

## Taif community's perception of biological health hazards of laser radiation, KSA

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### Abstract

#### *Background*

It's risky to use used laser equipment. Consequences might range from minor skin burns to permanent eye and skin damage. Lasers can harm biological systems by thermal, acoustic, and photochemical processes.

#### *Aim*

To assess the Taif Community perception about Biological Health hazards of laser Radiation.

#### *Method*

Design of a community-based study using descriptive screening. performed between April and June 2022. The Al-Taif University ethical committee had approved the study prior to data collection. (43-596 ), The survey was prepared and then sent to the participants via mobile phones. 3079 participants (male and female) The participants of the study were between the ages of 20 and 51.

#### *Results*

Most of the ages that use laser are young people between the ages of 18 to 28 years(54.2%), There is no statistically association between age and awareness of laser hazarded (P.783) .most of them are university educated (764%). the results showed that female use lasers male than men (89.2%). Cosmetic lasers were used more than other types of lasers 24%, and most of them were for hair removal from the body 82%. And there is association between level of education and t laser used (P.047), educational level and using cosmetic laser (P.053) and using laser and the knowing of its health hazard (P.000) Conclusion : Most participants knew the health hazards of laser uses, and despite that, more than half of the sample recommended using lasers. I recommend doing analytical research to find out why they recommend using lasers despite their knowledge of the health risks.

**Keywords:** Health effect from use of laser, Socio demographic, Type and Duration of uses .

### Introduction

Laser equipment that is misused could be harmful. Effects might range from minor skin burns to permanent eye and skin damage. Lasers can harm biological systems by thermal, acoustic, and photochemical processes. A rise in temperature following the absorption of laser radiation results in thermal consequences. The length of the exposure, the wavelength and energy of the beam, as well as the area and type of tissue exposed to the beam, all affect how much damage is done. (Merriam Webster et al., 2021). Acoustical impacts are caused by a mechanical shockwave that propagates through tissue and eventually causes tissue damage. This occurs when the laser beam causes localized tissue vaporization, producing a shockwave similar to the waves created when a rock is thrown into a body of water. (Taylor and Nick

**2000)** For most of the non-stop laser sources, laser radiation is made of a couple of slim frequency lines, at unique wavelengths corresponding to vigorous transitions of the amplifying medium. In the case of pulsed sources, mild radiation is constituted of many frequencies contained in a spectral envelope, whose width can be of up to heaps of nanometers. For example, a supply handing over mild pulses of 10 fs emits a radiation whose spectral width is equal to ninety nm. the mild emitted by using a laser is in the “optical” area of the electromagnetic spectrum. (Sajan George et al., 2022)

The majority of lasers used in the clinical setting generate UV light and are primarily used for diagnostic and therapeutic purposes. Examples of laser applications in health care facilities for athletes include: Among the lasers used for corneal refractive surgery is the argon fluoride laser, which emits UV-C light; Far ultraviolet lasers are UV rays with a wavelength of 193 nanometers that are frequently utilized in ablation (the removal of damaged tissue) surgery. The following are some additional tasks that lasers are frequently employed for in the construction industry: A non-UV emitting laser called a helium-neon laser produces a pencil-thin beam. It frequently aids in the precise alignment of objects in surveying and construction; Lasers that emit carbon dioxide are frequently employed for precise cutting. (Girish Bhatt et al., 2022).

Depending on the type of light emitted, lasers' relative fitness hazard varies dramatically. The low electricity of laser emissions makes them typically safe to find in consumer goods. Yet, there are numerous health risks associated with using specialized lasers, which create more excessively gentle beams. (Milad Soluki et al., 2022). The threats posed by laser beams and non-beam hazards are the two different categories of laser hazards. Burns to the skin, eyes, and pores are among the hazards associated with laser light exposure. Non-beam risks are connected to the laser equipment or the dangerous materials released from the laser equipment, as well as fumes emitted from materials exposed to laser beams, such as laser-plumes produced during surgical procedures. Risks associated with laser use include: unintentional eye exposure during alignment, crooked laser beam, inadequate eye protection, faulty equipment improper handling of high-voltage systems and the use of unproven tools incorrect tool restoration after provider (Farivar S et al., 2014). Laser technological know how is nevertheless experiencing gorgeous improvements regarding concurrently the beam characteristics, the excessive powers, however additionally the dimension of the supply system. this explains the unfold of laser science to various domains, such as telecommunications, medicine, vital physics. Consequently, to this variety of applications, one knows the necessity to teach laser sources customers to laser safet. (Smalley PJ, 2011)

Despite the many uses of lasers in the community, there are no studies conducted in the Taif city to measure the percentage of community knowledge about the health effects of using lasers. Thus, the researcher came up with the idea of research.

## **Material and method**

### ***Study design:***

Descriptive, community-based study; the purpose of this design was to assess the Taif Community perception about Laser health hazards.

### ***Setting:***

The study was conducted at a Taif city use public electric survey send by phone or email

### ***Study population***

The target population of this study are western region citizens of Saudi Arabia “Taif”, male and female, above 17 years

### ***Sample size and procedure***

Convenience non-random sampling will include during the study period. out of 3079 individuals who met the requirements for inclusion. Send the closed end quainter by phone or email, and after receiving a reply, return it to the researcher. The study was carried out at Taif, a city and governorate in Saudi Arabia's Makkah Province. With a population of 688,693 in 2020, Ta'if City would rank as the sixth most populated city in the kingdom. It is situated at an elevation of 1,879 m (6,165 ft) on the slopes of the Hejaz Mountains, which are a part of the Sarawat Mountains.

### ***Study variables:***

Socio demographic, health effect from use of laser, type and duration of uses.

### ***Study period:***

The whole duration of the study will be in period from January 2022 to April 2022.

### ***Data collection technique and tools:***

Questionnaire forms using a survey tool, send through Phone. A pilot study was carried out on 150 participants, the questionnaire's projected time of completion and the responses of the women as a whole were tested to see if they were appropriate for usage. This research showed that the questionnaire was appropriate.

## **Data Analysis and presentation**

All the data was organized in a master data sheet in windows Microsoft Excel spreadsheet and analyzed using SPSS – 16 with a level of significance (P) at 0.05. Frequency, percentage, and mean were used to determine the Taif community's perception of biological health hazards of laser radiation, and to ascertain the relationship between the dependent and independent variables, the chi-square test was employed.

### ***Ethical consideration:***

Before data collection, the study had received ethical approval from the Taif University ethics committee, No. 43-596. To provide participants with clarifications regarding the research, a message outlining the study's main objective was produced at the start of the survey. By agreeing to complete the survey, participants have given their consent to be included in the study. In order to safeguard the privacy of those who participated in this study, the researchers saved all of the acquired data.

### ***Acknowledgement***

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### ***Author Contributions***

All searches have been performed by the researcher

### ***Funding***

No outside funding has been provided for this research.

### Conflict of Interest

The author declares that there are no conflicts of interests

## Results

**Table (1):** Demographic data include Age, Gender, and Level of education in the study sample :*(n=3079)*

Variables	Frequency	Percent	Mean	Std. Deviation	PV
<b>Age:</b>					
18-28	1669	54.2%	1.7997	.99945	.783
29-38	589	19.1%			
39-48	581	18.9%			
>49	240	7.8%			
TOTAL	3079	100.0%			
<b>Education levels</b>					
Illiterate	5	.2%	4.67649	.67894	.047
Elementary	55	1.8%			
Intermediate	120	3.9%			
Secondary	427	13.9%			
University	2351	76.4%			
Postgraduate	121	3.9%			
TOTAL	3079	100.0%			
<b>Gender:</b>					
Male	334	10.8	1.8927	.30957	
Female	2745	89.2			
TOTAL	3079	100.0%			

The table shows the age range from 18 - 28 years old was more than half of the study sample this age was 54.2%, from age 29 to 38years old the percentage is 19.1%, in ages from 39 to 48years old the percentage is 18.9%, 48years old and above the percentage is 7.8%. the female more uses of lasers 89.2%, while the male is 10.8% so and only .2% of the study sample was illiterate,1.8%, in elementary,3.9%, in intermediate, 13.9% was secondary education, 76.4 % of the study sample was university educated and 3.9% postgraduate studies. There is no static association between age and awareness of laser hazards for laser application, there is a statically associated between educational level and the use of laser.

The table shows that the therapeutic uses were 6.2 percent, Eye treatment percentage was 47.1%, teeth medicine the percent was 40.3%, cure dermatology the percent was 7.3%, varicose disease percent only 5.3%, cosmetics was the most typically used percentage of 24% distributed to, hair removal was 82%, 4.1% was Remove pigmentation,2.7% Acne removes, while 1.6% Scare removal, Remove the birthmarks was 2.5, Eyelid eye lift was .6, Skin Freshness and Peeling skin was 4.4 %, 2.1 %., and 18.6% was technical uses from the total study sample distributed to 52.2 % was Pens tagged, 19.1 % was laser printers, 16.8% was Scanner and 11.9 was Punching and welding, While 51.2 % not used laser.

**Table (2): The purpose for using the laser in the study sample: (n=3079)**

Variables	Frequency	Percent	Mean	Std. Deviation	PV
<b>Therapeutic</b>					
Eye treatment	90	47.1			
Teeth medicine	77	40.3			
Cure dermatology	14	7.3	4.7649	.67894	.000
Varicose disease	10	5.3			
TOTAL	191	6.2			
<b>Cosmetic</b>					
Hair removal	606	82			
Remove pigmentation	30	4.1			
Acne removes	20	2.7			
Scare removal	12	1.6			
Remove the birthmarks	19	2.5	3.1599	1.03381	.001
Eyelid eye lift	5	.6			
Skin Freshness	33	4.4			
Peeling skin	15	2.1			
TOTAL	739	24			
<b>Technical</b>					
Pens tagged	299	52.2			
laser printers	110	19.1			
Scanner	97	16.8	4.4320	1.25900	.000
Punching and welding	68	11.9			
TOTAL	574	18.6			
Not used	1575	51.2			
TOTAL	3079	100	3.1611	1.03263	.001

**Table (3): Knowledge of study sample regarding health hazards of laser use:(n=3079)**

Variables	Frequency	Percent	Mean	Std. Deviation	PV
Blindness	221	7.1			
Serious injury burns	542	17.5			
Skin cancer	167	5.4			
Itching and redness	307	10.9			
Infection	95	3			
Pain and swelling	128	3.4			
Color pigmentation	143	4.6			
Picking and numbness	193	6.2			
Sterility	133	4.3	8.2023	8.34795	.000
Dry cornea	133	4.3			
Retinal injury with burns	105	3.4			
Scars	103	3.3			
Pain in eye	114	3.7			
Acne	119	3.8			
Increase skin fat	99	3.2			
Drying the uterus	100	3.7			
Subcutaneous hair growth	377	12.2			
Total	3079	100.0			

The table shows that 7.1% It is assumed that the use of the laser causes blindness, 117.5 % know it causes serious injury burns, 5.4% said it causes Skin cancer, 10.9 % think was causes Itching and redness, and 3% said it causes Infection. .3.4% Sayed the use leads to Pain and swelling, 4.6% said it causes Color pigmentation, 6.2% think it causes Picking and numbness, 4.3% think it causes Sterility, 4.3% think it caused Dry cornea, .4.3% think was caused Retinal injury with burns,3.3% think it leaves visible scars, .3.7% think it causes Pain in the eye, 3.8 percentage said it leads to Acne.,3.2% think it Increases skin fat, 3.7% said it leads to Drying the uterus and 12.2 % said use of laser lead to Subcutaneous hair growth.

**Table (4):** *The viewpoint and recommendation of the participants to use the laser despite their knowledge of the laser health hazard (n=3079)*

	Frequency	Percent	Mean	Std. Deviation
Yes	1789	58.1		
No	1290	41.9	1.4182	.49335
TOTAL	3079	100.0		

(58.1 %) from total study sample recommended us using laser while less than a half 41.9% did not recommend

## Discussion

The study was conducted at taif city by using public electric survey. The survey has been sent by phone or email. This study included 3079 participant studies randomly selected. To assess community knowledge about health effect of use of laser radiation, the study was evaluated by using questionnaires. Related to age distribution, more than half (54.2%,) were in the age range of 18 - 28 years, while only (7.8%.) in the age between 48 and above. that the age distributed in study was from 18-above 48 .There is no statically associated between age and awareness of laser hazard for laser application (p= .783).

Related to gender distribution, the female was more percentage (89.2%) while the male was (10.8%) . education level was very low percentage in illiterate ( .2% )elementary was only (1.8%) while the intermediate education was (3.9%) and (13.9%) were in secondary educated ,highest percentage found on university educated (76.4%). There is statically associated between educational level and type of laser (p= .047).

For the Purpose of use, the most purpose used was cosmetic use (24%) compared to (6.2%) was in therapeutic uses while technical uses was (18.6%) and (51.2%) from total study sample that not used the laser . there is statistically association between educational level and the use of laser in non-invasive cosmetic procedures (p=.053) .

Related to use laser for therapeutic purpose , the eye treatment was the most use Compared to other uses (47.1), follow by teeth medicine (40.3%) and cure dermatology were (5.1%) and only ( 5.3% ) use laser for varicose disease, more than half from total study sample that not used the laser .

one-third used Cosmetic laser in hair removal (82%), pigmentation removal was (4.1%) , ( 2.1%) use it in skin peeling, removing pigmentation was ( 4.1) ,and Remove the birthmarks was ( 2.5) , (.6%)lifted their eyelids. Only (4.4%) of the participants used it in refreshing their skin. According to a performed and posted find out about in January 2017, amongst 530 women college students from the utilizedsciences and Community Service

College in Dammam. Hair elimination by using laser was once the most regularly carried out beauty technique (60.8%) and about (29.5%) have skilled some facet results after the procedure<sup>19</sup>. Also, (33.1%) have had pores and skin care carried out via laser<sup>20</sup>. Another find out about about tendencies and traits of Saudi beauty surgical treatment sufferers posted in July, 2017. It mentioned that laser hair elimination (26.2%), (n=605) ranked range 1 in the pinnacle<sup>5</sup> minimally invasive strategies amongst female (Fadul et al., 2017) in my study There is statistically association between educational level and the use of laser in non-invasive cosmetic procedures (p=.053).

Technical laser has used were more than half (52.2%) from total study sample did use technical laser in laser pointers, the percent similar approximately in use laser in laser printers and in scanners were (19.1%) and (16.8%) and just (11.9%) used it in punching and welding. A report case study published in 2018 Jun 16, stated that National safety regulations are necessary to govern use of blue laser devices since they are readily available online and because they can result in severe ocular injury. The reported case involved a 14-year-old boy who, following exposure to blue laser, developed redness, discomfort, and impaired vision in his left eye. He had 4+ cells in the anterior chamber and a fibrinous reaction after a severe conjunctival injection. (Al-Hargan A et al., 2018).

The answers of the participants for their knowledge of the health effects of laser were as follows (7.1%) said it causes blindness, (17.5%) know it causes serious injury burns, Approximate percentage said it causes color pigmentation and think it causes numbness or subcutaneous hair growth were (4.6%), (12.2%) while (5.4%) said it causes skin cancer. (3%) percent think it cause Infection, retinal injury (3.4%), and (3.7%) drying the uterus, (10.9%) know it causes itching with redness, (3.4%) said it causes pain and swelling, (3.8%) think it causes acnes or sterility, (3.2%) think it increases skin fat, (3.3%) think it leaves visible scars, (3.7%) think it causes eyes pain, some partesapent said it leads to dry cornea (4.3%). there is statistical association between using laser and knowing about its health effect (P.000). in study published in October, 2018 reported a case study of a 21 year-old female presented with crypto menorrhagia and urine retention resulted from laser induced synlabia (complete fusion of labia majora) after her pubic hair removal by laser. The patient further disclosed that despite LHT, she still need additional hair removal techniques for the vulva. (Al-Hargan A et al., 2018). A study published in Feb 2018, a middle-aged women with skin type 2 developed palpable purpura over her bilateral lower extremities 2 days after undergoing hair removal with an alexandrite laser. Although LHR-induced purpura is an uncommon adverse effect that occurs in 7% of cases when utilizing LHR devices, patients with darker skin tones and treatments for the extremities are more likely to experience it. (Al-Hargan et al., 2018). (58.1%) from total study sample recommended us using laser while less than a half (41.9%) did not recommend. I suspect this is due to their obsession with beauty and aesthetics.

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