Benha Journal of Applied Sciences (BJAS) **print : ISSN 2356–9751**
Vol.(5) Issue(2) Part (2) (2020), (263-266) **online : ISSN 2356–976x**
http://bjas.journals.ekb.eg

Serum Galectin-3 and its Relation to Insulin Resistance in Patients with Acne Vulgaris

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Abstract

Acne vulgaris is one of the most prevalent inflammatory skin diseases. It is particularly prevalent during the late adolescent period. It is a chronic skin disease of the pilosebaceous unit and develops due to blockages in the skin's hair follicles. to evaluate serum galectin-3, fasting insulin and fasting blood glucose levels in patients with AV, assessment of its clinical significance, relation to severity of AV and its relation to Insulin resistance (IR)**.** This study included 60 patients suffering from AV. In addition to 20 apparently healthy individuals of matched age and sex as a control group. All studied individuals were subjected to complete history taking and complete clinical examination. there was a statistically significant difference regarding the serum galectin-3and HOMA-IR values between studied patients and control groups. HOMA-IR levels were higher in patients than controls, which indicate presence of IR in AV patients more than the controls. Besides, HOMA-IR levels were higher in severe AV than mild or moderate AV. Regarding serum galectin-3 level; it was significantly higher in AV patients than controls**.** IR is more common among AV patients especially in patients with severe AV lesions and that could be explained by higher serum galectin-3 level in those patients. Since acne is a problem in adolescents, the early recognition of IR might help in better management of acne patients.

Keywords: Galectin-3, Insulin Resistance, Acne Vulgaris.

1. Introduction

Acne vulgaris (AV) is a chronic inflammatory disease of the pilosebaceous unit (PSU) characterized by seborrhea, formation of comedones, erythematous papules, and pustules and less frequently by nodules, deep pustules, or pseudocysts. The formation of microcomedo requires complex interplay of altered follicular keratinization, hyperplasia of sebaceous glands, and over colonization of sebaceous glands with propionibacterium acne (P. acne) [1]

AV is a multifactorial disease in which several factors have been implicated, including hormonal effects, follicular hyperkeratinization, proliferation of propionibacterium acne, inflammatory, environmental and genetic factors. Inflammation plays a main role in the development of acne vulgaris [2].

Acne can be related to some endocrine diseases; the most common of these diseases in females are polycystic ovary disease, metabolic abnormalities, including glucose intolerance and lipid abnormalities, all of which confirm the systemic nature of the disease [3].

Studies have shown a relationship between acne and nutritional factors. These studies suggest that high-glycemic-load diets and milk consumption; in particular; might promote the development or exacerbation of acne vulgaris [4].

Some studies suggest that a high-glycemic-index diet induces hyperinsulinemia, which subsequently elicits endocrine responses and enhances androgen synthesis, ultimately affecting the development of acne through mediators such as androgens, insulin like growth factor (IGF)-1, and IGF binding protein (IGFBP)-3.While, low-glycemic-load diet results in improvement in acne severity and insulin sensitivity, as expressed by the homeostasis model assessment of insulin resistance (HOMA-IR), suggesting that nutrition-related lifestyle factors might play a role in the pathogenesis of acne [3].

Galectin-3 (Gal-3) is a lectin with predominantly pro-inflammatory activities that can also stimulate adipocyte proliferation. It is also a β-galactoside binding protein, but only some of its functions are related to its lectin activity. This protein interferes with cell adhesion, proliferation, differentiation, and angiogenesis, but its biological role has not been elucidated so far [5].

Galectin-3 activity may depend on its cellular localization, and galectin-3 in intracellular compartments protects from cell death, whereas extracellular galectin-3 stimulates apoptosis. It was suggested that galectin-3 may also participate in the development of obesity and type 2 diabetes. Levels of circulating galectin-3 have been shown to correlate positively with age, prevalence of obesity, diabetes, hypercholesterolemia, and hypertension [6].

The aim of the present study was to evaluate serum galectin-3, fasting insulin and fasting blood glucose levels in patients with AV, assessment of its clinical significance, relation to severity of AV and its relation to IR.

2. Patients and methods

This case-control study was conducted on 60 patients suffering from AV (Group A) and 20 apparently healthy individuals of matched age and sex as a control group (Group B). Patients were recruited from the outpatient clinic of Dermatology and Andrology Department of Benha University Hospitals.

The study was approved by the local ethic committee of Benha Faculty of Medicine. Informed

consent was obtained from each individual before sample collection.

Inclusion Criteria

Patients with different degrees of severity of AV according to Global Acne Grading system (GAGS) **.**

Exclusion Criteria

- Patients with AV on systemic therapy that affect blood glucose level eg: systemic retinoids and hormonal therapy.
- Pregnant and breastfeeding females.

All patients were subjected to full history taking, complete clinical examination and investigations as Serum level of galectin-3; Serum level of fasting insulin level ; Fasting blood glucose level.

2.1 Statistical analysis

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Data were presented and suitable analysis was done according to the type of data obtained for each parameter. Descriptive statistics: Mean, Standard deviation (± SD) for numerical data. Frequency and percentage of non-numerical data . Shapiro test was done to test the normality of data distribution. Significant data was considered to be nonparametric Analytical statistics : Student T Test was used to assess the statistical significance of the difference between two study group means . For the comparison of the three groups' means, one way analysis of variance (ANOVA) was used. Chi-Square test was used to examine the relationship between two qualitative variables. Fisher's exact test: was used to examine the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells. Correlation analysis: To assess the strength of association between two quantitative variables. The correlation coefficient defines the strength and direction of the linear relationship between two variables. The ROC Curve (receiver operating characteristic) provides a useful way to evaluate the sensitivity and specificity for quantitative diagnostic measures that categorize cases into one of two groups. The optimum cut off point was defined as that which maximized the AUC value.

3. Results

The present study was conducted on 60 patients with Acne Vulgaris and 20 age, sex and BMI matched healthy subjects as a control group. Comparison of laboratory data between patients and control groups. table 1

Table (1) Comparison of laboratory data between patients and control groups.

	Control N=20			Acne Vulgaris N=60			*P*
	Mean	**±**	**SD**	**Mean**	**±**	**SD**	
FBG (mg/dL)	95.6	±	10.6	103.3	±	15.1	0.113^{T}
Serum insulin (mIU/ml)	1.9	±	4.5	16.3	±	3.6	0.124^{T}
HOMA IR	3.5	±	0.9	4.1	±	1.9	$<0.001^{T}$
(galectin-3 (ng/mL	5.7	±	1.3	17.7	±	5.1	$<0.001^{T}$

SD, standard deviation; T, Student t test.

On comparison of HOMA IR between patients and control groups it was found that HOMA IR was significantly higher in AV patients than controls. No significant differences were found in FBG and serum insulin between both groups. On comparison between patients and control groups regarding serum Gal-3 levels it was found that serum Gal-3 level was significantly higher in AV patients than controls ($p<0.001$) Table (1).

4. Discussion

Results of the current study showed that there was no statistically significant difference between patients and controls regarding FBG and serum insulin level, these results agreed with the study conducted by Kaymak et al.[7], While their results disagreed with the results of the study done by Nagpal et al. [8]; they found increased blood glucose levels in AV patients compared to controls. This difference can be explained by small number of studied group of AV patients.

Results of the current study showed that there was no statistically significant difference between fasting insulin levels in AV patients and control group which agreed with results of the study conducted by Munichandrappa et al. [9].

Results of the current study showed no significant correlation between Gal-3 and FBG level, these results disagreed with the results of the study conducted by Yilmaz et al. [10]; they found increased Gal-3 levels in patients having high FBG level. This difference can be explained by larger number of candidate studied by Yilmaz et al and measuring blood glucose level both fasting and 2 hours after glucose loading.

Results of the current study showed a statistically higher values of HOMA-IR in AV patients when compared to control group. This was in line with the

study performed by Abdel Rahman et al. [11]; they showed significantly high values of HOMA-IR in AV patients compared to controls. However, these results disagreed with results of the study performed by Munichandrappa et al. [9]; they did not found any difference of HOMA-IR between AV patients and controls.

Results of the present study showed a statistically significant positive correlation between serum galectin-3 levels and HOMA-IR values in AV patients. This was in line with the study conducted by Siwicki et al. [12]; as they observed that Gal-3 impair glucose tolerance and increase insulin resistance. To the best of our knowledge, no published studies were found to compare the results between AV patients concerning serum Gal-3 levels. Results of the present study showed significant positive correlation between serum level of Gal-3 , BMI, severity of AV and HOMA IR.

Results of the present study showed statistically significant differences of HOMA-IR and serum Gal-3 levels in relation to grading of AV as HOMA-IR increases with increased severity of AV that indicates the correlation between IR and severity of AV. These results agreed with the results of the study done by Emirglu et al. [13]; they found increased blood glucose and insulin levels, also high levels of IGF-1 and androgens in AV patients. Both insulin and IGF induce the production of androgens while simultaneously inhibiting the hepatic synthesis of sex hormone-binding globulin (SHBG), therefore the bioavailability of androgens increases. Hyperinsulinemia increases serum levels of IGF-1 and reduces serum levels of insulin-like growth factor binding protein 3 (IGFBP3). These two factors directly influence proliferation and apoptosis of keratinocytes. Insulin-like growth factor may also stimulate some comedogenic factors such as androgens, growth hormone, and glucocorticoids. On the other side, the current study showed that; serum Gal-3 level was increased with increased severity of AV as it was higher in patients with severe AV, this can be explained by the higher prevalence of IR among severe AV patients as Gal-3 is highly expressed in keratinocyts and involved in the pathogenesis of inflammatory skin diseases [14].

The present study revealed that Gal-3 at cut off value of 6.05 can be used as prognostic marker in early diagnosis of AV with sensitivity rate 90%, specificity was 93.3% and 91.7% accuracy rates. It can be used in early detection of degree of severity of AV as well. HOMA IR also can be used in early diagnosis of AV at cut off value of 1.75 with sensitivity rate 93.3%, specificity 93.3% and 93.3% accuracy rates. So it can help in also as a marker of severity of AV.

Results of the present study found that, there was significant positive correlation between HOMA-IR levels and severity of AV, these results agreed with the study by Emirglu et al. [13]; they found a positive correlation between IR and severe AV because there was a significant difference between patients and control groups in terms of HOMA as they diagnosed insulin resistance according to the cut-off value of 2.7 and in the present study the cutoff point of HOMA-IR was 1.75.

5. Conclusion

From the results of the present work, it was concluded that; IR is more common among AV patients especially in patients with severe AV lesions and that could be explained by higher serum galectin-3 level in those patients. Since acne is a problem in adolescents, the early recognition of IR might help in better management of acne patients.

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