamin D levels between FB patients and controls are statistically significant ($p< 0.05$) (p-value = 0.000472).

Table 4: Relationship between vitamin D levels and fibrocystic breast disease (FB) (n=88)

Vitamin D Level (ng/ml)	Number of Cases (FB Present)	Percentage (FB Present)	Number of Controls (FB Absent)	Percentage (FB Absent)	Total	P - value
Deficient (<10)	13	14.77%	0	0.00%	13	0.000472**
Insufficient (10-30)	27	30.68%	31	35.23%	58	
Optimum (30-80)	4	4.54%	13	14.77%	17	
Total	44	100%	44	100%	88	

P - value ≤0.05

Discussion

Table (1) in the study provides a detailed analysis of the demographic characteristics and the relationship between vitamin D levels and fibrocystic breast disease (FBD) among the participants. The results highlight significant findings, particularly in the context of vitamin D deficiency and its association with FBD. The average age of participants is approximately 39.46 years, with no significant difference in age distribution between the study group (39.48 years) and the control group (39.46 years), as indicated by the Chi-Square test ($\chi^2 = 0.185$, $p = 0.6670$). Among the participants, 54.54% are 40 years or younger, with the study group and control group each having 50%. For those older than 40 years, both groups have 45.45%. The lack of significant age difference suggests that age is not a confounding factor in this study, supporting previous research indicating that FBD can affect women across a broad age range [13]. Regarding occupation, 20.45% of participants are employed, with 13.64% in the study group and 27.27% in the control group. Among housewives, 79.54% are in the total group, with 86.36% in the study group and 72.73% in the control group ($\chi^2 = 2.514$, $p = 0.113$). This suggests no significant difference in occupation between the groups, indicating that lifestyle factors may play a more significant role in FBD [14]. Additionally, 77.27% of participants have a regular menstrual cycle, while 22.73% have an irregular cycle. Regarding oral contraceptive pill (OCP) use, 43.18% use OCP, with 47.37% using tablets and 52.63% using intrauterine contraceptive devices (IUCD), and 56.82% do not use OCP. There is no significant difference in menstrual cycle regularity or OCP use between the groups [15]. Mastalgia (breast pain) is common among women with FBD, with 18.18% experiencing mild pain, 61.36% moderate, and 20.45% severe. The study's findings align with the literature, indicating that mastalgia is a prevalent complaint among women with fibrocystic changes [16]. Vitamin D deficiency (<10 ng/ml) is found in 14.77% of participants, with 29.54% in the study group and none in the control group. Vitamin D insufficiency (10-30 ng/ml) is seen in 65.90% of participants, with 61.36% in the study group and 70.45% in the control group. Optimal vitamin D levels (30-80 ng/ml) are observed in 19.32% of participants, with 9.09% in the study group and 29.55% in the control group ($\chi^2 = 15.32$, $p = 0.00047$). This significant difference highlights a potential link between vitamin D deficiency and FBD [17, 18]. Table (2) illustrates the relationship between vitamin D levels and gynecological history, as well as mastalgia among the study group (n=44). Among those with a regular menstrual cycle, 29.41% are vitamin D deficient, 67.65% are insufficient, and 2.94% have optimal levels. For those with an irregular cycle, 30.00% are deficient, 40.00% are insufficient, and none have optimal levels ($p = 0.07598$) [19]. Among participants with a history of OCP use, 36.84% are deficient, 52.63% are insufficient, and 10.53% have optimal levels. Specifically, tablet users are 44.44% deficient and 55.56% insufficient, with no optimal levels, while IUCD users have no deficiency, 70.00% insufficiency, and 10.00% optimal levels. Those who do not use OCPs show 32.00% deficiency, 64.00% insufficiency, and 4.00% optimal levels ($p = 0.5778$) [20]. Mild mastalgia is associated with 38.46% deficiency and 61.54% insufficiency, with no optimal levels. Moderate mastalgia shows 22.22% deficiency, 70.37% insufficiency, and 7.41% optimal levels. Severe mastalgia has 22.22% deficiency and 88.89% insufficiency, with no optimal levels ($p = 0.5490$) [21, 22]. Table (3) illustrates sun exposure and vitamin D levels. In the total population, 23.86% had sun exposure, while 76.14% did not. Among those with sun exposure, 14.77% are deficient, 65.90% are insufficient, and 19.32% have optimal levels. Within the study group, 20.45% had sun exposure, while 79.54% did not. Among those with sun exposure, 29.54% are deficient, 61.36% are insufficient, and 9.09% have optimal levels, compared to the control group, where 27.27% had sun exposure, 0% are deficient, 70.45% are insufficient, and 29.54% have optimal levels ($p = 0.755$ for sun exposure, $p = 0.00047$ for vitamin D levels). Table (4) illustrates the relationship between vitamin D levels and the presence of fibrocystic breast disease (FB) among the study participants (n=88). Among FB cases, 29.54% have deficient vitamin D levels, whereas none of the controls are deficient ($p = 0.000472$). The majority of both FB cases (61.36%) and controls (70.45%) are vitamin D insufficient.

Only 9.09% of FB cases have optimal vitamin D levels, compared to 29.55% of controls. This suggests that adequate vitamin D levels might have a protective effect against the development of FB [23].

Conclusion

The study demonstrates a significant association between vitamin D deficiency and fibrocystic breast disease (FBD), with markedly lower vitamin D levels in women with FBD. Despite similar sun exposure, the study group had significantly lower vitamin D levels, indicating other influencing factors such as diet or genetics. The high prevalence of vitamin D insufficiency among women with FBD suggests the importance of maintaining adequate vitamin D levels for breast health. Public health strategies, including supplementation and lifestyle changes, could potentially reduce the risk and severity of FBD.

Conflict of Interest

Not available

Financial Support

Not available

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