ISSN 0974-3618 (Print)
0974-360X (Online)

www.rjptonline.org

RESEARCH ARTICLE

Evaluation of some Physiological Parameters in patients with Asthma

Thanaa Abdulmahdi Mokif[1], Alaa Jawad Hassan[2], Zainab Nasser Nabat[1]
[1]Babylon Technical Institute, Al-Furat Al-Awsat Technical University, 51015 Babylon, Iraq.
[2]College of Science, University of Babylon, Iraq.
*Corresponding Author E-mail: **thanaabdalmahdi@yahoo.com, zainabnasser1989@gmail.com**

ABSTRACT:
The present study was performed to estimate some physiological parameters in patients with asthma, as well as the correlation between this disease and sex in three age groups. This work was applied on 59 asthmatic patients (23 male and 36 female) and 30 apparently healthy subjects (14 male and 16 female) as control group. The study reveals that the level of estradiol was increased significantly (P< 0.05) in females compared with males, while there has been a raise in the level of estradiol of patient in the age groups (1-10), (11-20), and (31- 40) years in comparison with the with the categories (21-30) and (> 50), in addition, there was higher increase in its level through the duration of the most illness than ten years, while the results of the study presented a clear difference (P< 0.05) in the RBCs count of males with asthmatic compared to females. The data also displayed an obvious difference (P< 0.05) in the platelets of patient males compared with healthy males, there is an increase (P< 0.05) in the means of PCV and Hb in the age group (> 50) in contrast with (1-10), (11-20) (21-30) and (31-40) groups, the results showed a significant variance in the platelets count between patients and healthy in the age group (1-10) as well as, there was a significant variance in the mean of RBCs count, PCV and Hb in the duration of illness > 10 years compared with the duration of the illness (1-5) years and (6-10) years.

KEYWORDS: Estradiol, Asthma, Hb, PCV, RBC.

INTRODUCTION:
Asthma is a diversified factors disease that is affected by the interaction between environmental factors and genetic [1]. This disease can affect about 155 million people around the world. Despite the fact that asthma affects people of different ages, it most often in childhood, more males have asthma than females, but in adulthood more females have asthma than males [2]. Serious factors of asthma include the existence of allergen–specific immunoglobulin E (IgE), obesity, viral respiratory illness, cigarette smoking, exposure aeroallergens and low socioeconomic status [3]. Some studies have shown that the physiological concentrations of estradiol (E2) stimulate or inhibit mast cell degranulation [4,5]. Furthermore, pre-incubation cells containing physiological concentrations of E2 showed an increase in stimulation and release of histamine by cross-linking the surface of IgE with antibodies [6,7]. The increased incidence of asthma in the last few years has led to attention to some of the different aspects, including those related to hormones [8,9]. It has been described that both endogenous and exogenous sex hormones lead to the possibility of asthma in young women [10]. Progesterone and estrogen are known to reduce the contraction of smooth muscles in the airway, and their positive effect with asthma is linked to their effect on the immune system [11]. IL-4 production is stimulated by progesterone and T helper 2 (Th2) differentiations is promoted [12], while estrogen increased production of TNF-α and IL-4, and thus enhance the migration of eosinophil during allergic inflammation [13]. Therefore, this study aims to infer the correlation between estradiol and some hematological parameters with asthma patients in both sexes and in different age groups.

Subjects and Materials:

This study was applied on 59 asthmatic patients (23 males and 36 females) admitted to the maternity and pediatrics hospital, the center of asthma and allergyas in Babylon province, Iraq, and 30 subject (16 females and 14 males) healthy without symptom selected as control group. For comparison, the cases were divided into six age categories: (1-10), (11-20), (21-30), (31-40), (41-50) and (>50) years. Furthermore, they were divided into three categories according to the duration of disease: (1-5), (6-10) and (>10) years. Where it was estimated the platelets and RBCs count were done according to the [14], the percentage of PCV were measured according to [15]. The concentration of Hb was estimated according to [16] and the measure the concentration of estradiol by ELISA the materials that were used in this research is the Kit for company DRG (German).

Statistical Analysis:

Statistical system SPSS version -18 (LSD testing) was used to analyze the results.

RESULTS:

There was a significant reduction ($P < 0.05$) in estradiol concentration of female patients compared with healthy females in the control group, while there were no significant differences between patients and healthy males. In Figure (1) the results show a significant increase in estradiol concentration in female patients compared with males.

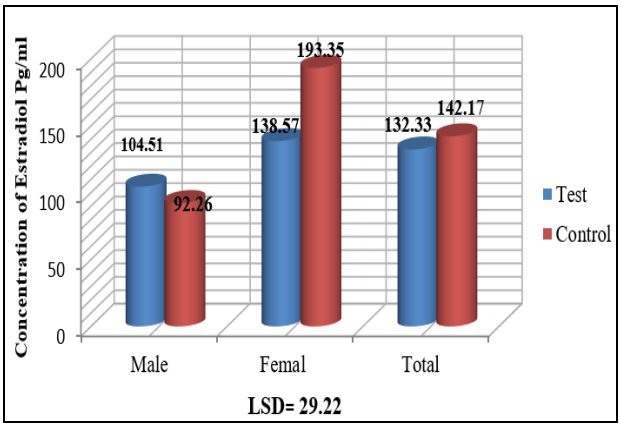

Figure (1) The concentrations differences of estradiol (pg\ml) in asthmatic patients

Table (1) shows a clear difference ($P<0.05$) in the RBCs count between males with asthmatic compared to females. The data also reveals an obvious difference ($P<0.05$) in the platelets male patients compared with healthy males.

Table (1) Means of RBCs, PCV, Hb and Platelets in patients with asthma.

Parameter Category	RBCs10^6 cell/µl Mean±S.E	PCV % Mean±S.E	Hb g/dl Mean±S.E	Platelets10^3/µl Mean±S.E
Male N=23	5.03± 0.16	40.49±0.81	13.51±0.32	322.60±25.90
Female N=36	4.53± 0.08	39.08±0.62	13.11±0.23	303.97±13.67
Male C N=14	5.41± 0.23	44.55±1.09	14.86±0.38	259.92±20.28
Female C N=16	4.57± 0.09	38.54±0.38	12.78±0.14	310.93±22.88
Total N=89	4.88± 0.07	40.21±0.42	13.43±0.15	303.11±10.17
LSD	**0.47**	**3.24**	**1.11**	**32.50**

Male C (Male control), Female C (Female control)

The results showed an obvious difference ($P < 0.05$) in the level of estradiol of patients in the age groups (1-10), (11-20), and (31-40) years compared to age groups (21-30) and (>50), while there were no clear differences between patients and healthy control group as shown in Figure (2).

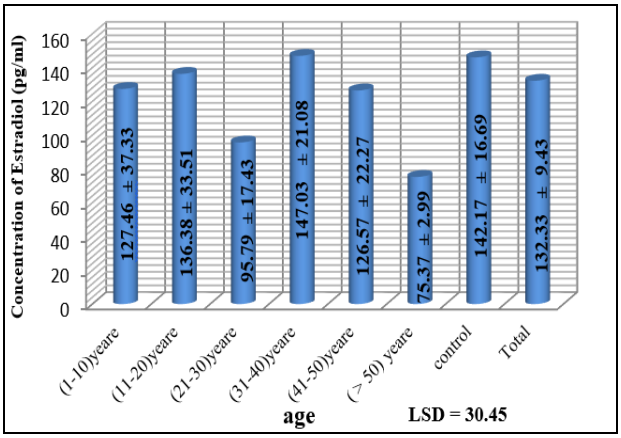

Figure (2): The Level of estradiol (pg\ml) for asthmatic patients in different age groups.

The results reveal that the RBCs count has a clear differences ($P<0.05$) in the age groups, (41-50) and (>50) compared with the age groups (1-10), (11-20) (21-30) and (31-40), while there was a significant increase in the means of PCV and Hb in the age group (>50) in contrast with (1-10), (11-20) (21-30) and (31-40) groups. Otherwise, an apparent difference in the platelets count between patients and healthy in the age group (1-10), while there was a decrease in the mean of RBCs count, PCV and Hb in the age group (1-10) see Table (2).

Table (2) Means of RBCs, PCV%, Hb and Platelets for asthmatic patients in different age groups.

Parameter category (years)	RBCs 10^6cell/µl)(Mean±S. E	PCV % Mean±S.E	Hb (g/dl) Mean±S.E	Platelets 10^3/µl)(Mean±S. E
N=6 1-10)(	4.44±0.14	34.60±1.40	11.68±0.56	468.0±60.17
(11-20) N=8	4.77±0.11	38.80±0.70	13.12±0.22	343.0±21.32
(21-30) N=6	4.73±0.15	39.76±1.28	13.21±0.44	301.66±55.50
(31-40) N=16	4.66±0.14	39.51±0.91	13.35±0.38	272.50±14.61
(41-50) N=18	5.06±0.19	40.54±0.92	13.38±0.38	299.16±14.05
> 50) N=5(	5.13±0.21	42.60±0.62	14.42±0.27	242.40±43.07
Control N=30	4.95±0.13	41.34±0.77	13.75±0.27	287.13±15.90
TotalN=89	4.88±0.07	40.21±0.42	13.43±0.15	303.11±10.17
LSD	**0.29**	**2.72**	**0.89**	**80.32**

Figure (3) illustrates an obvious increase (P<0.05) in the estradiol level of in asthmatic patients during the period of illness (>10) years compared with other durations.

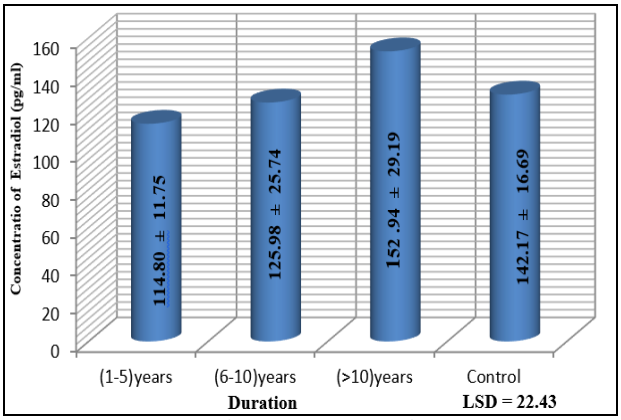

Figure (3) The Level of estradiol (pg\ml) for asthmatic patients during the duration of illness.

In Table (3) the results indicate that there was a clear difference in the mean of RBCs count, PCV and Hb in the duration of illness > 10 years compared with the duration of the illness (1-5) years and (6-10) years. The study also showed a considerable difference in the platelets count in the duration of illness (1-5) years compared with other duration of illness.

Table (3) Means of RBCs, PCV, Hb and platelets for asthmatic patients during the duration of illness.

parameter duration of illness (years)	RBCs(10^6 /µl) (Mean±S. E	PCV % Mean±S .E	Hb (g/dl) Mean±S .E	Platelets (10^3/µlMean±S.E
1-5) N=35 (	4.70±0.09	39.29±0. 67	13.16±0. 25	322.28±1 9.35
(6-10) N=11	4.44±0.12	38.01±0. 72	12.74±0. 32	291.27±2 6.44
(>10) N=13	5.18±0.20	41.90±1. 01	14.0±0.4 0	298.38±1 7.28
Control N=30	4.95±0.13	41.34±0. 77	13.75±0. 27	287.13±1 5.90
LSD	**0.39**	**2.29**	**0.72**	**18.76**

DISCUSSION:

Asthma and other type's allergic diseases are more widespread (more than three times) in female than male through early to middle adulthood [17,18]. The results appeared a significant increase in estradiol concentration in female patients compared with males, while there has been an increase in the level of estradiol of patient in the age groups (1-10), (11-20) and (31-40) years in comparison with the with the categories (21-30) and (>50), in addition, there was higher increase in its level during the period of the most illness than ten years. The 17-β-estradiol (17-β-E2) activate human mast cell lines give rise to release of beta-hexosaminidase (a marker for the granules containing preformed allergic mediators) and moreover promote the synthesis and liberation of leukotriene C4 [19,20]. Although female hormones have been distinguished to play an important role in respiratory health. [21] In addition, some studies have found that early menarche to be associated with the risk of adult asthma [22, 23], while the study Jartti *et al* in 2009 [24] reported that there was no association. Moreover, estradiol and progesterone are female sex hormones have been suggested to stimulate mast cell [25,26,27]. a study discovered more than that implicated low estradiol in asthma. In one experimentation on human lung tissue samples, the existence of estradiol low airway inflammation after exposition to asthma triggers. [28] Another study showed that asthmatic male mice treated with estrogen had lower lung inflammation than other infected mice. While the study [29] found that estrogen reduces intracellular calcium in the airway smooth muscle, causing bronchodilation, or relaxation of these tissues, which is a positive effect. [30] In contrast to human data, in animals the relationship between estrogen and asthma is the opposite. Estrogen appears to protect against airway hyperresponsiveness in mice [31,32] while progesterone increases allergic airway disease [33].

The results of the present study showed a clear difference (P<0.05) in the RBCs count among asthmatic males compared to females. An obvious difference (P <0.05) in the platelets of male patients compared to healthy males. The data showed that there was an apparent increase (P<0.05) in PCV and Hb in the age group (> 50) compared with (1-10), (11-20) (21-30) and (31-40) groups. The results showed a considerable difference in the platelets count between patients and healthy people in the age group (1-10). Part of the

platelet aggregates in asthma patients has a much lower survival time. New observation also suggests severe thrombocytopenia in people with allergic asthma [34], but these findings are inconclusive, as other reports show no reduction in platelet survival time and no evident platelet sequestration in the pulmonary microvasculature [35,36]. This study does not correspond to our study, where it was found that the observed reduction in RBCs, PCV, Hb and the level of oxygen (hypoxia) in lung tissue is a known phenomenon through allergenic attack [37]. This demand promotes the supply of oxygen to lung tissue to repair injuries [38,39] Another study noted that the reduction in RBCs count, hemoglobin concentration, and hematocrit (PCV) was associated with the exposure of particulate in humans. Sub-chronic inhalation toxicity of soluble hexavalent chromium trioxide in rats showed the reduction of in RBCs count and hematocrit (PCV) values [40]. Who reported decreased RBCs, platelets count, hemoglobin concentration, hematocrit after exposure to concentrated ambient particles. As noted in various studies, the common risk factors for the expansion of pulmonary diseases include, hemoglobin decrease, the degree of anemia and the number of stable white blood cells [41]. More recently, [42] low levels of hemoglobin and white blood cells have been found to be elevated among children with asthma compared with healthy children. The results of the other study confirm that patients with asthma may suffer from anemia. The factors associated with this deterioration in asthma during the premenstrual phase are unclear. It has been associated with psychological factors such as decreased resistance to stress and inflammation or increased bronchial hyperactivity [43].

REFERENCES:

1. Tollefsen E, Langhammer A, Romundstad P, Bjermer L, Johnsen R and Holmen TL. Female gender is associated with higher incidence and more stable respiratory symptoms during adolescence .Respir. Med, 2007; 101:896-902.
2. Cengizlier MR and Misirlioglu ED. Evaluation of risk factors in patients diagnosed with bronchial asthma. Allergol. Immunopathol .2006 (Madr); 34(1): 1-3 .
3. Zhang Z, Lai HJ, Roberg KA, Gangnon RE, Evans M D, Anderson E L and *et al* . Early childhood weight status in relation to asthma development in high –risk children .J. Allergy. Clin. Immunol, 2010; 126 (6): 1157 -62.
4. Vliagoftis H, Dimitriadou V, Boucher W, Rozniecki JJ, Correia I, Raam S and Theoharides T C . Estradiol augments while tamoxifen inhibits rat mast cell secretion. Int. Arch. Allergy Immunol., 1992; 98 (4): 398-409.
5. Spanos C, Mansoury M, Letourneau R, Minogiannis P, Greenwood J, Siri P, Sant GR. and Theoharides TC. Carbachol-induced bladder mast cell activation: augmentation by estradiol and implications for interstitial cystitis. Urology, 1996; 48 (5): 809-816.
6. Cocchiara R, Albeggiani G, Di Trapani G, Azzolina A, Lampiasi N, Rizzo F. and Geraci D. Modulation of rat peritoneal mast cell and human basophil histamine release by estrogens. Int. Arch. Allergy Appl. Immunol., 1990; 93 (2-3): 192–197.
7. Cocchiara R, Albeggiani G, Di Trapani G, Azzolina A, Lampiasi N, Rizzo F, Diotallevi L, Gianaroli L. and Geraci D. (1992). Estradiol enhances *in vitro* the histamine release induced by embryonic histamine-releasing factor (EHRF) from uterine mast cells. Hum. Reprod. , 1992; 7 (8): 1036-1041.
8. Lange P, Parner J, Prescott E, Ulrik CS and Vestbo J. Exogenous female sex steroid hormones and risk of asthma and asthma-like, symptoms: a cross sectional study of the general population. Thorax, 2001; 56:613–662.
9. Faschino Barbaro MP, De Tullio R, Cagnazzo M G, Depalo A, Carpagnano G E, Spanevello A and *et al*. Asthma and the menopause. Ageing Lung. 2006; 1:13–19.
10. Salam MT, Wenten M and Gilliland FD. Endogenous and exogenous sex steroid hormones and asthma and wheeze in young women .J. Allergy Clin. Immunol. 2006; 117:1001-1007.
11. Haggerty CL, Ness RB, Kelsey S and Waterer GW. The impact of estrogen and progesterone on asthma. Ann. Allergy Asthma Immunol., 2003; 90:284- 291.
12. Piccinni M P, Giudizi M G, Biagiotti R, Beloni L, Giannarini L, Sampognaro S, Parronchi P, Manetti, R, Annunziato F and Livi C. Progesterone favors the development of human T helper cells producing Th2-type cytokines and promotes both IL-4 production and membrane CD30 expression in established Th1 cell clones. J. Immunol., 1995 ; 155:128–133.
13. De Oliveira AP, Domingos HV, Cavriani G, Damazo AS, Dos Santos Franco AL, Oliani SM, Oliveira-Filho R M. and Vargaftig BB. Cellular recruitment and cytokine generation in a rat model of allergic lung inflammation are differentially modulated by progesterone and estradiol. Am. J .Physiol. Cell Physiol. 2007; 293:C1120–C1128.
14. Dacie JV and Lewis S M. Practical Hematology. 9thedn. 2001 ; 353-357.Churchillivingstone, London ,UK.
15. Hillman R S and Ault KA. Hematology in Clinical Practice. 3thedn. 2002; 46-47. McGram-Hill Company.
16. Rodak SB. Hematology Clinical Principles and Applications. 2ndedn., 2002; W.B. Saunders Company.
17. De Marco R, Locatelli F, Cerveri I, Bugiani M, Marinoni A. and Giammanco G. Incidence and remission of asthma: a retrospective study on the natural history of asthma in Italy. J. Allergy Clin. Immunol. 2002; 110 (2): 228-235.
18. Schatz M and Camargo CA Jr. The relationship of sex to asthma prevalence, health care utilization, and medications in a large managed care organization. Ann. Allergy Asthma Immunol., 2003 ; 91 (6): 553-558.
19. Zhao XJ, McKerr G, Dong Z, Higgins C A, Carson J, Yang ZQ. and Hannigan BM. Expression of estrogen and progesterone receptors by mast cells alone, but not lymphocytes, macrophages or other immune cells in human upper airways. Thorax. 2001; 56 (3): 205-211.
20. Narita S, Goldblum R, Watson C, Brooks EG, Estes DM, Curran EM and Midoro-Horiuti T. Environmental estrogens induce mast cell degranulation and enhance IgE-mediated release of allergic mediators. Environ. Health Perspect., 2007; 115 (1): 48-52.
21. Real FG, Svanes C, Omenaas ER, Anto JM, Plana E, Jarvis D and *et al*. Lung function respiratory symptoms, and the menopausal transition. J .Allergy Clin. Immunol. , 2008; l (121):72–80.
22. Macsali F, Real FG, Plana E, Sunyer J, Anto J, Dratva J, Janson C, Jarvis D, Omenaas ER, Zemp E, Wjst M, Leynaert B . and Svanes C. Early age at menarche, lung function, and adult asthma. Am. J. Respir. Crit. Care Med. 2011; 183:8–14.
23. Al-Sahab B, Hamadeh MJ, Ardern C I and Tamim H. Early Menarche Predicts Incidence of Asthma in Early Adulthood. Am. J. Epidemiol., 2011;173:S293–S293.
24. Jartti T, Saarikoski L, Jartti L, Lisinen I, Jula A, Huupponen R, Viikari J and Raitakari OT. Obesity, adipokines and asthma. Allergy, 2009; 64:770–777.
25. Jensen F, Woudwyk M, Teles A, Woidacki K, Taran F., Costa S., Malfertheiner, S.F., and Zenclussen, A. C. Estradiol and progesterone regulate the migration of mast cells from the peripherytothe uterus and induce their maturation and

degranulation. PLoSONE. 2010; 5, e1 4409. doi:10.1371/journal.pone. 0014409
26. Jing H, Wang Z and Chen,Y. Effect of estradiol on mast cell number and histamine level in the mammary glands of rat. Anat.Histol. Embryol, 2011; 41, 170–176.
27. Walter J, Klein C and Wehrend A. Distribution of mast cells in vaginal, cervical and uterine tissue of non-pregnantmares: investigations on correlations with ovarian steroids. Reprod. Domest. Anim. 2011 ;47, e29–e31.
28. Freeman M R, Manlove L J, Thompson M A, Pabelick C M, Prakash Y S, and Sathish V. Estrogen Receptor Beta (erβ) Blunts Inflammation-Induced Human Airway Smooth Muscle Proliferation And Remodeling. Am J Respir Crit Care Med, 2014;189, A5318.
29. El-Desouki N I, Tabl G A and Elkhodary Y A. Biological studies on the effect of estrogen on experimentally induced asthma in mice. Toxicology and industrial health, 2013, 0748233713486959.
30. Townsend E A, Sathish V, Thompson M A, Pabelick C M, and Prakash Y S. Estrogen effects on human airway smooth muscle involve cAMP and protein kinase A. American Journal of Physiology-Lung Cellular and Molecular Physiology, 2012; 303(10), L923-L928.
31. Dimitropoulou C, White RE, Ownby DR and Catravas JD. Estrogen reduces carbachol-induced constriction of asthmatic airways by stimulating large-conductance voltage and calcium-dependent potassium channels. Am J Respir Cell Mol Biol. 2005;32:239–247.
32. Matsubara S, Swasey CH, Loader JE, Dakhama A, Joetham A, Ohnishi H, Balhorn A, Miyahara N, Takeda K and Gelf EW. Estrogen determines sex differences in airway responsiveness after allergen exposure. Am J Respir Cell Mol Biol. 2008; 38:501–508.
33. Hellings PW, Vandekerckhove P, Claeys R, Billen J, Kasran, A and Ceuppens, J.L. Progesterone increases airway eosinophilia and hyper-responsiveness in a murine model of allergic asthma. Clin Exp Allergy. 2003;33:1457–1463.
34. Sullivan PJ, Jafar ZH, Harbinson PL, Restrick LJ and Costello JF, Page CP. Platelet dynamics following allergen challenge in allergic asthmatics. Repir 2000;67:514–517.
35. Ind PW, Peters AM, Malik F, Lavender JP and Dollery CT. Pulmonary platelet kinetics in asthma. Thorax 1985;40: 412–417.
36. Hemmendinger S, Pauli G, Tenabene A, Pujol JL, Bessot JC, Eber M and Cazenave JP, Platelet function: Aggregation by PAF or sequestration in lung is not modified during immediate or late allergen-induced bronchospasm in man. J Allergy Clin Immunol 1989; 83:990–996.
37. Fajardo I, Svensson L, Bucht A and Pejler G. Increased levels of hypoxiasensitive proteins in allergic airway inflammation. Am J Respir Crit Care Med 2004;170(5):477–84.
38. Saito H, Yamagata T and Suzuki S. Enzymatic methods for the determination of small quantities of isomeric chondroitin sulfates. J Biol Chem 1968;243(7):1536–42.
39. Seaton A, Soutar A, Crawford V, Elton R, McNerlan S and Cherrie J. Particulate air pollution and the blood. Thorax, 1999; 54:1027-1032.
40. Bai KM, Krishnakumari MK, Ramesh HP, Shivanandappa T, and Majumder SK. Short-term toxicity study of zinc phosphide in Albino rats (*Rattusnorvegicus*). Indian J. exp. Biol. 1980; 18(8): 854-857.
41. Quinn CT. The acute chest syndrome of sickle cell disease. J. Pediatr., 1999; 135: 416-422.
42. Jessica HB, Eric AM, Robert CS and Michael RD. Asthma is associated with acute chest syndrome and pain in children with sickle cell anemia. Blood, 2006 108: 2923-2927.
43. Dratva J, Schindler C, Curjuric I, Stolz D, Macsali F, Real-Gmez F, et al., . on behalf of the SAPALDIA Team. Perimenstrual increase in bronchial hyper-reactivity in premenopausal women: results from the population-based SAPALDIA 2 cohort. J. Allergy Clin. Immunol. , 2010; 125:823-9.