



## RESEARCH ARTICLE

### EFFECT OF POLARIZED LIGHT THERAPY ON ACNE VULGARIS IN WOMEN SUFFERING FROM POLYCYSTIC OVARIAN SYNDROME

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#### ABSTRACT

**Background:** Polycystic ovary syndrome is a hormonal disorder that is common among females of reproductive age. Hyperandrogenism in PCOS often manifests itself with the cosmetically disfiguring problems of acne. Bioptron Light Therapy proved efficacy in treatment of selective skin disorders. **Purpose:** This study was conducted to determine the effect of Polarized Light therapy on acne vulgaris in women suffering from polycystic ovarian syndrome. **Method:** Forty participants diagnosed as having PCOS, suffer from inflammatory acne in face for more than 3 months aged from 20 to 35 years and their BMI ranged from 30 to 35 Kg/m<sup>2</sup> were selected randomly from the outpatient clinics of Gynecology at kasr El Einy Hospitals. They were divided randomly into two groups equal in number: control group (group A) (n= 20) received topical retinoid once daily, doxycyclin 100 mg and topical peroxide twice daily for 4 weeks and study group (group B) (n= 20) received the same medical treatment as in group (A) in addition to Polarized Light Therapy 3 times per week for 30 minutes/session for 4 weeks. Evaluation of acne for participants in both groups (A&B) was done before the beginning and after the end of the study using photographs and Investigator's Global Assessment (IGA) scale for acne. **Results:** Showed that there were a statistically significant difference between both groups (A&B) in median value of IGA and number of acne lesion post treatment. There was a statistical significant decrease in the median value of IGA post-treatment favoring group (B) with (P= 0.27). Also, there was a statistical significant decrease in the median value of number of acne favoring group (B) with percentage of improvement of 85% in group (B) rather than 20% in group (A). **Conclusion:** It could be concluded that the application of polarized light therapy was effective in treatment of acne vulgaris and its application with medical treatment was more effective than using medical treatment alone in management of acne in PCOS women.

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## INTRODUCTION

Acne is a disease of the pilosebaceous unit-hair follicles in the skin that are associated with an oil gland (Degitz *et al.*, 2007). The clinical features of acne include seborrhoea (excess grease), non-inflammatory lesions (open and closed comedones), inflammatory lesions (papules and pustules), and various degrees of scarring. The distribution of acne corresponds to the highest density of pilosebaceous units (face, neck, upper chest, shoulders, and back). Nodules and cysts comprise severe nodulocystic acne (Shalita, 2004). Acne is the second most common sign of hyperandrogenism (Abid *et al.*, 2017). Androgens increase sebum production, causing abnormal desquamation of follicular epithelial cells resulting in comedones formation. Further colonization of the follicles results in inflammation and further formation of papules, pustules, nodules, cysts, and scar (Ozdemir *et al.*, 2010). Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age with a prevalence up to 20%. In conjunction, with its reproductive, metabolic, and psychological features, PCOS poses a

significant public health issue (Azziz *et al.*, 2016). It is characterized by signs and symptoms of androgen excess and ovulatory dysfunction disrupts Hypothalamic-Pituitary-Ovarian (HPO) axis function (Escobar-Morreale, 2018). Hyperandrogenism presented clinically by (hirsutism, acne, and alopecia) and biochemically by (elevated circulating androgen concentrations) (Yildiz *et al.*, 2010). Androgens play an essential role in acne pathogenesis. It is postulated that androgens may play only a permissive role in priming or initiating acne development, or it may be the local overproduction of androgens in the skin and/or the high expression and responsiveness of androgen receptors that determines the formation of acne lesions (Chen *et al.*, 2006). The main influence of androgen on acne pathogenesis concerns the proliferation/ differentiation of sebocytes and infundibular keratinocytes (Thiboutot *et al.*, 2003). Acne develops because of blockages in follicles. Hyperkeratinization and formation of a plug of keratin and sebum is the earliest change. Enlargement of sebaceous glands and an increase in sebum production occur with increased androgen (dehydroepiandrosterone sulfate) (DHEA-S) production at adrenarche (Simpson *et al.*, 2004). Many different treatments exist for

acne including benzoyl peroxide, antibiotics, retinoids, anti-seborrheic medications, anti-androgen medications and hormonal treatments but it is not preferable because it's side effects (Ramos and Carneiro, 2009). Phototherapeutic approaches for acne vulgaris such as laser and light-based modalities are fast safe and side-effect-free novel therapy (Thomas, 2004). Polarized phototherapy (PPT) is a relatively new therapeutic approach. A linearly polarized, polychromatic light was used where the light waves move in parallel planes, producing a narrow, concentrated beam. Unlike ordinary light where its waves oscillate in all directions, polarized light comes from refraction of common light through special laminated mirrors to be passed through a photo filter system (Monstrey *et al.*, 2002). Bioptron light therapy (BLT) system is a medical device, with expanding clinically proved efficacy both in the treatment of wounds and pain conditions as well as in the treatment of selective skin disorders. It employs a combination of infrared (IR) and visible light (VL) wavelengths considered to be beneficial in the treatment of different types of problems and injuries. Both visible and infrared light have been shown to affect different positive changes at cellular level (Lubart *et al.*, 2007). Polarized light (PL) also stimulated self-defense mechanisms of the body. Microscopic studies proved that following polarized light therapy (PLT), the number of white blood cells such as lymphocytes, monocytes, and eosinophilic cells significantly increased (Fenyo *et al.*, 2002).

## MATERIALS AND METHODS

This study was designed as a Prospective, Pre/ Posttreatment randomized controlled trial, after approval by the research ethical committee of Faculty of Physical Therapy, Cairo University in 27/2/2022 (No:P.T.REC/012/003611). Duration of the study was 16 months from June 2022 till October 2023. Randomization was accomplished by using a computer-generated randomized table created in advance of data collection using the SPSS (version 25 for windows) software. Each participant was given a unique identification number. These numbers were randomized into two groups equal in number (n=20). Individually and sequentially numbered index cards were placed in opaque envelopes. A blinded and unbiased research assistant gave each participant a handpicked envelope, which was opened, and the participants were assigned to their group accordingly.

**Participants:** Forty participants clinically diagnosed as having PCOS suffering from inflammatory acne in their face for more than 3 months were selected from the outpatient clinics of gynecology at Kasr El-Einy hospitals. They were randomly assigned into two groups equal in number group (A) control group (n=20) received medical treatment only in the form of (topical retinoid once daily, oral antibiotics in form of doxycycline 100mg twice daily and topical benzoyl peroxide twice per day) for four weeks and group (B) study group (n=20) received polarized light therapy for 30 minutes / session (15 minute on each side of the face), 3 times/ week for four weeks in addition to the same medical treatment as in group (A).

**Control group (A):** Consisted of 20 participants, their age ranged from 20 to 35, height ranged from 145 cm to 170 cm, weight ranged from 63 kg to 96 kg and BMI ranged from 30 to 35 kg/m<sup>2</sup>. They received medical treatment only in the form of (topical retinoid once daily, oral antibiotics in the form of doxycycline 100mg twice daily and topical benzoyl peroxide twice per day) for four weeks.

**Study group (B):** Consisted of 20 participants, their age ranged from 20 to 35, height ranged from 147 cm to 172 cm, weight ranged from 65 kg to 101 kg and BMI ranged from 30 to 35 kg/m<sup>2</sup>. They received polarized light therapy for 30 minutes / session (15 minute on each side of the face), 3 times/ week for four weeks, in addition to the same medical treatment as in group (A).

**Inclusion Criteria:** Forty participants clinically diagnosed with polycystic ovarian syndrome had inflammatory acne in their face for more than 3 months:

1. All suffered from amenorrhea or oligomenorrhea.
2. Their ages ranged from 20 to 35 years.
3. Their BMI ranged from 30 to 35 kg/m<sup>2</sup>.
4. Degree of acne was ranged from 1 to 4 assessed by IGA.
5. All of them suffered from inflammatory acne for more than three months.

**Exclusion Criteria:** Patients who had the following features were excluded from the study:

- 1) History of diabetes, circulatory or sensory disorders.
- 2) Using ovulation induction drugs.
- 3) Had photosensitivity or a history of frequent sunburns.
- 4) Any systemic diseases as pulmonary, cardiac, or vascular diseases.
- 5) Any dermatological condition rather than acne vulgaris in face.

They were randomly assigned into two groups equal in numbers. Group (A) serves as control group and group (B) serves as study group.

### Instrumentation

#### Evaluative Instrumentation

- 1) Recording data sheet was used to record data of each participant in both groups (A&B) including personal, past and menstrual history.
- 2) Standard weight and height scale was used to measure weight and height for each participant in both groups, in order to calculate their BMI before starting the study.
- 3) Nikon professional camera D5200 (24.1MP DX format, CMOS sensor, EXPEED 3 processing, ISO 100-6400 standard, up to 25600 expanded 5 fps continuous shooting, 39 point AF system, 9 sensors cross type and 2016 pixel RGB metering sensor) was used to evaluate the photographic acne lesion count before and after the end of treatment.
- 4) Investigator's Global Assessment scale for acne.

It was used for assessing acne lesions before the beginning and at the end of the study. The IGA is a qualitative assessment used to determine the degree of improvement, a universal assessment of acne in which a client's presentation is compared against photographs. Grading is promoted for use within a clinic setting as it is practical and easy to use (Tan, 2008).

#### Treatment Instrumentation

##### Bioptron pro. 1

- It is a non-invasive optical device, with patented technology based on bio-stimulative of polarized, non-coherent in the visible and infrared spectrum. Filter diameter: 11cm.
- Power Supply, 100-240 V~ 50/60 HzM.
- Power consumption, 90 VA.
- Weight without stand, 3.4 kg.
- Weight with stand, 7.8 kg.

##### Physical parameters of the output of this unit are:

- Wavelength, 480 - 3400 nm.
- Degree of polarization, >95% (590 - 1550 nm).
- Specific power density, av. 40 mW/cm<sup>2</sup>.
- Light energy per minute, av. 2.4 J/cm<sup>2</sup>.
- Light Intensity, min. 10.000 lux.
- CE labeling, CE0197.

#### Procedure

##### Evaluative procedure

**History taking:** A full history was taken from each participant in both groups (A&B) before starting this study and data was recorded on a data sheet. All participants were fully instructed about the evaluative procedures to motivate them to perform maximally.

**Weight and Height measurement:** Weight and height were measured for each participant for both groups (A&B) before beginning of the study after calibration of the scale straight against the top of the patient’s head and made sure it was flat and not angled, marked the top of the ruler and measured the distance from the head mark to the floor with the tape measure. Then BMI was calculated by dividing the weight in (kg) on the height in (m<sup>2</sup>). According to the following equation:

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}} \text{ (Tunjiet al., 2020).}$$

**Photographic assessment of acne lesion:** The photographic picture was taken to the affected area (photo from front of the face and photo for each side of the face) before and after the end of treatment.

- Each participant was asked to assume sitting position.
- The camera was applied vertical to the affected area, about 60 cm from the acne lesion of the face.
- A test shot was done to ensure that the camera is functioning normally, then the assessment photo was taken.

**Assessment of acne improvement**

**Investigator's Global Assessment scale for acne (IGA):** The IGA was used to determine the degree of acne improvement before and after the end of treatment for each participant in both groups (A&B). It is a scale with approximately six severity graded from very severe to clear skin (Tan, 2008).

**Table 1. Investigator's Global Assessment scale for Acne**

Score	Description
0= clear skin	no inflammatory or non-inflammatory lesions
1= almost clear	rare non-inflammatory lesions with no more than one inflammatory lesion
2= mild severity	some non-inflammatory lesions with no more than a few inflammatory lesions “papules/pustules only, no nodular lesions”
3= moderate severity	some to many non-inflammatory lesions and possibly some inflammatory lesions but no more than one small nodular lesion
4= severe	some to many non-inflammatory and inflammatory lesions with some or many nodular lesions
5= very severe	many non-inflammatory and/or inflammatory lesions with some or many nodular lesions

**Treatment procedure**

**Medical treatment:** Each participant in both groups (A&B) received the same medical treatment in the form of topical retinoid once daily, oral antibiotics in the form of doxycycline 100mg twice daily and topical benzoyl peroxide twice per day.

Each participant in group (B) received 12 sessions (3 sessions per week) each session was about 30 minutes (15 minutes on each side of the face) for 4 weeks.

Before starting the first treatment session, verbal explanation about the treatment program was given to each participant to gain her confidence and co-operation through the course.

- The participant was asked to sit in a comfortable position.
- The bioptron device was held facing acne lesion in a distance of 10 cm from the treated side of face for 15 min.
- After the end of the treatment session, the device was switched off, then the treated area was checked.

**Data analysis and statistical design:** Data were expressed as mean±SD. Unpaired t-test was used to compare between subjects Characteristics of the two groups. Shapiro-Wilk and Kolmogrov-smirnov tests were used for testing normality of data distribution. Wilcoxon test was used for within group comparison and Mann-

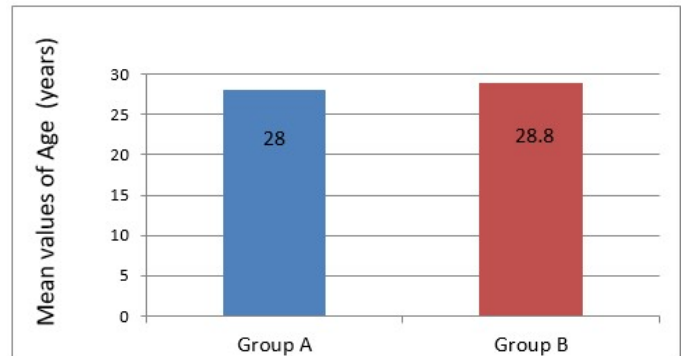
Whitney test for both groups (A&B) before beginning of the study. Data were Investigator's Global Assessment scale (IGA) and for number of acne. Statistical package for the social sciences computer program (version 20 for Windows; SPSS Inc., Chicago, Illinois, USA) was used for data analysis. P less than or equal to 0.05 was considered significant.

**General Characteristics of the participants:** As shown in table (2) and (figures 14-17 The mean ± SD of age of groups A and B were (28±5.6) and (28.8±5.7) years respectively, the mean ± SD of weight were (79.6±9) and (77.3±5.9) kg respectively, the mean ± SD of height were (157.3±7.6) and (155.4±6.4) cm respectively and the mean ± SD of BMI were (31±6.7) and (32±1.6) kg/m<sup>2</sup> respectively. There were no statistical significant difference between the mean value of age, weight, height and BMI of both groups (p>0.05).Table (2) and Fig. (1-4).

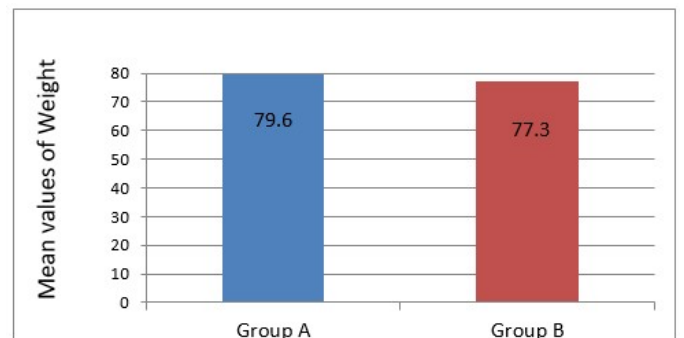
**Table 2. Mean values of physical characteristics of both groups (A&B)**

Demographic data	Group A	Group B	t-value	p-value
Age (years)	28±5.6	28.8±5.7	-0.445	0.659
Weight (kg)	79.6±9	77.3±5.9	0.958	0.344
Height (cm)	157.3±7.6	155.4±6.4	0.875	0.387
BMI (kg/m <sup>2</sup> )	31±6.7	32±1.6	-0.735	0.467

Data was expressed as mean ± standard deviation, p- value: significance



**Figure 1. Mean values of age measured in both groups (A&B)**



**Figure 2. Mean values of height measured in both groups (A&B)**

**Normality test:** Data were screened for normality assumption, homogeneity of variance, and presence of extreme scores. Shapiro-Wilk and Kolmogrov-smirnov tests for normality showed that IGA scale was not normally distributed (p>0.05).

**The impact of Polarized Light therapy on IGA**

**Median values of IGA pre-treatment for both groups (A and B):** The pre-treatment median (IQR) value of IGA of group (A) was 2.5 (2-3.75) and that of group (B) was 3 (2-3). There was no statistical significant difference in median value of IGA between groups (A and B) pre- treatment (p = 0.445) (Table 3 and Fig. 18).

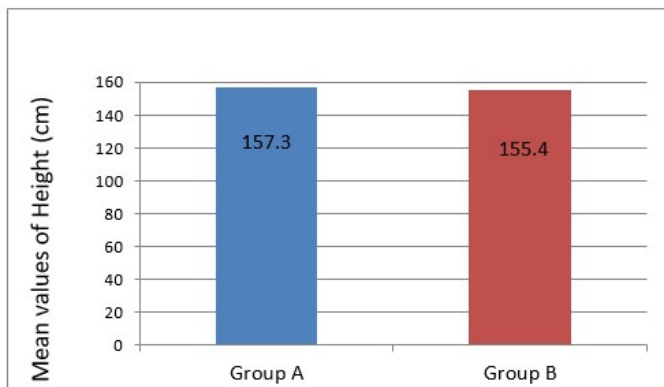


Figure 3. Mean values of height measured in both groups (A&B)

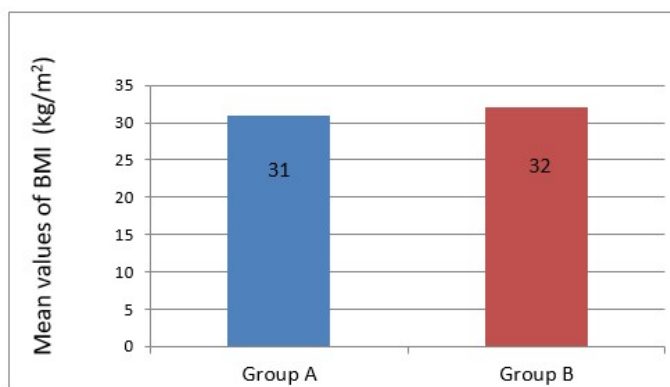


Figure 4. Mean values of BMI measured in both groups (A&B)

Table 3. Median values of IGA pre-treatment for both groups (A and B)

Pre treatment	IGA	u- value	p-value	Sig
	Median (IQR)			
Group (A)	2.5 (2- 3.75)	171	0.445	NS
Group (B)	3 (2-3)			

IQR: Interquartile range p values: Probability values  
U value: Mann-Whitney test value NS: Non significant

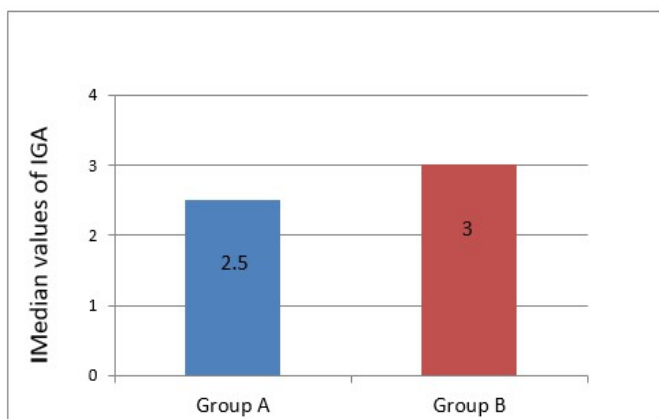


Figure 5. Median values of IGA pre- treatment for both groups (A and B)

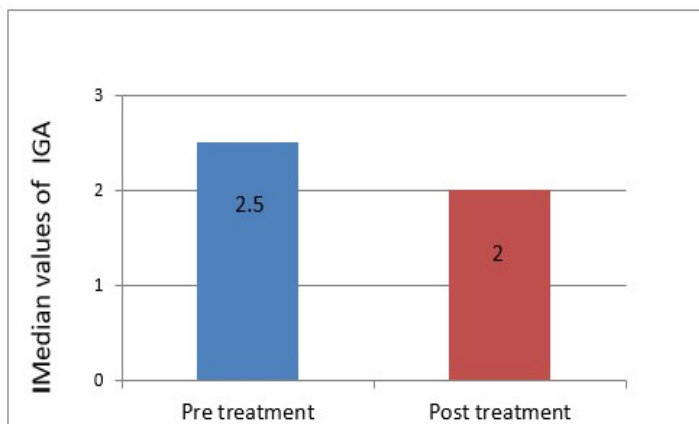


Figure 6. Median values of IGA pre and post- treatment for group (A).

Table 4. Median values of IGA pre and post- treatment group (A)

IGA Group A	Pre treatment	Post treatment	% of improvement	z-value	p-value	Sig
	Median (IQR)	Median (IQR)				
	2.5 (2-3.75)	2 (1-3)		-2.5	0.012	S

Z- value: Wilcoxon signed ranks test value  
p-value: Probability level  
S: Significant

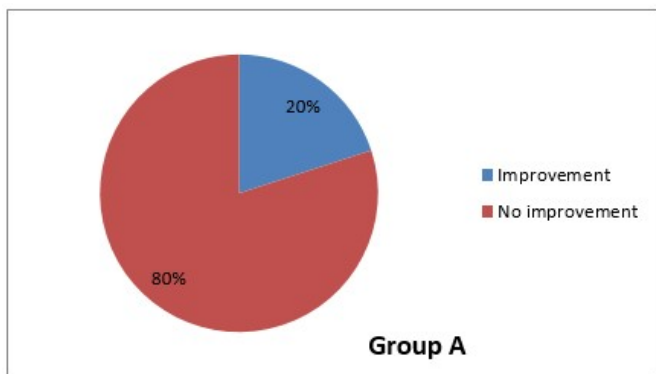


Figure 7. Percentage of improvement of IGA post-treatment for group (A)

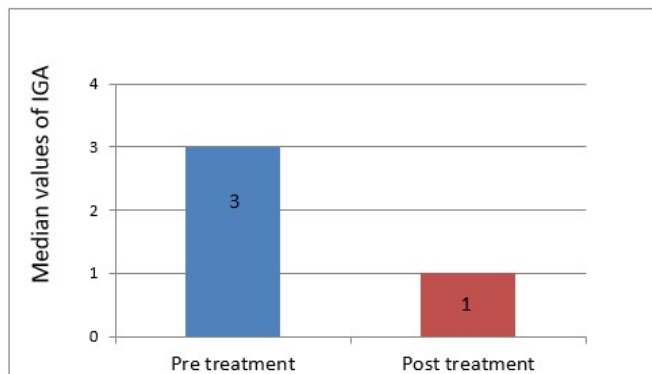


Figure 8. Median values of IGA pre and post-treatment for group (B)

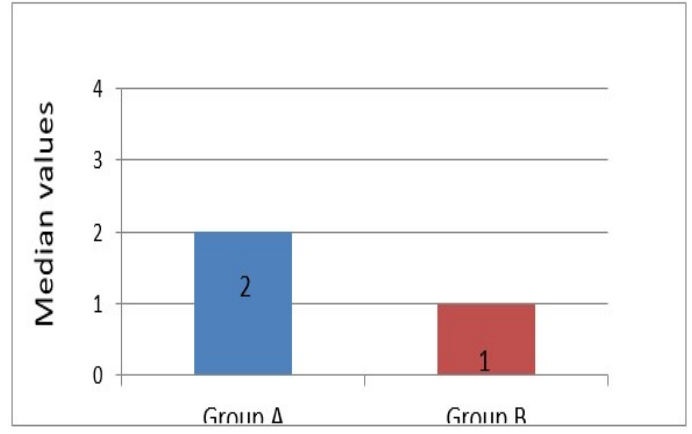
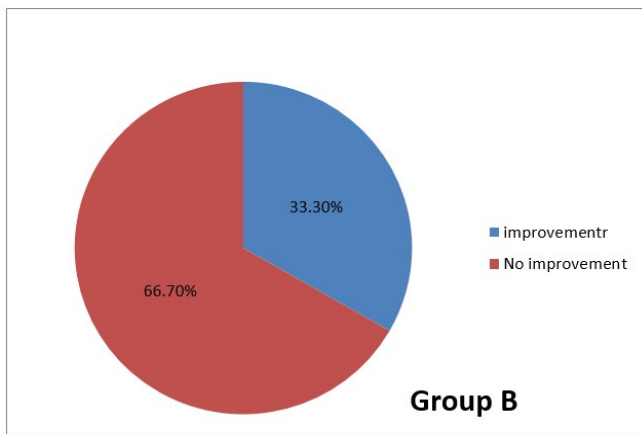


Figure 9. Percentage of improvement of IGA post-treatment for group (B) Figure 10. Median values of IGA post-treatment for both groups (A and B)

Table 6. Median values of IGA post-treatment for both groups (A and B)

Post treatment	IGA	U- value	p-value	Sig
	Median (IQR)			
Group (A)	2 (1-3)	121.5	0.027	S
Group (B)	1 (0.25-1)			

IQR: Interquartile range U value: Mann-Whitney test value  
 p values: Probability values  
 S: Significant

Table 7. Median values of acne number pre-treatment for both groups (A and B)

Pre treatment	Acne number	u- value	p-value	Sig
	Median (IQR)			
Group (A)	10 (5- 17)	140	0.099	NS
Group (B)	13 (11-14)			

IQR: Interquartile range U value: Mann-Whitney test value p values: Probability values NS: Non significant

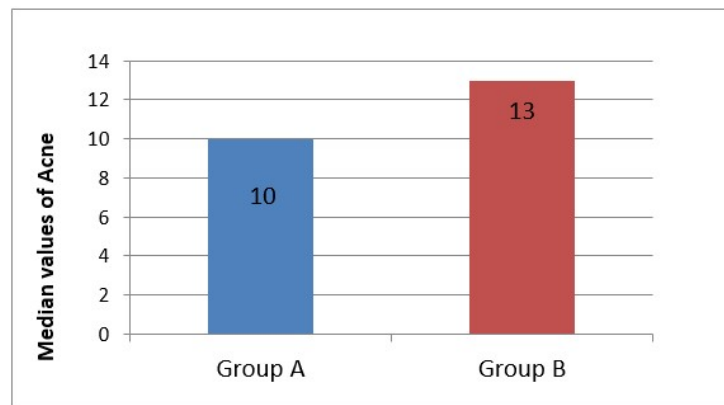


Figure 11. Median values of acne number pre-treatment for both groups (A and B)

**Median values of IGA pre and post- treatment for group (A):** The pre- treatment median (IQR) value of IGA was 2.5 (2-3.75) and that post- treatment was 2 (1-3). There was a significant statistical decrease in median value of IGA of group (A) post- treatment compared with that of pre- treatment (p = 0.012) (Table 4 and Fig 19, 20) and percentage of improvement= 20 %.

**Median values of IGA pre and post- treatment for group (A):** The pre- treatment median (IQR) value of IGA was 2.5 (2-3.75) and that post- treatment was 2 (1-3).

There was a statistical significant decrease in median value of IGA of group (A) post- treatment compared with that of pre- treatment (p = 0.012) (Table 4 and Fig 6,7) and percentage of improvement= 20 %.

**Median values of IGA pre and post- treatment for group (B):** The pre- treatment median (IQR) value of IGA of group (B) was 3 (2-3) and that of post- treatment was 1 (0.25-1).

There was a significant decrease in median value of IGA of group (B) post- treatment compared with that pre- treatment (p = 0.001) (Table 5, figure 8, 9) and percentage of improvement= 66.7 %.

**Median values of IGA post- treatment for both groups (A and B):** The post- treatment median (IQR) value of IGA of group (A) was 2 (1-3) and that of group (B) was 1 (0.25-1). There was a statistical significant decrease in the median value of IGA of group (B) compared with that of group (A) post- treatment (p = 0.027) (Table 6 and Fig. 10).

**The impact of Polarized Light therapy on number of acne**

**Median values of acne number pre- treatment of both groups (A and B):** The pre-treatment median (IQR) value of acne number for group (A) was 10 (5-17) and that of group (B) was 13 (11-14). There was no significant difference in median value of acne number

between both groups (A and B) pre- treatment ( $p = 0.099$ ) (Table 7 and Fig. 11).

**Median values of acne number pre and post- treatment for group (A):** The pre- treatment median (IQR) value of acne number of group (A) was 10 (5-17) and that of post-treatment was 8 (1-13). There was no statistically significant difference in median value of acne number of group (A) post-treatment compared with that of pre-treatment value ( $p = 0.064$ ) (Table 8 and fig. 12) and percentage of improvement= 20 % (fig. 13).

**Median values of acne number pre and post- treatment for group (B):** The pre- treatment median (IQR) value of acne number of group (B) was 13 (11-14) and that of post- treatment was 2 (2-5). There was a statistical significant decrease in median value of acne number of group (B) post- treatment compared with that of pre- treatment value ( $p = 0.001$ ) (Table 9 and Fig. 14) and percentage of improvement= 85% (Fig. 15).

**Median values of acne number post- treatment for both groups (A and B):** The post- treatment median (IQR) value of acne number of group (A) was 8 (1-13) and that of group (B) was 2 (2-5). There was a statistical significant decrease in median value of acne number of group (B) compared with that of group (A) post- treatment value ( $p = 0.034$ ) (Table 10 and Fig. 16).

## DISCUSSION

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age with a prevalence up to 20%. In conjunction, with its reproductive, metabolic, and psychological features, PCOS poses a significant public health issue (Azziz et al., 2016). It is primarily characterized by signs and symptoms of androgen excess and ovulatory dysfunction, disrupting HPO axis function (Escobar-Morreale, 2018). It is estimated that 72% to 82% of women with PCOS are seen with cutaneous signs classically associated with hyperandrogenism (HA) such as acne, hirsutism, and androgenic alopecia (AGA) (Schmidt and Shinkai, 2015). Acne is a pilosebaceous unit disorder with lesions on the face, neck, back and pectoral region. The importance of androgens in the pathogenesis of acne is well documented (Ozdemir et al., 2010). Sebaceous glands are highly androgen sensitive, and, although the number of sebaceous glands remains approximately the same throughout life, their activity and size vary according to age and circulating hormone levels. The sebaceous glands, as well as the sweat glands, account for the vast majority of androgen metabolism in the skin (Deplewski and Rosenfield, 2000). Polarized phototherapy (PPT) is a relatively new therapeutic approach. A linearly polarized, polychromatic light was used where the light waves move in parallel planes, producing a narrow, concentrated beam. Unlike ordinary light where its waves oscillate in all directions, polarized light comes from refraction of common light through special laminated mirrors to be passed through a photo filter system (Monstrey et al., 2002). Bioptron light therapy can be used both as a complementary treatment to support conventional medical methods and as a monotherapy for specific indications (Sattayut et al., 2009). Bioptron light therapy stimulates the higher quality of granulation by revascularization and collagen production via the following sequence: release of mediators leads to release of cytokines (IL1&IL VI) and release of growth factors, which lead to Keratinocyte stimulation, epithelium formation, endothelial cell stimulation, and angiogenesis stimulation (Song et al., 2015). Therefore, the current study was conducted to determine the effect of Polarized Light Therapy on acne vulgaris in women suffering from polycystic ovarian syndrome. Forty participants were diagnosed as having PCOS suffer from inflammatory acne vulgaris in their face for more than 3 months. They were divided randomly into two groups equal in number (A&B). Group (A) control group ( $n=20$ ) received medical treatment only (topical retinoid once daily, oral antibiotics in form of doxycycline 100mg twice daily and topical

benzoyl peroxide twice per day) for four weeks and group (B) study group ( $n=20$ ) received polarized light therapy for 30 minutes / session (15 minute on each side of the face), 3 times/ week for four weeks in addition to the same medication as in group (A). All participants in both groups (A&B) were evaluated before starting and at the end of the study using the Investigator's Global Assessment of scale of Acne (IGA), and photographic method for assessment of Acne.

**The results of this study revealed that:** Group (A) showed that there was a statistical significant decrease in the median value (IQR) of IGA post treatment compared to that of pretreatment value ( $P=0.12$ ) with percentage of improvement 20%. Also, in Group (B) there was a statistical significant decrease in the median value of IGA post-treatment compared to that of pre-treatment value ( $P$  value = 0.001), with percentage of improvement of 66.7%. Also, there was a statistical significant decrease in the median value of IGA post-treatment in favor to group (B) with ( $P$  value = 0.27). Regarding the impact of polarized light therapy on number of acne, the results of this study that the percentage of improvement in group (B) was 85 % ( $P$  value = 0.001), while in group (A) it was 20% ( $P$  value = 0.046). The significant improvement in group (B) could be explained by the effect of Bioptron light therapy which has a positive stimulating effect on specific skin cells known as fibroblasts, resulting in the production of collagen and elastin. Also it causes the skin to heat up because it contains infrared light. This exogenous light is interpreted as irritation by thermo-receptors and leads to activation of reflex and local reactions, improves microcirculation and nutrition of exposed tissues and has anti-inflammatory action. Light changes the sensitivity of the skin, increases tactile sensitivity and reduces sensitivity to pain (Nicolaou et al., 2020). The effects of PLT was assessed over 3 weeks in regards to inflammation, re-epithelialization, neovascularization, fibroblast proliferation and collagen fiber deposition. PLT was shown to increase collagen deposition, enhance the inflammatory response and improve vascularization of wounds (Oliveira et al., 2011).

Bioptron Light phototherapy can be used in various types of conditions, such as: skin disorders, upper airway infections (common cold, vaginal infections) and tonsils, tonsils bones (Rifai, 2010). Also, it has been recommended for the management of lateral elbow tendinopathy, chronic venous and pressure ulcers and acne vulgaris (Jasmina et al., 2010). The therapeutic use of polarized light has deservedly gained its place in literature through various studies as a promising treatment equal to that of lasers (Tondiy et al., 2015). The results of this study agreed with that of Abdou et al., 2019, who studied the effect of Bioptron in treating cracked nipples in breastfeeding woman and reported that there was a statistically significant decrease in pain and significant improvement in healing of cracked nipple. Also, the result of this study comes in agreement with that of stasinopouls et al., 2005, who found that bioptron light therapy was an effective treatment in treating carpal tunnel syndrome during pregnancy after 2 weeks of treatment. The result of the current study comes in support with the results of Mohamed et al., 2016 who examined the effect of light therapy on episiotomy in post-partum women and concluded that polarized polychromatic non-coherent light was considered as one of the efficient alternative methods in accelerating wound healing and pain relief after episiotomy. Also, the results of this study were in the line with that of Eldeen et al., 2014 who examined the effect of polarized light versus light-emitting diode on healing of diabetic foot ulcer, and the results showed a significant reduction of surface area and depth of ulcer with higher improvement in favor of polarized light group, and concluded that, polarized light therapy seems to be more effective in accelerating healing of grade II diabetic foot ulcer than light-emitting diode therapy. In the other hand, the results of this study comes in contradiction with that of Samir et al., 2015 who studied the effect of polarized light as an adjuvant therapy on wound healing process in prediabetics, and concluded that polarized light therapy has a limited effect as an adjuvant therapy on healing process of deep partial thickness burn wounds in children.

## Summary

PCOS is the most common and complicated endocrine disorder in women of reproductive age, with multiple endocrine and metabolic disorders. (Durmus et al., 2016). It jeopardizes feminine identity of a woman due to alteration in her aesthetic standards in the form of hirsutism, acne, alopecia, obesity, menstrual irregularities, and infertility (Gainer and Sharma, 2019). Most women with PCOS show facial acne lesions. The leading cause of acne is excessive ovarian and/or adrenal androgen secretion, which Androgens results in overproduction of the sebum causing abnormal keratinization resulting in comedones formation (Lizneva et al., 2016). Polarized light therapy may have a role in treatment of acne as it has an anti-inflammatory, anti-bacterial effect, helps in enhancement of microcirculation, tissue oxygenation, fibroblast proliferation, composition of collagen and accelerated epithelialization (Monstrey et al., 2002). It was claimed that there are no side effects for the use of polarized light therapy because there is no ultraviolet light (UVL) in its spectrum, so there is no heating effect on the skin (Monstrey et al., 2002). This study was conducted to determine the effect of polarized light therapy on acne vulgaris in women suffering from polycystic ovarian syndrome. This study was conducted at Kasr El Aini University Hospital from June 2022 till October 2023. Forty women with polycystic ovarian syndrome suffer from inflammatory acne in their face for more than 3 months participated in this study. They were divided randomly into 2 groups equal in number; group (A) (control) consisted of 20 participants received their medical treatment in the form of topical retinoid once daily, oral antibiotics in form of doxycycline 100mg twice daily and topical benzoyl peroxide twice per day, and group (B) (study group) consisted of 20 participants received the same medical treatment as in group (A) in addition to polarized light therapy 12 sessions (3 sessions per week) each session was about 30 minutes (15 minutes on each side of the face) for 4 weeks.

Age of the participants were ranged from 20 to 35 years. Their BMI ranged from 30 to 35 Kg/m<sup>2</sup>. Participants were excluded from this study if they had history of diabetes, circulatory or sensory disorders, Using ovulation induction drugs. Had photosensitivity or a history of frequent sunburns, and any dermatological condition rather than acne vulgaris in face. All participants in group (A&B) were evaluated before starting and at the end of the study. Severity of acne were measured by using photographs and Investigator Global Assessment scale. The results of the study revealed that there was a statistical significant decrease in the median value of IGA of group (A) post-treatment compared with that of pre-treatment value ( $p = 0.12$ ) with percentage of improvement = 20%. Also There was a statistical significant decrease in the median value of IGA of group (B) post-treatment compared with that of pre-treatment value ( $p = 0.001$ ) with percentage of improvement of IGA = 66.7 %. Also, there was a statistical significant decrease in the median value of acne number in group (B) compared with that of group (A) post treatment value ( $P=0.01$ ) with percentage of improvement of 85% in group (B) rather than 20% in group (A).

## CONCLUSION

It could be concluded that the application of polarized light therapy was effective in treatment of acne vulgaris and its application with medical treatment was more effective than using medical treatment alone in management of acne in PCOS women. Limitations of This study was Physical and psychological status of the participants. Also, Personal and individual differences between participants. Environmental factors which may affect the participants response.

**Conflict of interest:** The authors confirmed that this article content has no conflict of interest.

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