

# Comparative Study of Diode Laser Versus Intense Pulsed Light (IPL) for the management of Hirsutism in Sulaimani Government

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## ABSTRACT

*Hirsutism defined as excessive hairiness, hirsutism can negatively affect individuals, particularly females. Hirsutism has been attributed to the presence of high levels of androgen. There are different procedures to treat hirsutism; however, diode laser and intense pulsed light (IPL) are the most common methods. The present study was carried out in order to compare diode laser and IPL procedures regarding their effectiveness in decreasing hirsutism, patient satisfaction, and pain level. The present cross-sectional prospective study was carried out on 66 patients with hirsutism who regularly visited a dermatology clinic in Sulaimani, Kurdistan Region-Iraq over a period of 8 months from February to October 2020. They were assigned into a diode laser group (n=35) and an IPL group (n=31). Each patient had 8 laser sessions, once every month. Required data were collected through photos taken in every session. The collected data were analyzed through Statistical Package for the Social Sciences (version 22.0). The patients' mean age was 33.12 years. Over 53% and 35% of them had a family history of first- and second-degree hirsutisms, respectively. Both procedures led to good and very good primary outcomes in 43.9% and 36.4% of the patients, respectively. Patient satisfaction was high in 42.4% of them. Our research has showed that IPL has fewer side effects (p-value<0.001), better primary outcome (p-value<0.001), and better patient's mood (p-value<0.002). The two procedures led to similar level of patient satisfaction, and they were not significantly different in this regard (p-value=0.3). In terms of hair types, the two procedures were significantly different (p-value<0.001), such that IPL was better for thin hair, while diode laser for thick hair. Both diode laser and IPL procedures were found to be efficient in terms of primary outcome, patient*

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*satisfaction, and patient's mood. However, diode laser is proper for dark-skinned patients with thick hair and IPL for thin hair. Diode laser was found to be better choice for our patients because most clients in the region are dark-skinned with thick hair.*

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## 1. INTRODUCTION

Hirsutism can be defined as an excessive hairiness [1] according to the local Kurdistan the ministry of health (MOH) report, it is the most prevalent endocrinal condition among female in our society, which causes enormous psychological effect on the quality of life of our patients. The excessive hairs will be on the face, chest and back of the patients. The excessive hairs in women is present in male pattern characteristic [2]. Excessive hairiness is due to presence of high level of androgen which can be due to serious or most likely non-serious medical condition [3]. Hirsutism, in some women can cause severe psychological effect on general wellbeing of the patient. It can be seen as loss of femininity and may produce stress, anxiety or even depression. Due to its cosmetic effect, it may lead to isolation of the patient [4]. The main purposes in treating patients with hirsutism are to exclude serious medical problem and manage the condition accordingly [5]. The majority of women have minor hirsutism which can be due to high or low level of androgen. It is obvious that androgens are produced in the adrenal gland or the ovaries. It is clear that the most dominant and active form of androgen is testosterone which is produced by the male testis [6]. In treating patients with hirsutism, it is important to tell the patient carefully the cause of the problem and reassure the patient that hirsutism does not mean loss of femininity [7]. In our community, the majority of hirsutism is Idiopathic hirsutism which means the exact cause of hirsutism is not known. However, if the cause is known the direction of intervention should be towards the underlying causes [8]. Treatment of hirsutism can be either by cosmetic method or systemic therapy. Cosmetic method has immediate result however systemic therapy can have slow effect. In some situation we can use both systemic and cosmetic method [9]. Cosmetic method includes different type of depilation such as plucking, shaving, depilatory creams, waxing and lasers, systemic therapies include medication that either decrease androgen production by the ovary and adrenal gland or inhibit the action of androgen in the skin. Systemic therapy medications can be spironolactone, flutamide, finasteride, oral contraceptive pills, cyproterone acetate and insulin sensitizer such as metformin or rosiglitazone [10]. Laser therapy is the best option for treating hirsutism. In some situation hirsutism can be treated only with laser without any other modality of treatment [11]. Photothermolysis is the basic principle of hair removal lasers therapy, generally through penetration of laser energy to the components of the hair follicle [12]. For the darker terminal hair, diode laser is considered one of the most effective type of laser, but its effectiveness on light lighter terminal is less, it has fast repetition rate, and it covers larger area allowing treatment of the whole body easier. In contrast, Intense pulsed light (IPL) devices the second most common technique used in our country for hair removal. This laser equivalent considered a difficult technique and requires a trained and efficient rephination to operate, and its mechanism and concept are the same of selective photothermolysis. There are limited reports available in our country to compare these two methods of treatment for hirsutism. Therefore, the aim of the current research was to compare the diode laser versus intense pulsed light (IPL) devices for the treatment of hirsutism in single center in Sulaimani city.

## 2. METHODS AND MATERIALS

Sixty-six patients were recorded in this cross-sectional prospective study. The patients were routine visitor to dermatology clinic center / Sulaimani city, and they all complains of having unwanted hair on their face. They wanted to have laser treatment. In our society the patient is usually skin type III- V. Recorded informed consent were taken from all patients prior to the research. Acceptance of Sulaymaniyah directorate of health ethical committee was taken prior the start of the study. Exclusions criteria were; Vellus hair which is non pigmented fine hairs, any recent laser treatment or electrolysis to face, pathological cause of hirsutism, gross hormonal dysfunction, Pregnancy, history of keloid or hypertrophic scars, and Immunosuppression patient. The patients were split into two main groups of 35 patients for Diode laser in group I. Diode laser is Lumenis type laser which is the universal leader in the field of laser based medical solutions for esthetic, surgical and optic care applications. It is a Germany made equipment. The rest 31 patients for IPL laser in group II IPL laser is Ellipse laser which is Intense Pulse Light it is a Selective Waveband Technology (SWT) for permanent hair reduction in all skin types. The machine is manufactured in Denmark. Prior to carrying out the laser treatment, photograph was taken of the site of the hirsutism. The patients were having laser session on monthly basis. The study started on 1/2/2020 till 1/10/ 2020, total of 8 session were performed. Photographs were also taken on monthly laser session to check the amount of hair reduction. Full detailed history, pelvic ultrasound, hormonal test was performed to exclude any pathological cause of hirsutism. For the safety reason, all patients were told to apply cold pack on the site of the laser immediately post laser session, they were instructed to avoid sun exposure for few days and informed about the importance of sun cream. The fluence and duration of the pulse laser were performed according the patient's tolerance to the laser and side effects post laser treatment. The patients were advised to avoid shaving or applying depilary cream 14 days prior to the next session for the sake of checking the amount of hair reduction. The two group were compared for the effectiveness and safety of the lasers at the end of the treatment. Efficacy were ranked into four categories from category 1; very good- 80% reduction of hair, category 2; good-50-80%, category 3; fair-25-50% and category 4; poor- <25%. The primary end result was the percentage of hair reduction on each session.

## 3. RESULTS

Sixty six patients were enrolled in the current study, the mean age of the patients was Mean  $\pm$  Sd (33.12  $\pm$  7.76), most of the patients were their age less than 40 years (83.0%), inside city (71.2%), had first degree of family history 53.0%, and thick hair type (66.7%)

**Table 1:** Demographical characteristic of the patients

Patients demographic	
<b>Age groups in years</b>	
<b>Mean <math>\pm</math> Sd (33.12 <math>\pm</math> 7.76)</b>	
20 – 30	27(40.9)
31 – 40	28 (42.4)
41 – 50	11 (16.7)
<b>Address</b>	
Inside	47 (71.2)
Outside	19 (28.8)
<b>Family history of first degree</b>	
Yes	35 (53.0)
No	31 (47.0)
<b>Family history of second degree</b>	
Yes	26 (35.0)
No	31 (47.0)
<b>Hair type</b>	
Thick	44 (66.7)

Table 2. shows the general outcome of both procedures on 66 patients. In general, more than half of the patients were not shown side effect of the procedure, 74% of the outcome of the procedure were good and very good, in addition more than 80 % of the patients were satisfied for the both procedures, and 60 % of them feel happy post procedure.

**Table 2:** General outcome of procedures

<b>Side effect</b>	
None	35 (53.0)
Pain	16 (24.2)
Pain and redness	6 (9.1)
Redness	9 (13.6)
<b>Primary outcome</b>	
Very good	29 (43.9)
Good	24 (36.4)
Fair	9 (13.6)
Poor	4 (6.1)
<b>Patients satisfaction</b>	
Very satisfy	28 (42.4)
Satisfy	29 (43.9)
Unsatisfied	9 (13.6)
<b>Patients mood/pre</b>	
Depress	35 (53.0)
Stress	31 (47.0)
<b>Patients mood/post</b>	
Very happy	26 (39.4)
Happy	40 (60.6)

Table 3 shows the relation between laser types and the side effects of procedures post treatment. It is cleared that LPL show significant less side effect compared to diode procedure. In term of pain and redness. P value <0.001

**Table 3:** Side effects related to the laser procedure

Side effects		Laser type		P-value
		Diode	IPL	
None		8	27	<0.001
		22.9%	87.1%	
Pain		13	3	
		37.1%	9.7%	
Pain and redness		5	1	
		14.3%	3.2%	
Redness		9	0	
		25.7%	0.0%	

Table 4 shows the relation between laser types and the outcomes of procedures post treatment. It is cleared that LPL show significant good and very good outcome compared to diode procedure. In P value <0.001.

**Table 4.:** Primary outcome related to the laser's procedure

		Laser type		P-value
		Diode	IPL	
Primary outcome	Very good	25	4	<b>&lt;0.001</b>
		71.4%	12.9%	
	Good	6	18	
		17.1%	58.1%	
	Fair	4	5	
11.4%	16.1%			
Poor	0	4		
	0.0%	12.9%		

Table 5 shows the relation between laser types and satisfaction of the patients of procedures post treatment. It is cleared that LPL and diode showed no significant differences in term of patients' satisfaction in P value <0.3.

**Table 5:** Patient satisfaction with the laser procedure

		Laser type		Total
		Diode	IPL	
Patients satisfaction	Very satisfy	17	11	0.3
		48.6%	35.5%	
	Satisfy	15	14	
42.9%		45.2%		
Unsatisfied	3	6		
	8.6%	19.4%		

Figure 1 shows the before and after-treatment of a 24-year-old female post eight sessions of diode laser. The percentage of the hair reduction was 80%



**Figure 1:** Before and after-treatment photo of a 24-year-old female post eight sessions of diode laser

Figure 2 shows the Before and after-treatment photograph of a 30-year-old women post eight sessions of LPL laser. The percentage of the hair reduction was 90%



**Figure 2:** Before and after-treatment photograph of a 30-year-old woman after eight sessions of LPL laser

Table 6 shows the relation between laser types and patient's mood of procedures post treatment. It is cleared that LPL showed significant difference in term of the patient's mood after the procedure, as most the patients were shown happy impression after the procedure P value 0.002.

**Table 6:** Patient's mood in related to the post lasers procedure

		Laser type		P-value
		Diode	IPL	
Patients mood/post	Very happy	20 57.1%	6 19.4%	<b>0.002</b>
	Happy	15 42.9%	25 80.6%	

#### 4. DISCUSSION

Nowadays, both the intense pulsed light (IPL) and the diode laser are quite popular and broadly employed by dermatologists. Although many research studies have shown that these two methods are quite efficient and safe in removing unwanted hair, these two technologies have been compared in very few studies. In this regard, different results have been reported by various studies. For example, Ormiga et al compared diode laser and the IPL and introduced them as safe and effective methods that can lead to lasting elimination of undesirable hair [13]. However, the results of a similar study performed by Cameron et al revealed that, compared to the IPL, the diode laser led to better results in terms of the objective reduction of hair [14]. Similarly, the results of the study conducted by Haak et al to compare diode laser and IPL effectiveness in removing facial hair indicated that these two methods are significantly different [15]. In this regard, the results of the present study revealed that the hairy women with normal range of testosterone had equal response to facial hair treatment through diode laser and IPL. The results also showed no sufficiently great difference in the patients' level of satisfaction; however, the level of pain described by them was invariably greater in treatment with IPL compared to diode laser.

Over half of the participants in the present study had a history of first-degree hirsutism and 35% had a history of second-degree hirsutism. In this regard, it has been stated that hirsutism often develops on a familial basis because of the familial clustering of some of its underlying diseases like polycystic ovarian syndrome (PCOS) or congenital adrenal hyperplasia (CAH). Also, it has been shown that 35% of the mothers and 40% of the sisters of the participants with PCOS were affected by PCOS. Often, a positive family history of hirsutism is found in half of the people. That is why the etiology of excessive growth of hair can be assisted by obtaining a family [16].

As reported by half of the participants, the application of none of the products was associated with any side effects. In addition, about one-fourth of them reported pain, less than one-tenth pain and redness, and 13.6% complained of redness. In line with this finding, Atta-Motte and Załęska pointed out that treatment with a diode laser is commonly associated with bruising, blisters, excessive swelling, scarring, damage to the natural skin texture, and discomfort [17]. In the present study, the primary outcome of therapies was reported by over 80% of the participants to be good or very good. In this regard, the results of the study conducted by Khodaeyani et al indicated that the treatment outcomes from IPL, diode lasers, Alexandrite, and ruby laser were comparable, while ND:Yag laser lead to less satisfactory outcomes. They also concluded that IPL successfully treated the chin and neck within three sessions, and the outcomes were 3.94 times better than those of the ruby laser. Additionally, they observed that diode laser and IPL had the same level of efficacy [18].

More than 86% of the participants declared that they were satisfied or very satisfied with both treatment procedures. Different studies have reported a high rate of satisfaction in treatment with both methods of diode laser and IPL. For example, Zaleska and Atta-Motte [19] concluded that unwanted hair might not be permanently removed; however, IPL is more favored in terms of the patient satisfaction rate. However, they demonstrated that there was no important difference between one or two sessions of removing auxiliary hair through IPL. Moreover, they found no statistically significant differences in hair reduction rates between the groups treated with IPL and diode laser [19].

The outcome of the present study showed that the diode laser has higher side effects in comparison with IPL procedure. In this regard, Zaleska and Atta-Motte concluded that skin color and hair thickness have a significant effect on the rate of side effects and the efficiency of IPL and diode laser procedures. They also reported that treatment with IPL before the diode laser can have a negative impact on the treatment efficiency [19].

In the present study, comparing unwanted hair removal outcomes of treatment with IPL and diode laser procedures has shown that IPL leads to remarkably better outcomes than diode laser. In this regard, Puri recommended the diode laser for patients with dark hair because this procedure has a narrow margin of safety, in which appropriate pre- and post-procedure cooling is recommended. In addition, although the diode laser is associated with more side effects, it is more effective than other procedures [20].

According to the results of the present study, it was concluded that there were not any differences between the diode laser and IPL procedure in terms of patient satisfaction. As shown by the results of a study conducted by AL-Hamamy et al, both diode laser and IPL are effective in increased duration of hair regrowth, hair diameter, hair density, and hair reduction. However, they reported that treatment with IPL is associated with higher levels of pain compared to with laser. Also, diode laser procedure results in more post-treatment side effects like burn, hyperpigmentation, and erythema in comparison with IPL. Finally, AL-Hamamy et al observed a higher rate of patient satisfaction among those treated with IPL, compared to the diode laser, although the pain level associated with treatment through IPL resulted in more pain [21].

A large number of IPL devices exist; therefore, it is to some extent difficult to select appropriate parameters. Moreover, there is less experience published with the use of IPL devices. Additionally, compared to laser devices, IPL devices are harder to use and require a very experienced and skilled clinician to employ. Furthermore, the energy produced by a lamp in IPL devices is less powerful and more diffuse; therefore, it is proper to use for fairer skin types [22]. However, treatment with IPL devices is more cost-effective. IPL devices are also computer-driven, leading them to be more precise and tremendously versatile [19].

In the present study, patients with thicker hair and darker skin color reported more satisfactory outcomes with the diode laser. While the IPL procedure was more appropriate for thin hair. In line with this finding, Jo et al concluded that hair regrowth decreases remarkably in treatment with IPL; however, permanent removal of auxiliary hair cannot be obtained in patients with thicker hair. Only a small percentage of the IPL energy is effectively absorbed by the hair

follicle to achieve hair reduction; therefore, more and regular treatments are required, as thicker and deeper hair follicles might not be reached and disabled effectively [23].

## 5. CONCLUSION

In conclusion both diode laser and IPL are successful modes for hair reduction. However, for skin type 3 and 4 with dark hairs. But, since the diode laser has a narrow margin of safety, proper preparation of the patient is needed before and after the procedure. However, in competent hands this type of procedure is economical and more cost effective. It was seen that for our patients, diode laser was the excellent type of laser affecting coarse thick hairs, while IPL laser was not applicable for patients who have brown or black skin as it targeted only fine and thin hairs.

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