

The Association Between Dietary Calcium Intake and Premenstrual Asthma (PMA) Among University Students in Eastern Province of Saudi Arabia: Cross Sectional Study

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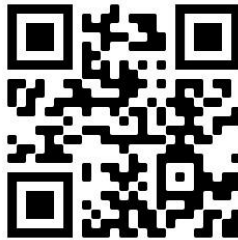
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The Association Between Dietary Calcium Intake and Premenstrual Asthma (PMA) Among University Students in Eastern Province of Saudi Arabia: Cross Sectional Study

Abstract:

Background: Premenstrual asthma (PMA) is a variant of asthma in women that causes symptoms to intensify a few days before menstruation. Up to 40% of women with asthma, according to estimates, are impacted. Increased bronchial hyperreactivity owing to unstable equilibrium calcium levels in intracellular cytoplasm has been proposed as one of the most important background causes for asthma aggravation during the perimenstrual period.

Objective: The aim of this study was to investigate if there was a relation between dietary calcium intake and the severity of PMA.

Method: A cross-sectional study was performed on seventy asthmatic students recruited from the Imam Abdulrahman Bin Faisal University (IAU), were divided into three groups mild, moderate, and severe based on the severity of menstrual syndrome and asthma, also there is negative control group (NCG). Dietary calcium intake was assessed based on FFQ questionnaire and analyzed through the "EISHA software". Anthropometric measurements, pulmonary function, serum calcium and estrogen hormone were analyzed.

Results: Serum calcium was cut down ranged between 7.87 ± 3.24 and 5.33 ± 0.39 mg/d respectively in moderate and severe groups which had the lowest concentrate of estrogen hormone at 28.49 ± 12.70 and 26.73 ± 6.50 pg/mL, respectively. Also, dietary calcium was decreased significantly (P -value ≤ 0.001) among asthmatic students who suffered from 1 to 4 times attacks per month. There is a positive correlation between estrogen hormone and serum Ca at (P -value ≤ 0.05). Also, dietary calcium was correlated significantly at (P -value ≤ 0.05) with estrogen hormone and pulmonary functions, including FVC and FEV1.

Conclusion: this study declared a positive relationship between dietary calcium consumption, estrogen hormone, and pulmonary

functions, which concluded that calcium homeostasis is a fundamental mechanism for relieving the severity of PMA.

Keywords: Premenstrual asthma, estrogen, pulmonary function, dietary consumption milk, calcium homeostasis.

Introduction

Premenstrual asthma (PMA) is an asthma attack that occurs during the premenstrual period (**Chhabra, 2005; Sánchez-Ramos et al., 2016**). More than 30% of asthmatic women suffer from this condition (**Pereira Vega et al., 2012**). In comparison to the pre-ovulatory phase, PMA is defined as a 20% increase in respiratory symptoms and/or a 20% reduction in peak flow values (**Pereira Vega et al., 2012**). PMA is caused by perimenstrual fluctuations in estrogen and progesterone levels, as well as alterations in the estradiol-progesterone relationship.

Most studies hypothesis the association between menstrual cycle changes of steroid hormones and changing concentrations of proinflammatory mediators in lower airways of patients with PMA (**Vrieze et al., 2003**). Moreover, the study of (**Haggerty et al., 2003**) showed that estrogen and progesterone are associated with modifying airway responsiveness, also **Koper et al., (2017)** suggested that PMA exacerbations might be triggered by some characteristic pattern of female sex hormones concentrations during the perimenstrual period. In the study of **Nakasato et al. (1999)**, they revealed that serum levels of histamine were significantly higher during perimenstrual exacerbations of asthma than after recovery. Therefore, **Skoczynski et al., (2017)** hypothesized that increased concentration of the cytokines in lower airways of PMA patients (caused by higher progesterone concentration in luteal phase of the cycle) is responsible for asthma deterioration during this period. In the study of **Pereira-Vega et al. (2012)** all women diagnosed with PMA had total blood immunoglobulin E (IgE) values increased above normal.

Dietary consumption, as we all know, has an impact on the body's hormones. Calcium, for example, is essential for blood coagulation, nerve impulses, and muscular contraction.

In individuals with stable bronchial asthma, serum levels of vitamin D, calcium, and magnesium were considerably lower than in control participants. A reduction in serum calcium levels is substantially related with an increase in asthma severity.

Dysregulation of Ca²⁺ homeostasis, driven at least in part by a downregulation in expression and activity of sarcoendoplasmic Ca²⁺ ATPases, is hypothesised as a unifying mechanism underlying the aberrant asthmatic phenotype (SERCAs). Contractile function, proliferation, cell migration, and release of proinflammatory cytokines and chemokines, as well as changes in ASM Ca²⁺ homeostasis, are all reviewed and linked to changes in ASM Ca²⁺ homeostasis.

Furthermore, **Najafi et al., (2018)** conducted a nested case-control study among university students to investigate the relationship between dietary pattern and the risk of dysmenorrhea. They discovered that the "snacks" dietary pattern, which is characterized by high consumption of fat, sugar, salty snacks, sweet, tea, coffee, and fruit juices, is associated with an increased risk of dysmenorrhea. The goal of this study was to find out if there was a link between dietary calcium consumption and the severity of PMA.

Subjects and Methods:

Study protocol and participants

This work is a cross-sectional study conducted at Imam Abdulrahman Bin Faisal University (IAU), Dammam, Saudi Arabia between January 2019 to June 2019.

The participants of seventy students aged between 18-24 years old females were recruited from the IAU. The Inclusion criteria were: single free from any other medical condition that

could affect menstruation. While Exclusion criteria: non-Saudi students, pregnant or lactating mothers, have chronic health issues that affect menstruation and the use of hormonal contraceptives. All subjects signed a consent form to participate in this study.

Assessment of dysmenorrhea severity

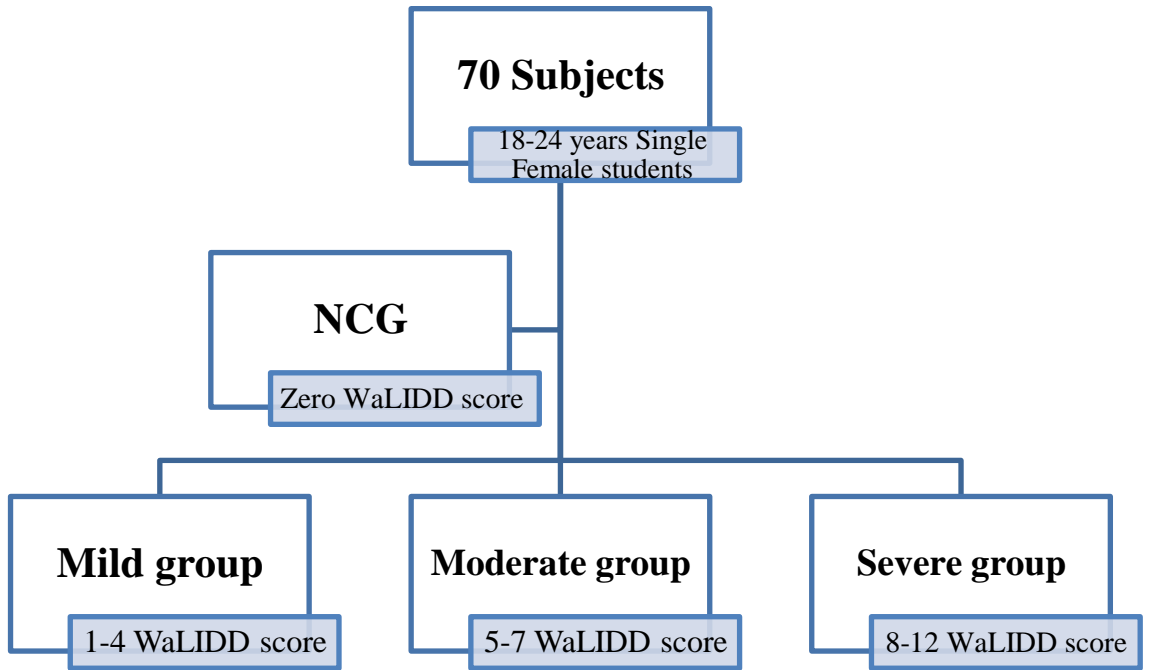
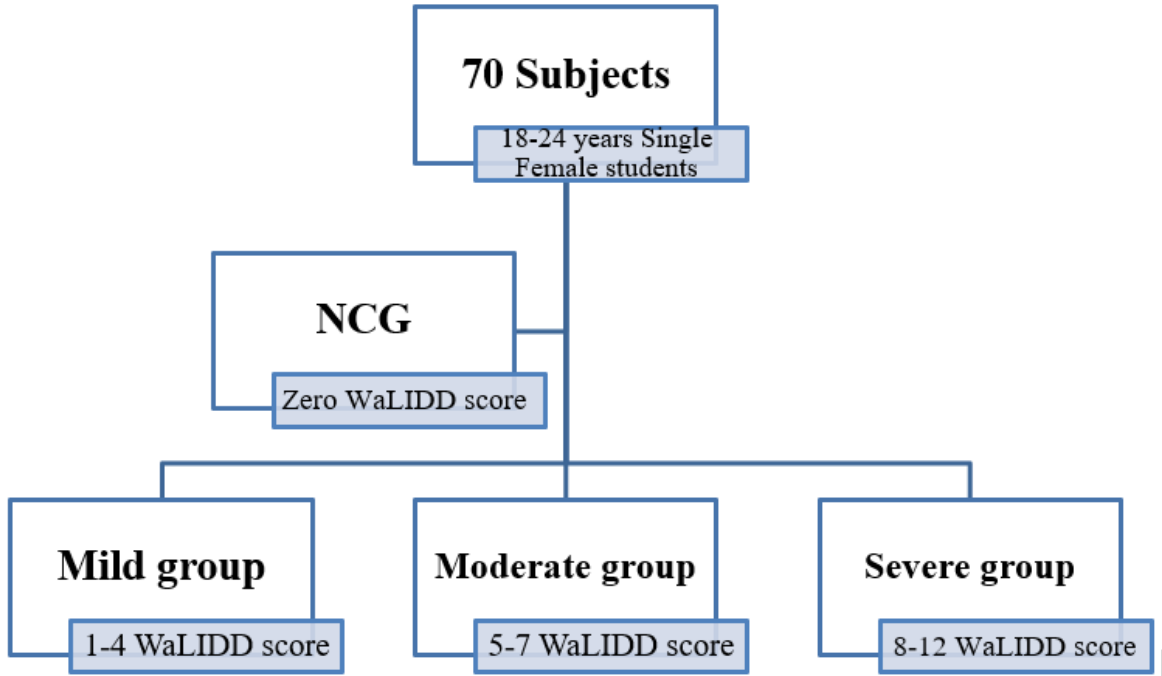
The severity of dysmenorrhea was assessed by WaLIDD score which is based on the number of anatomical pain site, working ability, the intensity of pain, and numbers of days of pain. The final score will range from 0-12. Score interpretation: 0 without dysmenorrhea, 1-4 mild dysmenorrhea, 5-7 moderate dysmenorrhea and 8-12 severe dysmenorrhea (**Teherán et al., 2018**).

Classification of asthma severity

The EPR-3 guideline classification divides asthma severity into four groups: Intermittent, persistent-mild, persistent-moderate, and persistent-severe (**Pollart and Elward, 2009**).

Experimental Design

The asthmatic students who involved all conclusion criteria were divided into three groups based on the severity of dysmenorrhea and severity of asthma as follow: Mild group, moderate group, and severe group, also there is negative control group (NCG), who had Zero WaLIDD score.



Collected dietary consumption data

Dietary intake were estimated by the 24-hr recall form. The nutrients were analyzed through the "EISHA software." FFQ developed based on a questionnaire from (Magkos et al., 2006) to assess the frequency of dietary calcium intake. FFQ included twenty-three items that are commonly consumed in Saudi Arabia, the FFQ specified the quantity and the frequency of each item. Dietary habits during menstrual were assessed based on the dietary habits questionnaire form as valid and published by (Ruzicka, 2013).

Anthropometric Measurement

All Participants were assessed for body weight, height, and BMI.

Blood Sample

Complete blood count (CBC), serum calcium and estrogen hormone were analyzed in a sample of venous blood in the first three days of the period. Measurements were performed at the laboratory of Family and Community Medicine Center at IAU for analysis.

Estimation of serum calcium were carried out by colorimetric methods described by **Goldstein (1990)**

Estimation of serum estrogens were carried out by methods described by **Blair (2010)**.

Blood hemoglobin (Hb) concentration was determined using cyanmethemoglobin method according to **Villanova (1994)**.

The pulmonary function

A. Forced vital capacity (FVC) measured according to **Watters et al., (1986)**. FVC is the maximum volume of gas the patient can exhale as forcefully and as possible. It is measured by having the patient exhale as forcefully and as quickly as possible into a spirometer or pneumotachometer. The patient should breathe in maximally and exhale as quickly as possible.

B. Forced expiratory volume (FEV1) is the volume of air that is exhaled during the first second of the FVC, reflecting the airflow in the large airways. It was measured according to **Strumpf et al., (1981)**.

C. Maximum voluntary ventilation (MVV) also called the maximum breathing capacity is the maximum volume of a gas a person can move during 1 minute (previously called the maximum breathing capacity). It was measured according to **Abdel salam et al., (1971)**.

D. Peak expiratory flow rate (PEFR) determine the changes in the airways resistance, it was measured by the peak expiratory flow meter, which measures the maximal flow maintained over 10 milli seconds at any part of the expiration according to **Crofton and Douglas (1981)**.

Ethical consideration:

All participants were informed about the procedure of the study, and their rights and duties and a written consent was obtained before enrolling into the study. The project application and protocol were reviewed and approved by the Imam Abdulrahman

Bin Faisal University Institutional Review Board (IRB) Committee and have the approval number (IRB-UGC-2019-03-019) with an agreement from the Department of Clinical Nutrition at IAU.

Statistical Analysis

The collected data was analyzed by the statistical software Statistical Package of Social Sciences (SPSS) version 23 (IBM Corp, 2015). The frequencies, percentage and chi-square tests were used for the categorical variables. (ANOVA) test, pearson correlation coefficient, and ordinal logistic regression were set at $p\text{-value} < 0.05$.

Results

Figure (1) The percentage of participants based on severity of dysmenorrhea

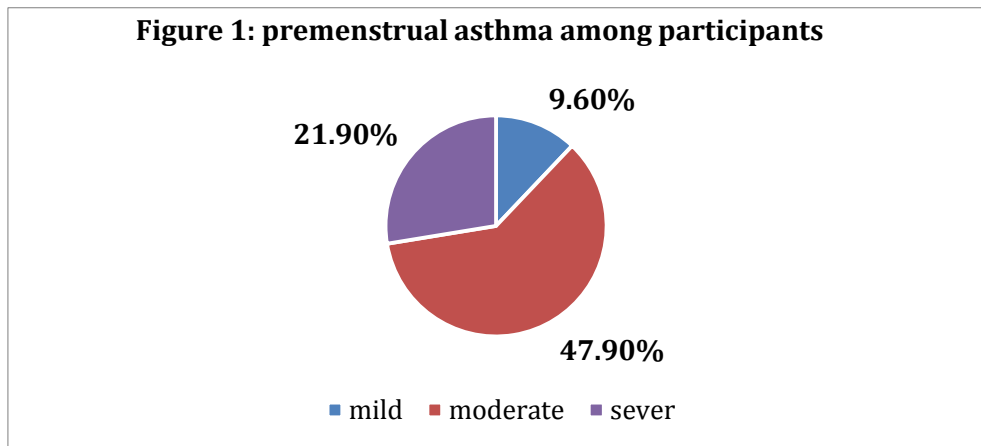


Figure 1 illustrates that most of the participants had moderate dysmenorrhea (47.9%). Twenty-two percent had severe dysmenorrhea which indicates low working ability, multiple pain locations, high pain level and many days of pain. Only (9.6%) had mild dysmenorrhea.

Table (1). The anthropometric measurements of enrolled participants

Variables	NCG	Mild group	Moderate group	Severe group	P- value
Weight	57.30 ± 6.23	63.00 ± 7.94	65.60 ± 8.15	75.82 ± 8.68	0.018*
Height	1.65 ± 0.77	1.67 ± 0.83	1.71 ± 0.75	1.58 ± 0.76	0.098
BMI	21.07 ± 4.27	22.58 ± 4.27	22.47 ± 3.86	30.33 ± 3.44	0.031*

NCG: negative control group; BMI: Body mass index.

The significant differences are considered at the 0.05 (*).

The anthropometric measurements of the enrolled participants are shown in (Table 1). There is a huge variety of body weight among studied groups with significant difference ($P \leq 0.05$) range between 57.30 ± 6.23 to 75.82 ± 8.68 kg. Consequently, BMI was changed significantly ($P \leq 0.01$); as NCG and mild group was categorized in normal weight at values 21.07 ± 4.27 and 22.58 ± 4.27 respectively, while moderate and severe groups classified as over-weight by means 22.47 ± 3.86 and 30.33 ± 3.44 respectively.

Table (2). Dietary and serum calcium of students with premenstrual asthma

Variables	NCG	Mild group	Moderate group	Severe group	P- value
Serum Ca (8.6-10.3 mg/dL)	8.60 ± 0.35	7.87 ± 3.24	7.20 ± 0.32	5.33 ± 0.39	0.002**
Dietary Ca (g/day)	492.67 ± 121.86	382.67 ± 101.86	286.08 ± 155.50	205.20 ± 193.44	0.000***

The significant differences are considered at the levels 0.05 (*), 0.01 (**), & 0.001 (***).

Dietary and serum calcium, as illustrated in table 3, showed significant reduction ($P \leq 0.001$) among asthmatic women with premenstrual syndrome compared to normal counterparts. Dietary calcium of normal students was 492.67 ± 121.86 gm, while decreased significantly in moderate and severe groups at values 286.08 ± 155.50 and 205.20 ± 193.44 respectively. At the same

line, serum calcium also was cut down among studied groups ranged between 7.87 ± 3.24 and 5.33 ± 0.39 mg/dL for mild and severe groups' respectively.

Table (3). Blood profiles and estrogen hormone of students with premenstrual asthma

Variables	NCG	Mild group	Moderate group	Severe group	P- value
Hgb	12.57 ± 0.33	11.10 ± 0.41	10.23 ± 0.99	10.56 ± 1.58	0.012*
RBC	4.58 ± 0.39	3.87 ± 0.51	3.33 ± 0.47	3.03 ± 0.25	0.053*
Estrogen 30 to 400 pg/mL	40.30 ± 8.54	33.30 ± 0.21	28.49 ± 12.70	26.73 ± 6.50	0.001**

Hgb: Haemoglobin; RBC: Red blood cells.

Blood profiles and estrogen hormone of premenstrual asthmatic students revealed in table 3. The mean value of Hgb was 12.57 ± 0.33 in NCG, while it was decreased significantly at (p-value ≤ 0.05) in moderate and severe groups 10.23 ± 0.99 and 10.56 ± 1.58 respectively; also RBC value was normal in NCG at 4.58 ± 0.39 , while it was lowered substantially (p-value ≤ 0.05); particularly in severe group at 3.03 ± 0.25 .

In asthmatic students before and during period; estrogen level was decreased, this hormone changes may worsen asthma. Moderate and severe groups had the lowest concentrate of estrogen hormone at 28.49 ± 12.70 and 26.73 ± 6.50 , respectively compared to NCG (40.30 ± 8.54).

Table (4). Asthmatic indicators and pulmonary functions of students at premenstrual phase

FVC: Forced vital capacity, FEV1: Forced expiratory volume in 1 second, MVV: Maximum voluntary

Variables	NCG	Mild group	Moderate group	Severe group	P- value
No. of Asthmatic attacks/ month	---	1.67±0.57a	2.66±0.56b	4.33±0.55c	0.000
FVC	3.59±0.05a	3.14±0.03b	2.69±0.04c	2.08±0.02d	0.000
FEV%					
N: More than 75%	80.54±2.69a	74.39±1.16a	70.99±40.69a	69.30±1.36a	0.278
MVV (L/min)	30.65±1.39a	24.55±1.28b	22.53±0.58b	18.58±2.02c	0.000
PEFR (L/s%)					0.000
N: More than 80%	86.48±0.93a	76.52±0.68b	75.14±1.51b	69.42±0.97c	

ventilation, and PEFR: Peak expiratory flow rate. N: Normal values obtained from Abdel salam et al., (1971).

Regarding to respiratory functions and asthmatic indicators as shown in table 4, the students were suffered from asthmatic attacks approximately 1 to 4 times per month in mild and severe groups respectively with highly significant differences (p -value ≤ 0.001) among studied groups. Forced vital capacity (FVC) was decreased significantly (p -value ≤ 0.001); the mean values were 3.59 ± 0.05 and 3.14 ± 0.03 in NCG and mild group and reduced in severe group to 2.08 ± 0.02 .

Forced expiratory volume (FEV%) is the volume of air that is exhaled during the first second of the FVC, reflecting the airflow in the large airways. It is diminished by worsening asthma to 69.30 ± 1.36 in severe group compared to NCG 80.54 ± 2.69 but did not differ significantly between studied groups. Both of Maximum voluntary ventilation (MVV) and Peak expiratory flow rate (PEFR) were dropped significantly (p -value ≤ 0.001) from 30.65 ± 1.39 and 86.48 ± 0.93 to 18.58 ± 2.02 and 69.42 ± 0.97 in NCG and severe groups respectively.

Table (5). Pearson correlation coefficient between BMI, Serum Calcium, Estrogen Hormone and Dietary Calcium

	FEFR	MVV	FEV ₁	FVC	N. Asthma	Estrogen	Serum Ca	Dietary Ca
Dietary Ca	--	--	0.008*	0.038*	-	0.045*	0.000**	-
Serum Ca	--	--	--	--	--	0.019*	-	
Estrogen	0.006*	0.024*	--	0.008*	0.017*	-		
No. Asthma	0.000**	0.000**	--	0.000**	-			
FVC	0.000**	0.000**	--	-				
FEV ₁	--	--	-					
MVV	0.000**	-						
FEFR	-							

* = (P-value \leq 0.05); ** = (P-value \leq 0.01); *** = (P-value \leq 0.001).

The Pearson correlation coefficient was used to obtain the correlation values, as shown in table 5. There is a positive correlation between estrogen hormone and dietary calcium and serum Ca at (P-value \leq 0.05). Also, dietary calcium was correlated significantly at (P-value \leq 0.05) with estrogen hormone and pulmonary functions, including FVC and FEV₁. Furthermore, the findings revealed that frequent asthma attacks were significantly correlated (P-value 0.05) with estrogen hormone concentrations as determined by the MVV (P-value \leq 0.001) and FEFR (P-value \leq 0.001) respiratory tests.

Figure (2). The correlation coefficient between WALIDD Score and Dietary Calcium

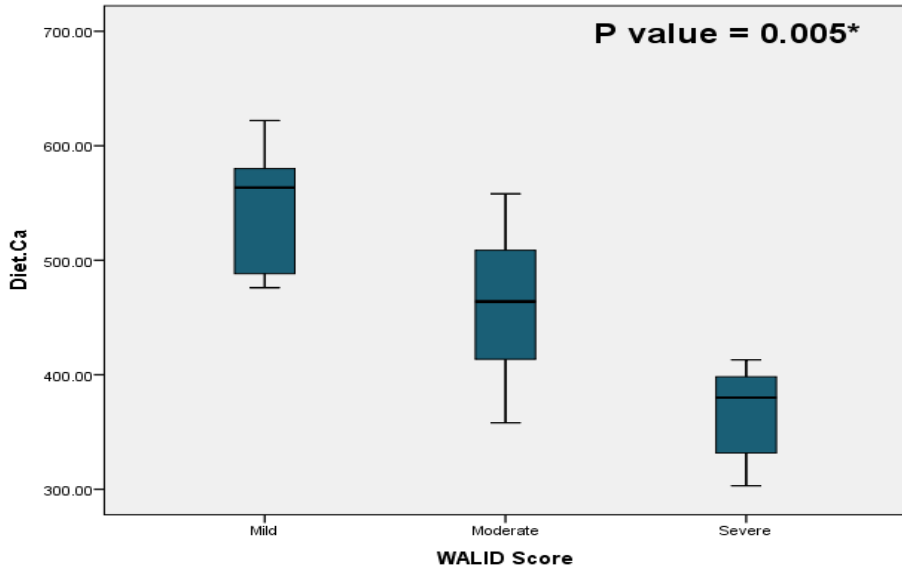
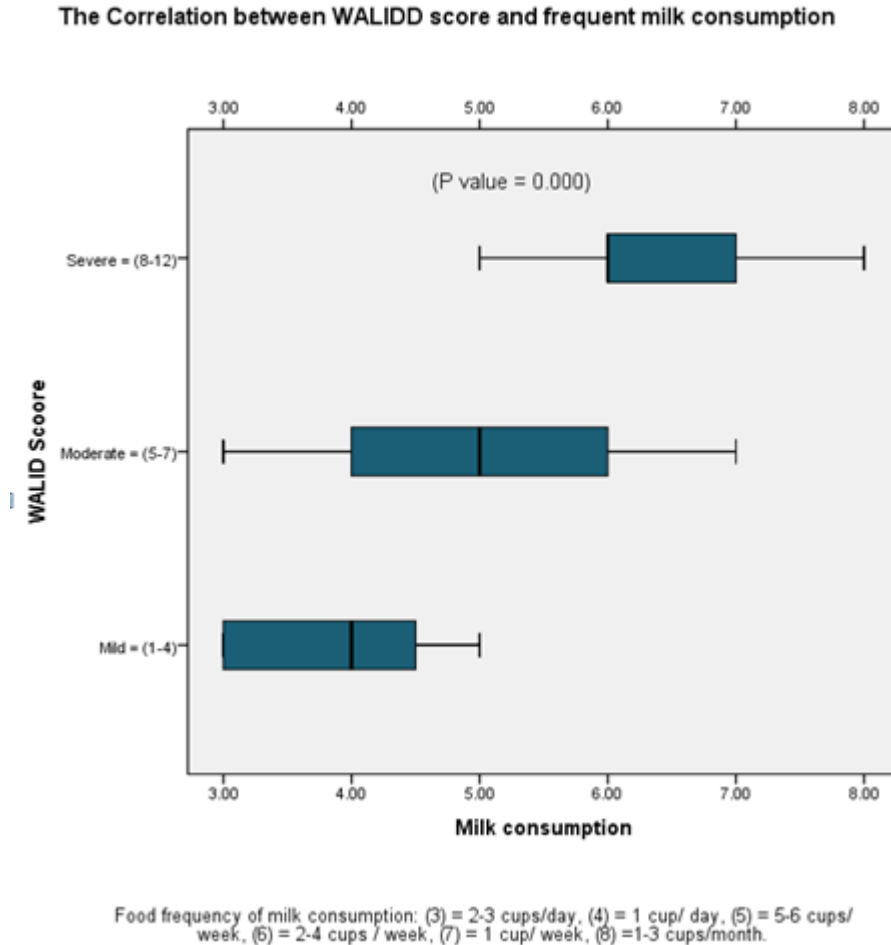


Figure 2 shows that the group with severe dysmenorrhea had the lowest dietary intake of calcium, followed by the moderate then the mild dysmenorrhea groups who consumed more quantity of dietary calcium. An ordinal logistic test obtained these results.

Figure (3). The correlation coefficient between WALIDD score and frequent milk consumption



An ordinal logistic test was used to obtain data for (Figure 3), where the variables in FFQ are as the following; (3) = 2-3 cups/day, (4) = 1 cup/ day, (5) = 5-6 cups/ week, (6) = 2-4 cups / week, (7) = 1 cup/ week, (8) = 1-3 cups/month. The group with severe dysmenorrhea that was stationed between (7&8) had the lowest dietary intake of milk (1-3 cups/month) compared to the moderate group that is in between (6&7) with p-value = 0.000 is considered significant. In contrast, students who had mild dysmenorrhea symptoms had the highest dietary intake of milk, 1-2-3 times/ day, (3 & 4).

Discussion

Asthmatic women have a phenotype that causes a worsening of symptoms a few days before menstruation, referred to as "premenstrual asthma" by **Chhabra, (2005) and Sánchez-Ramos et al., (2007)** respectively. As highlighted by **Alamoudi, (2001)** asthma was determined to be the leading cause of hospitalizations (38.6%) among patients admitted with respiratory diseases in previous studies (2001). Hospitalization rates among women (63.3 percent) were nearly twice those of men, as in prior investigations (36.7 percent). It is estimated that up to 40% of asthmatic women experience an asthma burner during menstrual period (**Tan, 2001**). Adults aged 26 to 45 and the elderly aged 46 to 65 were the age groups most affected, with an average stay of 8.8 days (**Abu Helwa et al., 2018; Nagy and Khan, 2022**). Previous studies have demonstrated that both oestrogen and progesterone have a role in modifying airway responsiveness, implying that asthma exacerbations could be triggered by a specific pattern of female sex hormone concentrations during the perimenstrual interval (**Peters et al., 2014**).

Furthermore, scientific evidence suggests that micronutrients, particularly calcium and vitamin D, promote cyclic variations during the menstrual cycle, which could assist to explain some PMA symptoms. On the other hand, ovarian hormones affect the metabolism of calcium, magnesium, and vitamin D. Estrogen affects calcium metabolism, intestinal calcium absorption, and parathyroid gene expression and secretion, which causes menstrual cycle oscillations. Calcium homeostasis disturbances have long been implicated in a variety of emotional issues (hypocalcemia and hypercalcemia). As a result, the goal of this study was to see if there was a link between dietary calcium intake and the severity of PMA among university students.

According to the current study's findings regarding respiratory functions and asthmatic indicators, as shown in table 3, students in the mild and severe groups experienced asthmatic attacks 1 to 4 times per month. When compared to NCG, worsening asthma significantly reduced respiratory functions such as FVC, FEV percent, MVV, and PEF. As shown in table 4, asthmatic students had lower estrogen levels before and during

their periods, while moderate and severe groups had the lowest concentrations of estrogen hormone compared to NCG.

This occurrence has been elucidated by **Haggerty et al., (2003)**, who stated that increased bronchial hyperreactivity is one of the most critical potential confounders for asthma aggravation during the perimenstrual period. According to **Tan et al., (1997)** airway responsiveness to adenosine 5-monophosphate (AMP) was greatest in asthmatic women during the premenstrual period. Changes in sex hormones throughout the menstrual cycle may potentially be linked to airway inflammation in asthmatic patients (**Mandhane et al., 2009**; and **Tan et al., 1997**). Although estrogen may be advantageous to asthma in women of reproductive age, progesterone, whose levels are high in the luteal phase but virtually nonexistent in the follicular phase, has a detrimental effect on asthma.

The interchangeability of calcium and oestrogen hormone, on the other hand, had a reciprocal link, as seen in the current study's results in table 3, which demonstrated that blood calcium was considerably lower in students with premenstrual asthma compared to their normal counterparts. In addition, students' dietary calcium intake was considerably reduced in the moderate and severe groups. These findings resembled those of **McKane et al., (1995)** and **Prince et al., (1995)**, who found that renal calcium excretion rises after menopause in humans and is reversed by estrogen, regardless of circulating parathyroid hormone (PTH). Humans with menopausal estrogen depletion have lower calcium absorption, which can be restored with estrogen replacement. As a result, there is evidence to suggest that normal ovarian activity increases several elements of intestinal calcium absorption.

Moreover, it has been shown that the administration of β_2 -agonists generates a drop in blood calcium levels in both asthmatic and nonasthmatic individuals (**Prince et al., 1988**). The use of intravenous aminophylline in the treatment of acute bronchial asthma attacks causes an increase in calcium excretion in the urine (**Alamoudi, 2001**). Further to that, very low Ca intake (350-400 mg/d as a human equivalent) aggravated estrogen-deficiency-induced impairments of energy, glucose, and lipid metabolism in estrogen-deficient rats by increasing serum

parathyroid hormone levels and initiating visceral fat accumulation and insulin resistance, as **Park et al.**, reported in (2020). Another study feature of **Bocchieri and Thys-Jacobs**, (2008) that exhibit the same hypothesis, showing that many behavioral disturbances have consistently been associated to abnormalities in calcium homeostasis. The menstrual cycle influences calcium metabolism, intestinal calcium absorption, and 1,25-dihydroxyvitamin D synthesis due to cyclical fluctuations in ovarian steroid hormones. These luteal-phase complaints are now thought to be caused by aberrant calcium and vitamin D metabolism.

Women with luteal phase manifestations have an underlying calcium dysregulation, which can lead to subsequent worsening of asthma, respiratory symptoms, hyperparathyroidism, and vitamin D insufficiency (**Thys-Jacobs, 2000**). Calcium supplementation successfully relieves the majority of mental and somatic symptoms in women with premenopausal syndrome, according to several clinical research. This reinforces up the current study's theory that PMS is the clinical manifestation of a calcium deficit that is revealed when ovarian steroid hormone levels rise throughout the menstrual cycle.

Low calcium consumption was attributed to the severity of menorrhagia in this study, as indicated in figure (2). A comprehensive review found that dairy products had a favourable relation with decreased menstrual irritation, which verifies the findings of the current study (**Bajalan et al., 2019**). Furthermore, an observational study involving 127 college students aged 19 to 24 years found that women who consumed three or four servings of dairy products per day had lower rates of PMA than women who did not (**Abdul-Razzak, 2010**), suggesting that dietary calcium may help manage or alleviate pain and symptoms associated with menstrual cramps.

Interestingly, a student with minor amenorrhea symptoms had the greatest dietary calcium consumption. This finding is consistent with another study (**Zarei et al., 2016**) that revealed calcium consumption to be useful in lowering menstrual pain severity in students with dysmenorrhea. Similarly, it has been proved that lowering calcium intake might worsen PMA symptoms (**Balbi et**

al., 2000). Calcium may operate as a regulator in modulating the capacity of muscle cells in response to neurological stimuli; its rise diminishes muscle regulation capacity, while its decrease may result in contraction and muscular spasm.

In the same manner that L-type calcium channels responses trigger numerous kinases and signalling cascades, **Vega-Vela et al., (2017)** explain that an increase in intracellular calcium can activate several kinases and signalling cascades. Estrogen-L-type calcium channel signalling boosts intracellular calcium levels and stimulates similar signalling cascades in the brain, most likely through oestrogen receptor-independent modulatory processes. As shown in the table 5, there is a significant correlation between estrogen and calcium intake. One justification for this correlation is that oestrogen is metabolised in two pathways, the 2 hydroxyl pathway, and the 16a-hydroxyl pathway, which leads to estrogenic metabolites. Interestingly, calcium can shift oestrogen metabolism, increasing oestrogen metabolite through the 16a-hydroxyl pathway (**Napoli et al., 2007**).

Calcium imbalance in the cytoplasm is a fundamental mechanism common to all neurotransmitters and physical stimuli that induce smooth muscle spasm in asthma (**Mahn et al., 2010**). As a result, every muscle contracts and relaxes in response to changes in intracellular free calcium. Various neurotransmitters that might elicit bronchial spasm may do so by activating receptor-operated calcium channels, whether these channels are triggered by histamine, serotonin, or acetylcholine receptor-operated calcium channels. As a result of this process, relatively unstable equilibrium calcium levels in intracellular cytoplasm, triggering the contraction response. The key intracellular signal determining smooth muscle tissue tone appears to be the cytoplasmic concentration of free calcium (**Hussein et al., 2019**).

Recommendations:

The study recommends premenstrual asthmatic women to maintain their nutritional intake at the recommended dietary allowances in order to preserve calcium homeostasis and compensate for calcium insufficiency caused by low oestrogen hormone levels attributed with this disorder.

We recommend that future researchers interested in this topic expand this study to include more pre and postmenopausal women, as well as examine prostaglandin levels during menstruation.

Conclusion:

According to the findings of the present study, dietary calcium consumption is inversely related to the severity of PMA.

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العلاقة بين تناول الكالسيوم الغذائي والربو السابق للحيض (PMA) بين طالبات الجامعة في المنطقة الشرقية في المملكة العربية السعودية: دراسة مقطعية

الملخص العربي:

الخلفية: الربو السابق للحيض (PMA) هو أحد أشكال الربو لدى النساء الذي يتسبب في تفاقم الأعراض قبل أيام قليلة من الدورة الشهرية، يتأثرن به 40 % من النساء المصابات بالربو وفقاً للتقديرات. وجد أن زيادة فرط نشاط الشعب الهوائية بسبب مستويات الكالسيوم غير المستقرة في السيترولازم داخل الخلايا كأحد أهم الأسباب الأساسية لتفاقم الربو خلال فترة الحيض. الهدف من الدراسة: هو معرفة ما إذا كانت هناك علاقة بين تناول الكالسيوم الغذائي وشدة تفاقم الربو السابق للحيض.

الطريقة: تم إجراء دراسة مقطعية على سبعين طالبة مصابة بالربو تم اختيارهن من جامعة الإمام عبد الرحمن بن فيصل، وتم تقسيمهم إلى ثلاث مجموعات خفيفة ومتوسطة وحادة بناءً على شدة متلازمة الحيض والربو، أيضاً تم تحديد مجموعة ضابطة سلبية. تم تقييم المتناول من الكالسيوم الغذائي بناءً على استبيان تكرارية تناول الأطعمة وتم تحليله من خلال "برنامج EISHA"، كما تم تحليل القياسات الأنثروبومترية، وظائف الرئة، الكالسيوم في الدم وهرمون الاستروجين.

النتائج: تراوحت معدلات انخفاض الكالسيوم في الدم بين 3.24 ± 7.87 و 0.39 ± 5.33 ملجم / يوم على التوالي في المجموعات المتوسطة والشديدة التي كان لها أقل تركيز لهرمون الاستروجين عند 12.70 ± 28.49 و 6.50 ± 26.73 pg/mL على التوالي. أيضاً، انخفض الكالسيوم الغذائي معنوياً ($P \geq 0.001$) بين الطالبات المصابات بالربو الذين عانوا من نوبات تصل إلى 4 مرات في الشهر. كما توجد علاقة ايجابية بين هرمون الاستروجين وسيرم الكالسيوم عند (قيمة $P \leq 0.05$). كما ارتبط الكالسيوم الغذائي معنوياً عند (قيمة $P \leq 0.05$) مع هرمون الاستروجين ووظائف الرئة متضمنة FVC و FEV1.

الخلاصة: أظهرت هذه الدراسة وجود علاقة ايجابية بين استهلاك الكالسيوم الغذائي وهرمون الاستروجين ووظائف الرئة، وخلصت النتائج إلى أن توازن الكالسيوم هو المفتاح الأساسي للتخفيف من حدة PMA.

الكلمات المفتاحية: الربو السابق للحيض PMA، الإستروجين، وظائف الرئة، الحليب الغذائي، توازن الكالسيوم.