

Evaluation of the Role of Eosinophil Cells, IGE Antibodies, Prostaglandin E2, and Leukotriene B4, in the Pruritus of Scabies

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ABSTRACT

The pruritus of scabies are an allergic reaction to the mites. IgE, and eosinophils are essential components of allergic inflammation. In this study showed a high significant correlation between the prostaglandin E2 (PGE2) and leukotriene B4 (LKB4) concentration of scabies patients vs the healthy persons. In scabies group patients the PGE2 was (409±184), while in control group the PGE2 was (80.65±17.9) and in scabies patients LKB4 was (322±149) while in control group was (551±43), with high significant relation ($P < 0.05$), for both parameters. The relationship between PGE2 and LKB4 is a reverse relationship that when the PGE2 concentration was rises, the LKB4 concentration falls in plasma samples, during the scabies infection

The elevated in IgE and Eosinophil cell together in scabies disease, at high significant correlation between the eosinophil cell and IgE antibody levels of scabies patients vs the healthy persons ($P < 0.001$).

Keyword : Prostaglandin E2, leukotriene B4, IgE, eosinophil, scabies.

INTRODUCTION

The ancestral origin of the sarcoptic mite is not known, which parasitizes human beings and many mammal families. Similarly, how long ago coevolved. It is unclear how *S. scabiei* originated with particular host mammals and how it has evolved over time. Nevertheless, the use of molecular and genomic details can be explained in time by acarologists and mammalogists¹ If you have never experienced scabies before, you can experience symptoms for as long as 4-6 weeks. Symptoms typically occur earlier after the exposure (1-4 days) due to hypersensitivity in a person who had previous scabies.² Depending on temperature and moisture the time of survival is different. Mites only live on dry surfaces, robes and bedding for a couple of hours.

The life expectancy of the mite can increase to 3-4 days under ideal temperatures and humidity conditions.³ Pruritus may be described as a discomforting feeling, evoking a desire to scratch,⁴ And it's a filthy discourager which universally infests the outside part of the body, but more especially the joints, and between your fingers, usually by scratching the skin with pustules⁵ The mite *Sarcoptes scabiei* is causes the scabies. The principal signs of scabies are pruritus, that result of a hypersensitive response to sperm, saliva and fecals of mite components.⁶ In addition, subsequent extoriation can lead to a bacteria entry point and so pyoderma is a common scabies complication⁷. However, the clinical features of pruritus were not studied in scabies. The subjective essence of itch is difficult to quantify⁸. The pathophysiology of scabetics does not

exist, and the molecular mechanisms connecting scabie and itch are still poorly understood. Better awareness as to how Scabies' Infestation leads to itching will help control it better in the near future and encourage tailored and effective care⁹. Eicosanoids are formed by arachidonic acid as a signaling molecules via enzymatic or non-enzymatic oxidation. They are important for a number of physiological and disease circumstances such as cell formation, inflammation control and immune response regulation. There are several subfamilies of resolvins, leukotrienes, lipoxins, prostaglandins, thromboxane's and eoxins. There are also eicosanoids. LTs are the most popular regulators of pruritus modulation¹⁰. The PGE2 (molecular mass of 352 Da) has been shown to regulate multiple inflammatory aspects and functions of different immune cells, which were recognized as biologically active in the 1960s.¹¹ Although it was generally recognized as an active inflammatory facilitator, the local vasodilation and attraction of locally and the activation of neutrophil, macrophagic and mastcell in the initiation phases of the of inflammation¹². Leukotriene B4 is a pro-inflammatory mediator synthesized with arachidonic acid in myeloid cells. Synthesis is catalyzed by 5-lipoxygenase and A4 hydrolase leukotriene and stimulated by inflammatory mediators including complement fragments, endotoxin, interleukins and tumor necrosis factor. A 5-lipoxygenase activating protein, the nuclear membrane protein, is an essential 5-lipoxygenase co-factor. Leukotriene B4 allows neutrophils, single cells and eosinophils to be recruited and activated. It also stimulates the development of several pro-inflammatory cytokines and mediators which show that tissue inflammation can increase and continue.¹³

IgE is essential for host defense against a variety of parasites and is an integral element in the allergic and parasite inflammation along with mast cells, basophils and eosinophils. In people, earlier studies showed that scabies produce more circulating IgE anticuerpos, but that their results differ widely.¹⁴ In addition, eosinophilia is also found in inflammatory sites associated with these diseases and the total IgE in OS patients was increased,¹⁵ in recent studies. In high numbers, eosinophils are created by allergic

inflammation and Helminth infection.¹⁶ The history of 25 skin biopsies showed that dermal eosinophils are present in 22 patients, of which 68% were eosinophils numerous and twenty percent showed few eosinophils¹⁷. CS revealed significant numbers of dermatic eosinophils in skin biopsy sections in two patients¹⁸, and 58 percent of the peripheral eosinophilic cohort of CS patients¹⁹ were registered. The expression of Th2 unique cytokines was demonstrated in eosinophils. IL-5 contributes to the attraction, activation and maturation of eosinophils and their production may be an independent mechanism to enhance their recruitment and survival²⁰. The presence and the ability of eosinophils in CS to express Th2 cytokines²¹ indicate that these granulocytes can modulate or maintain local Th2 inflammatory responses themselves.²²

MATERIAL AND METHODS

Study subjects:-

This study was conducted in dermatological consultations at Marjan Specialized Hospital, Imam Sadiq Hospital, Prisons and Health Centers in Babil Governorate from July 2019 to December 2019. All patients had clinical symptoms of scabies.

Patient groups:-

From a total 325 skin scraping routine KOH mount samples from scabies patients, only 40 patients was positive by skin scraping for detection the causative agent *Sarcoptes scabiei* mite under microscope, all 40 patients group have a symptoms of scabies. their ages were ranged from 8 – 63 years.

Control groups:-

Twenty healthy people were selected as a control group and they do not have a history of scabies.

Blood sample collection :-

Blood samples:

Five ml of blood sample was obtained from each patient by vein puncture using syringe with needle gauge 23, two ml transported to a non heparinized blood collecting tube and then centrifuged at 1800 XG to separate serum then labeled and stored at -20 c° until used, nopreservative was added. The other 2 ml were transported to heparinized (20 U of heparin / ml) vacutainer tube then used for plasma

collection.all samples were kept at -20°C until preparation for analysis.

STATISTICAL ANALYSIS

Statistical analysis was done according to percentages to compare between samples using SPSS V.25 computer software

THE RESULTS

Forty patients with a history of scabies with age range 6-60 years and 20 healthy person as a control group with age range 6-63 years were involved in this study as in Table (1).

Table (1) distribution of the age groups of control and scabies patients.

			Age				Total
			< 10 years	10 -19 Years	20 -29 Years	> 30 Years	
disease	patients	Count	10	11	16	3	40
		%	83.3%	73.3%	69.6%	30.0%	66.7%
	Control	Count	2	4	7	7	20
		%	16.7%	26.7%	30.4%	70.0%	33.3%
Total		Count	12	15	23	10	60
		%	100%	100%	100%	100%	100%

The table (1) showed the age group < 10 years have a high percentage 83.3 % among other groups. We can attribute that to the lack of personal hygiene of children and the low of immunity they have, in addition to that, that children exchange clothes between them, and this increases their incidence of scabies disease. Then the age group 10-19 years have 73,3% because this age group is within the stages of the school years and there is a school mixing between the infected and the healthy persons .69.6% of 20-29 years age group, this percentage increases between the explanation of university students, especially the residence of the internal departments in which they share clothes and sheets. In addition to this, the lack of ventilation and the sun entering the students' room

Evaluation of the role of Prostaglandin E2 (PGE2) and leukotriene B4 (LKB4) in scabies pruritus.

The result of the Prostaglandin E2, leukotriene B4 , IgE antibody , and eosinophil cell count were showed a significant increase in scabies patients when compared to the control group, except in LKB4 , as shown in the figure (1,2).

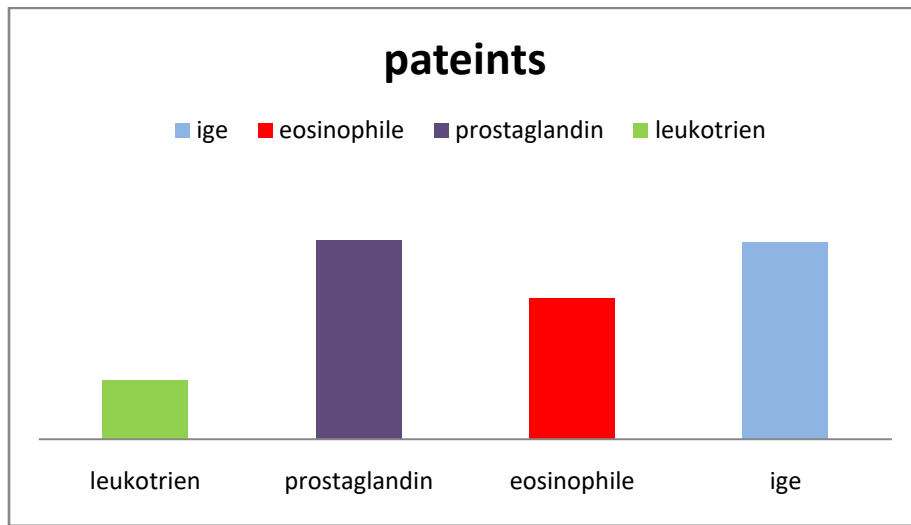


Figure (1): the activation of immunologic parameter (PGE2, LKB4, IgE, Eosinophil cells count) in scabies patients.

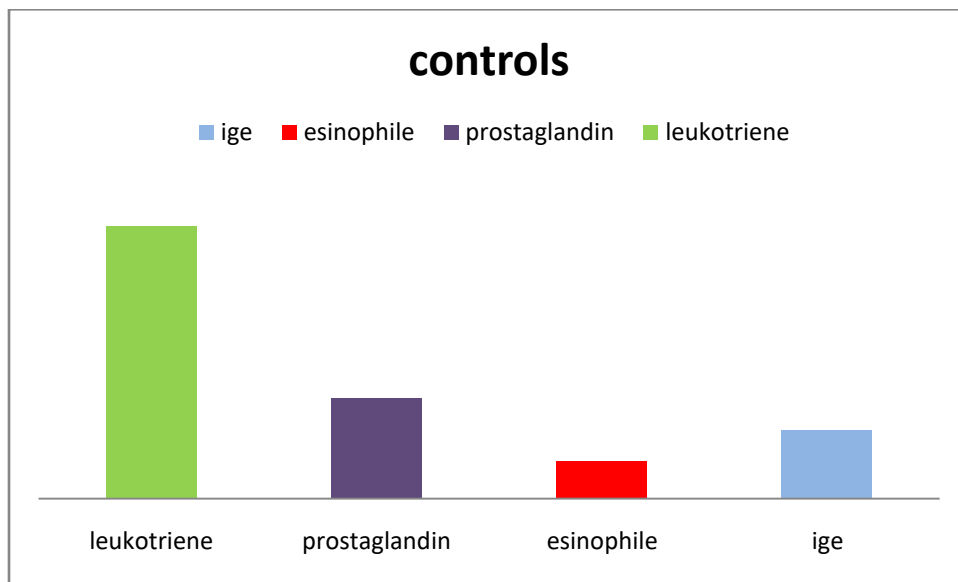


Figure (2): the normal activation of immunologic parameter (PGE2,LKB4,IgE,Esinophil cells count) in healthy persons .

Table (2): Descriptive statistics of the(PGE2 and LKB4) variables in the studied groups

Variable	Scabies group (n = 40) Mean±SD	Healthy control group (n =20) Mean±SD	p-value
PGE2	409±184	80.65±17.9	0.001
LKB4	322±149	551±43	0.001

P<0.001 is highly significant by chi squire

The table (2). showed a high significant correlation between the PGE2 and LKB4 concentration of scabies patients vs the healthy persons. In scabies group patients the PGE2 was (409±184), while in control group the PGE2 was (80.65±17.9) and in scabies patients LKB4 was (322±149) while in control group was (551±43), with high significant relation ($P < 0.05$), for both parameters

The relationship between PGE2 and LKB4 is a reverse relationship that when the PGE2 concentration was rises, the LKB4 concentration falls during the scabies infection.

Evaluation of the role of IgE antibody and eosinophil cells in scabies pruritus.

The table (3). showed a high significant correlation between the eosinophil cell and IgE antibody levels of scabies patients vs the healthy persons. In scabies group patients the eosinophil level was (10.02±3.96) while in control group was (1.37±0.82) with high significant relation ($P < 0.05$). In scabies group patients the IgE level was (326.41±180.22) while in control group was (65.25±83.56) with high significant relation ($P < 0.05$).

The relationship between eosinophil and IgE is a direct relationship that rises together, especially during the onset of scabies infection as a result of an allergic reaction to the mites or one of its wastes.

Table (3): Descriptive statistics of the (IgE, Eosinophil cell) variables in the studied groups.

Variable	Scabies group (n = 40) Mean±SD	Healthy control group (n =20) Mean±SD	p-value
Eosinophil (%)	10.02±3.96	1.37±0.82	0.001
Serum IgE (IU/ml)	326.41±180.22	65.25±83.56	0.001

$P < 0.001$ is highly significant by chi square

THE DISCUSSION

The results of this study indicated a significant increase in eosinophil cell count because the infection with this ecto-parasite causes stimulation immune system of host humeral and cellular. The results conducted eosinophilia associated with patients who suffering from *S. scabiei* infection. The reason for this observation maybe attributed to allergy disorder which is one of symptoms of *S. scabiei* infection and may be due to cellular respond due to the parasite infestation.

The elevated in circulating IgE antibodies that's bound to the Fc receptor on the mast cell, that lead to initiates the signaling pathway that leads to degranulation of mast cells following binding of allergen to the IgE molecule on the mast cell surface.

However, the prostaglandin and leukotriene are responsible for allergic symptoms, the elevated of prostaglandin are released from mast cells and

neutrophil cells during degranulation and the breakdown of the plasma membrane phospholipids in scabies patients, and the decrease in leukotrienes levels in patients blood due to the local skin release of mast cell granula which may not be detected in peripheral blood. The increased number of skin mast cells in patients suffering from scabies pruritus were decreased when compared to those of healthy controls. Once mast cells degranulated, the symptoms associated with an allergic reaction such as vascular dilation (redness), edema (loose tight junctions that result in fluid escape from the capillary), and pruritus (itching) become evident. These are explanations of all symptoms of ordinary scabies disease.

CONCLUSION

Pruritus has been studied for scabies through the role of some immune mediator in its mechanisms on the one hand and the possibility of selecting it as diagnostic parameters on the other hand. In the pruritus study, Prostaglandin E2, leukotriene B4

(lipid mediator), IgE antibody, and eosinophil cell count were have an effective role in itching for scabies patients, as the results gave significant

differences between the patients group and the control group.

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