American Journal of Dermatology and Venereology 2014, 3(1): 13-22
DOI: 10.5923/j.ajdv.20140301.04

Diet and Acne in Upper Egypt

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Abstract **Background:** Acne vulgaris is common skin disease in Assuit. Dietary factors were implicated in acne pathogenesis. No previous study examined the influence of diet on acne in Upper Egypt. **Aims:** The aim was to determine relationship between socio-economic dietary factors with acne in Upper Egypt young adults and to recommend a validated dietery regimen for acne patients. **Methods:** A case-control study was conducted on 460 participants, 230 male and female acne patients aged 17-30 years attending the outpatient clinic of Assiut & Student University Hospitals and 230 socio-demographically cross-matched healthy volunteers as controls. Three acne severity degrees were assessed by clinical diagnosis. The study began from October 2011 to October 2013. Interviewing questionnaires (socio-demographic dietary data, drug intake) & Anthropometric measurements {body weight, height and body mass index (BMI)} were recorded. Recommended diet regime for acne patients was given. SPSS version 9 was used for statistical analysis. **Results:** The study revealed significantly higher acne prevalence in young (<20 years old), females, patients with high education, medium family income & with positive acne family history. There were significant differences between patients & controls & between different severity degrees of acne patients for consumption of certain food i.e. chocolate, peanut, vegetables, cola & fast food. However, fruits & milk recorded insignificant differences. No significant difference was found in BMI between patients & controls. **Conclusion:** This suggests that nutrition-related dietary lifestyle factors play a role in acne pathogenesis.

Keywords Acne, Diet regime, Socioeconomic factors, Questionnaire, Vegetarian

1. Introduction

Acne is the most common disease of the skin that affects individuals in all ages [1, 2]. Diet was reported the third most frequently implicated factor (after hormones and genetics) [3-5] in the development of acne [6]. The relationship between diet & acne was highly controversial [7, 8]. Dermatologists revisited the potential link between diet & skin [5, 9-12].

Many acne patients believed that their acne was exacerbated by certain diets i.e. nuts, chocolate & fatty foods [3]. Low incidence of acne was found in non-Western culture eating traditional low milk diets [12, 13]. A low glycemic load (LGL) diet improved symptoms and insulin sensitivity in acne patients [14]. Convincing data exist supporting the role of dairy products and high-glycemic index (GI) food in influencing hormonal factors, which can increase acne prevalence and severity [15]. The prevelance of acne is lower in rural, non-industrial societies i.e. Eskimo population than in modern Western population [16, 17].

The present study is the first in Upper Egypt to investigate the type of nutrition and its effect on acne severity among acne patients using a validated food frequency questionnaire. The study aimed to illustrate profile of acne & its relation to diet and to recommend a validated dietary regimen for acne patients as well.

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Published online at http://journal.sapub.org/ajdv

2. Methods

A prospective case-control study was conducted at Assiut and Student University Hospitals, Assiut, Egypt. A total of 460 subjects of both sexes were included in the study from October 2011 to October 2013. The study included 230 patients with acne vulgaris, 145 (< 20 years old) & 85 (20-30 years old) who attended the dermatology outpatient clinic and 230 similar socio-demographically cross-matched healthy volunteers were included as controls, 180 (< 20 years old) & 50 (20-30 years old). They did not have any skin or systemic disease, they attended the dermatology outpatient clinic with their diseased relatives or friends. **Exclusion criteria** include: patients with juvenile acne vulgaris (<14 years old), those with other skin or systemic disease. Through clinical examination were performed by a single dermatologist. Informed consent was obtained from all patients and controls. The Medical Ethics Committee of the Faculty of Medicine, Assiut University approved the study protocol.

Acne severity in patients were classified as mild, moderate & severe according to the classification of the American

Academy of Dermatology [18].

– Mild acne: characterized by the presence of few papules and pustules mixed with comedones, but no nodules.

– Moderate acne: characterized by the presence of many papules and pustules together with a few nodules.

– Severe acne: characterized by the presence of numerous papules and pustules, as well as many nodules.

Moreover the clinical diagnosis of severe acne was based on the presence of any of the following criteria:

1. Persistent or recurrent inflammatory nodules.
2. Extensive papulopustular lesions
3. Ongoing scarring.
4. Persistent purulent and /or serosanguinous discharge.
5. Sinus tubes.

Two formulated tools were used in the study:

First tool: Interviewing questionnaires that included two parts:

1- Sociodemographic data including (age, sex, residence, level of education, family income, occupation and family history of acne). Anthropometric measurements including weight, height, and body mass index (BMI) were taken.

2- Questions related to food habits, drug intake and diet history.

Second tool: A recommended diet regime set up by the author was given [19].

- Content validity of the questionnaires sheet was checked by expert Professors in the field of medicine dietetion and nursing and corrections were carried out accordingly.

- Pilot study performed on 5 patients to test applicability of the research, estimate time needed for data collection to verify formulated tools of the necessary modifications.

- The purpose and nature of the study were explained to participants.

- Statistical analyses: Data was statistically analyzed using SPSS Program Version 9.X^2 and Chi-Square distribution test Version 16 was used to test the significance. Association was considered statistically significant when P-value was less than 0.05 [20].

3. Results

3.1. Sociodemographic Factors and Acne

The 230 acne patients included 97 mild, 112 moderate and 21 severe acne. The patient group (230) consisted of 199 females (86.5%) and 31 males (13.5%). Of the 230 controls, 182 (79.1%) were females and 48 (20.9%) were males (Table 1).

Table 1. Sociodemographic factors and family history in acne patients and controls in Upper Egypt

	Patients (n= 230)		Control (n= 230)		P-value
	No.	%	No.	%	
Age: (years)					
<20 years	145	63.0	180	78.3	0.000*
20 - < 30 years	85	37.0	50	21.7	
Sex:					
Male	31	13.5	48	20.9	0.036*
Female	199	86.5	182	79.1	
Residence:					
Rural	150	65.2	137	59.6	
Urban	61	26.5	61	26.5	0.064
Industrial	9	3.9	7	3.0	
Non-industrial	10	4.3	25	10.9	
Level of education:					
Basic education	10	4.3	4	1.7	
Secondary education	41	17.8	22	9.6	0.007*
High education	179	77.8	204	88.7	
Family income:					
< 500 LE	69	30.0	110	47.8	
500 – 1000 LE	93	40.4	92	40.0	0.000*
> 1000 LE	68	29.6	28	12.2	
Family history of acne:					
Positive	154	67.0	21	9.1	0.000*
Negative	76	33.0	209	90.9	

Chi-square test

Table 2. Comparison of mean (± SD) of body weight, length and BMI between acne patients and controls in Upper Egypt

	Patients (n= 230)		Control (n= 230)		P-value
	Mean ± SD		Mean ± SD		
Weight (kg)	60.03±9.30		57.47±8.36		0.002*
Length (cm)	161.45±7.30		158.31±7.27		0.000*
BMI (kg/m^2)	22.99±2.94		22.89±2.57		0.693
BMI	**Patients (n= 230)**		**Control (n= 230)**		
	No.	**%**	**No.**	**%**	
Under weight	14	6.1	8	3.5	
Normal	168	73.0	189	82.2	
Over weight/obese	48	20.9	33	14.3	
P-value	0.059				

*Significant difference using t- test ($p < 0.05$)

Table 3. Comparison of diet intake frequencies between acne patients and controls in Upper Egypt

	Patients (n= 230)		Control (n= 230)		P-value
	No.	**%**	**No.**	**%**	
Chocolate:					
None	70	30.4	117	50.9	
Once	58	25.2	81	35.2	0.000*
Twice	43	18.7	17	7.4	
Triple of more	59	25.7	15	6.5	
Peanut					
None	113	49.1	166	72.2	
Once	77	33.5	51	22.2	0.000*
Twice	16	7.0	8	3.5	
Triple of more	24	10.4	5	2.2	
Rice:					
None	6	2.6	0	0	
Once	26	11.3	22	9.6	0.039*
Twice	51	22.2	66	28.7	
Triple of more	147	63.9	142	61.7	
Corn:					
None	149	64.8	185	80.4	
Once	38	16.5	32	13.9	0.000*
Twice	17	7.4	7	3.0	
Triple of more	26	11.3	6	2.6	
Macaroni:					
None	19	8.3	16	7.0	
Once	91	39.6	123	53.5	0.028*
Twice	83	36.1	61	26.5	
Triple of more	37	16.1	30	13.0	
Potato:					
None	9	3.9	0	0	
Once	25	10.9	34	14.8	0.009*
Twice	67	29.1	57	24.8	
Triple of more	129	56.1	139	60.4	
Vegetable:					
None	8	3.5	1	0.4	
Once	18	7.8	3	1.3	0.000*
Twice	55	23.9	28	12.2	
Triple of more	149	64.8	198	86.1	
Fruit:					
None	4	1.7	6	2.6	
Once	28	12.2	36	15.7	0.635
Twice	61	26.5	56	24.3	
Triple of more	137	59.6	132	57.4	
Butter:					
None	118	51.3	73	31.7	
Once	34	14.8	57	24.8	0.000*
Twice	34	14.8	63	27.4	
Triple of more	44	19.1	37	16.1	

Table 3. Continued

	Patients (n= 230)		Control (n= 230)		P-value
	No.	%	No.	%	
Fat:					
None	21	9.1	62	27.0	
Once	48	20.9	92	40.0	0.000*
Twice	73	31.7	45	19.6	
Triple of more	88	38.3	31	13.5	
Beef:					
None	171	74.3	219	95.2	
Once	39	17.0	10	4.3	0.000*
Twice	14	6.1	0	0.0	
Triple of more	6	2.6	1	0.4	
Chips:					
None	39	17.0	82	35.7	
Once	31	13.5	41	17.8	0.000*
Twice	36	15.7	53	23.0	
Triple of more	124	53.9	54	23.5	
Pizza:					
None	170	73.9	218	94.8	
Once	48	20.9	12	5.2	0.000*
Twice	8	3.5	0	0.0	
Triple of more	4	1.7	0	0.0	
Cola:					
None	52	22.6	110	47.8	
Once	48	20.9	76	33.0	0.000*
Twice	38	16.5	24	10.4	
Triple of more	92	40.0	20	8.7	
Milk:					
None	101	43.9	89	38.7	
Once	34	14.8	46	20.0	0.097
Twice	30	13.0	43	18.7	
Triple of more	65	28.3	52	22.6	
Yoghurt:					
None	167	72.6	167	72.6	
Once	43	18.7	38	16.5	0.824
Twice	11	4.8	13	5.7	
Triple of more	9	3.9	12	5.2	
Fruit juice:					
None	72	31.3	63	27.4	
Once	61	26.5	75	32.6	0.036*
Twice	35	15.2	50	21.7	
Triple of more	62	27.0	42	18.3	
Soup:					
None	69	30.0	47	20.4	
Once	74	32.2	91	39.6	0.066
Twice	50	21.7	60	26.1	
Triple of more	37	16.1	32	13.9	
Spices:					
None	16	7.0	48	20.9	
Once	22	9.6	52	22.6	0.000*
Twice	36	15.7	53	23.0	
Triple of more	156	67.8	77	33.5	

Table 3. Continued

	Patients (n= 230)		Control (n= 230)		P-value
	No.	%	No.	%	
Pickles:					
None	40	17.4	73	31.7	
Once	46	20.0	77	33.5	0.000*
Twice	24	10.4	41	17.8	
Triple of more	120	52.2	39	17.0	
Salt fish:					
None	149	64.8	145	63.0	
Once	65	28.3	79	34.3	0.112
Twice	10	4.3	4	1.7	
Triple of more	6	2.6	2	0.9	
Meat:					
None	6	2.6	24	10.4	
Once	52	22.6	77	33.5	0.000*
Twice	82	35.7	85	37.0	
Triple of more	90	39.1	44	19.1	
Chicken:					
None	7	3.0	1	0.4	
Once	99	43.0	127	55.2	0.005*
Twice	76	33.0	73	31.7	
Triple of more	48	20.9	29	12.6	
Fish:					
None	55	23.9	44	19.1	
Once	145	63.0	168	73.0	0.040*
Twice	23	10.0	17	7.4	
Triple of more	7	3.0	1	0.4	
Honey:					
None	179	77.8	189	82.2	
Once	32	13.9	36	15.7	0.011*
Twice	10	4.3	5	2.2	
Triple of more	9	3.9	0	0.0	
Treacle:					
None	143	62.2	118	51.3	
Once	56	24.3	77	33.5	0.077
Twice	15	6.5	21	9.1	
Triple of more	16	7.0	14	6.1	
Tehena:					
None	134	58.3	156	67.8	
Once	62	27.0	63	27.4	0.003*
Twice	21	9.1	5	2.2	
Triple of more	13	5.7	6	2.6	

*Significant difference using chi-square test, $p < 0.05$

In the patient group, 145 (63.0%) were (< 20 years old) and 85 (37.0%) were (20- <30 years old). In controls, 180 (78.3%) were (< 20 years old) and 58 (21.7%) were (20- <30 years old). Acne was significantly higher in females ($p< 0.001$) & in young patients ($p< 0.05$). The prevalence of acne was insignificantly lower in both industrial and non-industrial societies than in urban and rural ones. Table 1 revealed that prevalence of acne was significantly higher among patients with high education 77.8% ($p< 0.05$) & medium family income 40.4% ($p< 0.001$). Positive family history of acne was significantly high in patients (67.0%) compared to controls ($p< 0.001$).

Anthropometric measurements and acne is given in Table 2. The mean weights of acne patients and control subjects were 60.03±9.40 kg; and 57.47±8.36 kg; respectively. While, the mean lengths of acne patients and controls were 161.45±7.50cm and 158.31±7.27cm; respectively. The study revealed significant differences between acne patients and controls for weight ($p < 0.05$) and length ($p < 0.000$). However, insignificant difference was found for BMI. The BMI [Weight (kg) / Height (cm^2)] was used to reflect the nutritional status of the studied samples. It was classified into 4 categories according to WHO [21], Gronder *et al*. [22] Classification.

3.2. Diet and Acne

Comparison of diet intake between patients and controls was shown in Table 3. There were significant differences ($p< 0.05$) between patients and controls in consumption of chocolate, peanut, rice, corn, macaroni, potato, vegetables, butter, fat, beef, chips, pizza, cola, fruit juice, spices, pickles, meat, chicken, fish, honey, and tehena. Significant increased consumption of all the previous food stuffs except vegetables & potato were recorded in acne patients compared to controls. However, consumption of fruits, milk, yoghurt, soup, salt fish and treacle recorded insignificant difference.

Table 4 outlined the relationship between the three severity degrees of acne and diet. The study showed that certain food stuffs namely: chocolate, fat, beef burger, potato chips and cola recorded significant increased consumption ($p< 0.05$) ascendingly according to the severity of acne. Significantly decreased consumption of vegetables were noticed among severe and moderate acne patients compared with mild acne patients. However, peanut, rice, corn, macaroni, potato, fruit, butter, pizza, milk, yoghurt, fruit juice, soup, spices, pickles, salt fish, chicken, fish, honey, treacle and tehena recorded insignificant difference. Insignificant decreased consumption of fruit, yoghurt, fish and treacle were recorded in severe acne patients compared with moderate and mild patients.

There were statistically significant differences between acne patients and controls regarding the number of vegetarians ($p<0.05$) (Table 5). In acne patients, 30 (13%) were vegetarians compared to 51 (22.2%) of controls. 72 acne patients (31.3%) took vitamin A and compared to 115 (50.0%) of controls, which were statistically significant ($p<0.001$). On the other hand, almost all controls and acne patients did not take zinc capsules which was statistically insignificant. Table 5 indicated that there was significant increase in the number of vegetarians, taking vitamin A supplement in controls compared with acne patients.

Table 4. Comparison of diet intake frequencies among the three severity degrees of acne in Upper Egypt

	Degree of acne			P-value
	Mild	Moderate	Severe	
	Mean ± SE	Mean ± SE	Mean ± SE	
Chocolate	1.09 ± 0.10	1.63 ± 0.11	1.52 ± 0.32	0.003*
Peanut	0.63 ± 0.09	0.94 ± 0.10	0.71 ± 0.17	0.066
Rice	2.56 ± 0.08	2.38 ± 0.08	2.57 ± 0.13	0.249
Corn	0.57 ± 0.10	0.71 ± 0.10	0.71 ± 0.24	0.565
Macaroni	1.58 ± 0.09	1.63 ± 0.08	1.52 ± 0.19	0.815
Potato	2.35 ± 0.08	2.41 ± 0.08	2.29 ± 0.18	0.767
Vegetable	2.66 ± 0.06	2.41 ± 0.08	2.24 ± 0.23	0.020*
Fruit	2.45 ± 0.08	2.46 ± 0.07	2.29 ± 0.21	0.636
Butter	1.06 ± 0.12	1.02 ± 0.11	0.81 ± 0.24	0.683
Fat	1.78 ± 0.11	2.11 ± 0.09	2.33 ± 0.20	0.014*
Beef burger	0.22 ± 0.05	0.47 ± 0.08	0.52 ± 0.16	0.020*
Chips	1.85 ± 0.12	2.35 ± 0.10	1.57 ± 0.30	0.001*
Pizza	0.23 ± 0.06	0.41 ± 0.07	0.38 ± 0.13	0.101
Cola	1.14 ± 0.11	2.21 ± 0.11	1.95 ± 0.21	0.000*
Milk	1.05 ± 0.12	1.37 ± 0.12	1.62 ± 0.31	0.082
Yoghurt	0.42 ± 0.08	0.44 ± 0.07	0.10 ± 0.07	0.152
Fruit juice	1.35 ± 0.11	1.38 ± 0.12	1.48 ± 0.30	0.906
Soup	1.25 ± 0.11	1.20 ± 0.09	1.43 ± 0.26	0.649
Spices	2.35 ± 0.10	2.49 ± 0.08	2.62 ± 0.18	0.365
Pickles	1.78 ± 0.12	2.08 ± 0.11	2.29 ± 0.26	0.090
Salt fish	0.44 ± 0.07	0.44 ± 0.06	0.52 ± 0.20	0.873
Meat	2.09 ± 0.09	2.14 ± 0.08	2.05 ± 0.20	0.852
Chicken	1.70 ± 0.09	1.71 ± 0.08	1.86 ± 0.17	0.720
Fish	0.95 ± 0.07	0.92 ± 0.07	0.81 ±0.13	0.695
Honey	0.28 ± 0.07	0.38 ± 0.08	0.43 ± 0.16	0.509
Treacle	0.63 ± 0.10	0.59 ± 0.08	0.33 ± 0.13	0.386
Tehena	0.55 ± 0.08	0.71 ± 0.09	0.52 ± 0.20	0.366

*Significant difference, $p < 0.05$

Table 5. Relationship between vegetarians, taking vitamin A, zinc capsules in acne patients and controls

	Patients (n= 230)		Control (n= 230)		P-value
	No.	%	No.	%	
Vegetarian:					
Yes	30	13.0	51	22.2	0.010*
No	200	87.0	179	77.8	
Taking vitamin A					
Yes	72	31.3	115	50.0	0.000*
No	158	68.7	115	50.5	
Taking Zink capsules					
Yes	3	1.3	1	0.4	0.616
No	227	98.7	229	99.6	

Table 6. The relationship between patients of the three degrees of acne severity and vegetarians, taking vitamin A and zinc capsules

	Degree of acne						P-value
	Mild (n= 97)		Moderate (n= 112)		Severe (n= 21)		
	No.	%	No.	%	No.	%	
Vegetarian:							
Yes	16	53.3	13	43.3	1	3.3	0.288
No	81	40.5	99	49.5	20	10.0	
Taking vitamin A:							
Yes	37	51.4	33	45.8	2	2.8	0.031*
No	60	38.0	79	50.0	19	12.0	
Taking Zink capsules:							
Yes	0	0.0	3	100.0	0	0.0	0.202
No	97	42.7	109	48.0	21	9.3	

The study showed that 16 (53.3%) of mild acne patients were vegetarians compared to 13 (43.3%) of moderate and 1 (3.3%) of severe acne patients, which was statistically insignificant. The data revealed that 37 (51.4%) of mild acne patients took vitamin A compared with 33 (45.8%) of moderate acne and 2 (2.8%) of severe acne patients, which was statistically significant ($p<0.05$) (Table 6).

Table 6 indicated that there was significant difference for taking vitamin A between the three severity degrees of acne. However, only 3 moderate acne patients out of 112 took zinc capsules. Therefore, table 6 indicated no significant difference for taking zinc capsules between the acne three severity degrees.

4. Discussion

Acne vulgaris is the most common skin disease, affecting nearly 80% of individuals at sometime in their lives. The relationship between diet and acne has been called into question [8]. Our study showed that acne was significantly increased in younger age patients (< 20 years old), females, with higher educational level, medium family income and in patients with positive family history of acne. Such data are in good agreement with some authors findings. [2, 10, 16, 23, 24]. The study revealed significant difference between acne patients and controls for weight and length. However, no significant difference was detected for the BMI. The theory postulating link between BMI and the development of acne is far from being proved, which quite agree with Ferdowsian and Levin findings [10]. However Landro et al. [25] reported that family history, BMI, selected dietary factors may influence the risk of moderate to severe acne.

Significant increased consumption of chocolate, peanut, rice, corn, macaroni, butter, fat, beef burger , chips, pizza, cola, fruit juice, spices, pickles, meat, chicken, fish, honey, and tehena were recorded in acne patients compared with controls. Moreover, significant decreased consumption of vegetables & potato were found in acne patients than control. Koku et al. [26] showed that fat, sugar and fast food consumption was positively correlated with acne prevalence.

The study revealed that chocolate, fat, beef burger, potato chips and cola recorded significant increased consumption ascendingly according to the severity of acne. Significantly decreased consumption of vegetables were noticed among severe and moderate acne patients compared with mild ones. Our findings are in good agreement with [1, 3, 7-11, 21, 23, 27-31] findings. This suggested that nutrition-related lifestyle factors play a role in acne pathogenesis.

It is note worthy that there was contradiction in the association with diet and acne. Some authors reported that chocolate did not aggravate acne [27, 29, 32-34] and the severity of acne did not change after chocolate intake. However, other author stated that acne was exacerbated by certain aspects of diet including chocolate [3].

On the other hand, the LGL diet may reduce acne [14, 16, 35]. Increased glycemic load (GL) may result in increased

activity of sex hormones and insulin like growth factor-1 (IGF-1), thereby contributing to acne development [4, 36]. Kwon et al [37] confirmed that the intake of LGL diet for 10 weeks resulted in clinical improvement in the number of non inflammatory and inflammatory acne lesions in Korean patients. Paoli et al. [38] supported an influence of various dietary components on the development of acne particulary focusing on the role played by carbohydrates. They reported the therapeutic potential of ketogenic diet in acne.

Furthermore, some authors stated that acne is positively associated with intake of milk (particularly skim milk). Association between acne and dairy products may be caused by hormones and bioactive molecules present in milk. These factors may be more bioavailable in skim milk [13, 15, 30]. However, Anderson [29] reported that milk did not produce any acne flares. The high GL pathway and increased consumption of milk & its products aggravate mammalian target of rapamycin complex 1 (m TORC1) signaling in acne [39, 40].

Furthermore, both roasted peanut and cola did not produce any acne flares [29]. On the contrary, the present study recorded significant increased consumption (for cola) and insignificant (for peanut) in the severe acne patients compared with moderate and mild patients.

The list of moderate glycemic diets (moderate glycemic index (MGI) 56-69 using glucose as reference food) recommended for acne patients are outlined in (table 7) [14].

Table 7. List of moderate glycemic diets. (MGI 56-69 using glucose as reference food)*

Food items of moderate glycemic index (MGI)
Sucrose
Brown rice
Boiled potato
Squash
Crisps
Bread
Banana

* reference [14]

No clinical studies had specifically examined the role of dietary fiber in acne treatment [8]. Our study showed statistically significant differences between acne patients and controls regarding the number of vegetarians (p= 0.01), where vegetarians were significantly increased in controls compared with acne patients, and insignificant increase in vegetarians in mild acne patients compared with moderate and severe degrees as well. Smith *et al* [5] reported that improved acne in patients on a LGL diet might be due to higher daily consumption of dietary fibers.

Dietary vitamin A is obtained either from preformed vitamin A or from provitamin A carotenoids. Most dermatologists are reluctant to recommend oral vitamin A supplements for acne because of the fear of inducing hypervitaminosis A [8]. Our study indicated that there was significant increase in taking vitamin A supplement in controls compared with acne patients (p=0.0001) as well as in mild acne patients compared with moderate and severe patients (p=0.031). However, there was insignificant difference between patients and controls taking zinc capsules. Our results are in good agreement with Kligman *et a.l* findings [41], who stated that vitamin A was effective treatment for acne patients at doses of 300 000 U for women, and 400 000 U for men. Besides, zinc and minocycline were both effective in treatment of inflammatory acne patients, however, minocycline had superior effect [42].

Table 8. List of recommended diets and forbidden diets for acne patients

Recommended diets	Forbidden diets
Food items of low glycemic index (LGI<55. using glucose as reference food)*	Food items of high glycemic index (HGI>70 using glucose as reference food)*
Bran flakes	Greased foods
Oats	Chocolate
Oat flakes	Fatty foods
Whole grain bread	Fried foods
Low-fat milk	Eggs
Apple juice	Spices
Vegetable salad	Coffee and tea
Tuna, lean meat & poultry	Processed foods
Fish, sea food	Refined sugars
Legumes, cooked beans	Refined oils
Vegetables including potato	Sherbet
Durum wheat pasta	Cottage cheese
Apple	White bread
Fresh or canned fruits	Potato puree
Yoghurt	Sweet melon
Crispbread, whole grain	Tropical fruits
Nuts	Glucose
Popcorn	Honey
Continental fruit bread	White rice
Water melon	Carrots
Pasta, Noodles (Macaroni)	Fried potato
Basmatic rice	Roasted potato
Spongue cake, fruit cake	Milk (particularly skim milk)

* References [4, 7, 14].

Recommended and forbidden diets for acne patients:

The list of recommended and forbidden diets for acne patients is represented in Table 8 [4, 7, 14].

Recent evidence suggested that LGL diets might affect sebum production based on beneficial hormonal effects of these diets [16]. The GL might be interpreted as a measure of the blood glucose and insulin-raising potential of the diet as it represents the rate of carbohydrate absorption (indicated by the GI) and the quantity of carbohydrate consumed [4, 43].

The recommended LGL diet consisted of 25% of energy from protein, 45% from low GI carbohydrates, and 30% energy from fats [5].

It is note-worthy that daily dietary glycemic index (GI) and GL were calculated from diet records. Dietary GI was calculated as ∑(GI for food item x proportion of total carbohydrate contributed by item), and the GL was calculated as ∑(GI for food item x its carbohydrate content in

grams/100) [5]. The GI values used had glucose as the reference food and were taken from Table 8 [4, 7, 14].

A recommended diet regime set up by the author [19] was given in Table 9.

Table 9. Recommended dietary regimen for acne patients*

Non-vegetarian acne patients	Vegetarian acne patients
Breakfast – corn flakes or oat flakes with skimmed milk and sugar – one boiled egg. – a piece of toast – a cup of apple juice After noon – a cup of anise or fenugreek Lunch – a piece of whole grain bread. – Tuna – Vegetables salad – Vegetables soup – One apple or orange – 4 O'clock after noon – A cup of peppermint Dinner – ½ cup of chicken broth with noodles. – 3 big spoones of minced meat. – 3 big spoones of boiled rice. – A piece of water melon. Before sleep – A cup of low-fat yoghurt.	Breakfast – corn flakes or oat flakes with sugar. – a piece of toast with apple or orange jam. – a cup of apple juice. After noon – a cup of anise or fenugreek. Lunch – A piece of whole grain bread. – A cup of lentil soup. – Vegetables salad. – Boiled squash – One apple or orange – 4 O'clock after noon – A cup of peppermint Dinner – One cup of boiled whole wheat with sugar. – Boiled broccoli. – 3 big spoones of boiled rice. – A piece of water melon. – Cup of Jelly. Before sleep – A cup of orange juice

* Recommended by the author [19].

Conclusion and general recommendation for acne patients:

The present study found significant differences between patients & controls as well as between different severity degrees of acne patients for the consumption of chocolate, peanut, rice, corn, macaroni, potato, vegetables, butter, fat, beef, chips, pizza, cola, fruit juice, spices, pickles, meat, chicken, fish, honey and tehena. However, fruits, milk, yoghurt, soup, salt fish and treacle recorded insignificant difference. This suggests that nutrition-related lifestyle and dietary composition factors play a role in acne pathogenesis.

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