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Identification of Common and Suitable Eyeglass Frames for the Prevention of Skin Sensitivities at High Temperatures

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Abstract

Most of the time, people choose the eyeglasses frame for various reasons depending on their desire and without knowing what is suitable for their skin. The wrong frame selection contributes to the skin's sensitivity because of contact with the eyeglass frame to the face in the summer season. This research aims at identifying the most common and effective frames to prevent skin sensitivities in the summer. This study's method is first to verify the characteristics of the most common frames in Iraq and then create a questionnaire for 100 patients who came to the Optical Clinic of the College of Health and Medical Technologies – Baghdad check-up. The number of patients who suffer was skin sensitivity 95 patients due to frames made of ferrous steel, plastic, nylon materials. An ophthalmologist had already known the characteristics of the appropriate frame for the skin. Therefore, the patient's frames replaced with titanium frames, and the results tracked until the end of the summer. This study's results have found that the titanium eyeglass frame is one of the most important frames used in modern times because it is skin-friendly even in high temperatures. That means can use the titanium frames reliably without causing skin sensitivity in high temperatures. Besides, it is light, durable, strong and can be folded and returned to its original shape. In conclusion, titanium eyeglass frames are 100% a good choice for people with skin sensitivity, and ophthalmologists, dermatologists, and optometrists should be conscious of this and recommend it to their patients.

Keywords: Allergy, Contact Dermatitis, Eyeglass Frame, Laser Welding, Titanium.

1. Introduction

Eyeglasses is a typical simple way used to corrective lenses for patients with refractive error in the eye such as myopia, hyperopia and astigmatism to correct human eyes and shield the eyes (protection) from direct light and cosmetics (1). The eyeglass main part is a plastic or nylon supra, metallic, titanium frame, or other material (2). Glasses frames made of various materials, and each of them has a set of characteristic and technical features (3). The most desirable characteristics of materials used in the manufacture of eyeglass frames are processed materials, lightweight, durable, non-flammable, easy to glaze and flexible, and resistant to environmental factors (heat, cold, and water) (4). When looking for new glasses, the glasses must be comfortable, flexible, and with a longer lifetime, and aesthetically suitable in terms of colour and design. Besides, the frame material can be just as important to the customer (5, 6, and 1). The wrong frame material selection contributes to the appearance of the skin's sensitivity that comes into contact with the frame, especially during the summer (7, 8, and 9). The type of sensitivity caused by the eyeglass frame is known as contact dermatitis (CD), and it is common in Iraq during the summer due to high temperatures. It is worth noting that other materials can cause contact dermatitis, such as metal, plastic, and rubber accessories, and the same materials can be found in eyeglass frames. Recently, plasticizers, UV stabilizers, and nickel have been identified as the most common allergens (10, 11). There is a lack of understanding and identifying eyeglass frames suitable for preventing skin sensitivities at high temperatures. Wherefore, the frame material that used must be carefully examined for the patients by an optometrist before selection of the types of appropriate lenses for them, in addition to awareness of the patient's skin sensitivity and take into consideration the high temperature that may reach 60 degrees celsius in Iraq summer. Thus, the research aims to determine the role and the type of appropriate frame to protect the face from external influences; therefore, some common eyeglass frames in Iraq must have to be commended:

1. Titanium frame:

It is known as titanium alloy; its most applied characterization used to improve durability and maintain the frame's initial shape (12). The titanium frame is skin-friendly, lightweight, and 100% hypoallergenic; it makes this material a good choice for people who are allergic to other eyeglasses. However, the titanium frame includes nickel material which increases the frame weight (13, 14). Sometimes certain materials are added to titanium alloys, such as nickel, copper or iron, making them cause skin allergens. Thus, when any substance added in large amounts to titanium alloys, titanium's hypoallergenic property are diminished (15, 16, and 17).

2. Stainless steel frame:

Stand steel (metals) frame is a mineral mixture and commonly used for eyeglasses frame (18). It uses all of the light metal frames carefully crafted from stainless steel sheets with a thickness

of less than 0.5 mm (19). Stand steel frames are minimalist in appearance, sturdy, compact, and lighter than plastic frames since they are made of aluminium or titanium mixture but are not light as titanium frame. Also, these frames contain nickel or other metals that may cause skin sensitivity (12). They can be less expensive than other frames but cause sensitivity to the skin when exposed to heat (20, 21). To address this problem, most stand steel frames have a coating to protect the skin or encapsulate the parts in contact with the skin with flexible plastic parts (10, 22).

3. Plastic frame:

Plastic frames are the most popular choice because it is usually less expensive, lightweight and comes in various colours and patterns. It is not unusual for this type of frame to be sensitive. However, there have been cases of patients suffering from sensitive skin, which may be due to some metal alloys containing nickel mixed with plastics, which respond with high heat, causing skin sensitivity in some individuals (23). There are two main types of plastic made; (A) Thermosetting: the materials that become plastic when heated and harden when cooled can withstand these processes have been repeated several times. In general, it described as being flexible and used in children's frames (23, 24). (B) Thermoplastic: The plastic material is a thermoplastic polymer that can solidify. The cause of solidification is an increase in polymer bonding caused by the thermal energy of chemical reactions. In general, it described as solidifying and used in adult's frames (24, 25).

4. Supra Nylon frame:

Supra nylon frames are semi-rimless frames around the glass that outline the top portion of the lens and accentuate the face's upper half. Frames have a sleek look with a light feel and comfort, but they are more prone to cracks and chips since the lenses are semi-exposed. Likewise, the lenses' bottom edges are exposed and are secured in place using thin nylon, which means the same as frameless (25).

2. Methods

2.1 Previous studies

Based on previous research, the treating physician will depend on the characteristics listed for each substance to confirm the most suitable frame in not exhibiting sensitivity to the facial skin in the summer. Therefore, a comparison table created to serve as the basis for the treating physician's explanation of the eyeglass frames' materials. Table 1 compares the technical specifications for each frame used by Iraqi patients.

Table 1 shows the comparison of all details of each type of frame used by Iraqi patients.

Items	Titanium	Stand steel	Plastic	Nylon
1 Weight	V. Light	light	heavy	light
2 Cost	Expensive	Cheap	Cheap	Cheap
3 irritate (skin) or (not allergenic)	No	Yes	Yes	Yes
4 Flexibility	V. Flexibility	Flexibility	little Flexibility	Flexibility
5 Corrosion Resistance	Yes	less	less	less
6 Check and adjust a frame difficulty		Less difficulty	Easily	Easily
7 Cosmetic and colour	No	Yes	Yes	Yes
8 Difficult design process	Yes	No	No	No
9 Durable	Titanium	stand steel	plastic	Nylon

2.2 Questionnaire

In Baghdad, we have a medical advisory centre for examining eyesight (Optical Clinic of the College of Health and Medical Technologies - Bagdad), and we accept patients to test eyesight and frames for medical sights. A total of 100 people had received from people who wore medical glasses with various frames. During the summer, many patients experienced skin irritation due to iron, plastic, or nylon frames. Upon inspection, it discovered that the colour of the frame and the pillows had changed due to his excessive use, sweating, and a lack of elasticity, leaving a mark on the forehead, then It appearance of skin allergies on the areas of contact. According to Table 1, identify the types of frames that cause skin sensitivity for patients who wear glasses for a long time according to their work and direct them to choose the optometrist's appropriate and correct frame. Where the examining doctor tests, the frame of the glasses had changed to a titanium frame, and it has waited until the end of the summer season (Almost more than three months, which is when Iraq reports the highest temperatures, which can exceed 60 degrees celsius) and contacting patients again to determine the magnitude of the difference and improvement the effect of the titanium frame on the sensitivity of the face.

This study's focus is on Iraqi citizen; therefore, the questionnaire had initially written in Arabic for ease of communication and compatibility with Iraqi society's official language, and it had later translated into English.

3. Results and Discussion

Frames typically made of various materials, but there is always a specific material pattern, resulting in a variation in characterization. The patient is often concerned with the colour, form, and style of the frame, which refers to its aesthetics. Still, the treating physician should consider the impact of manufactured materials, including the eyeglasses frame. The questionnaire had given to 100 patients who met specific criteria, such as being between the ages of 20 - 50, due to the ease of contact and discussion with them and adherence to the instructions. The following demographic findings had obtained:

A total of 100 respondent's questionnaire, that 100% from an Iraqi citizen, with consideration, male participants were higher than the female; 63% of males and 37% of females appeared. Most of the patients were between 20-50 years old; it must have been clarified that the highest patient age was 44 years. The highest proportion of patients aged between 26 and 30 years was 40%, while the lowest proportion of elderly participants from 36 to 50 years was 4%. Participants' jobs varied, including civil engineers, surveyors, communications workers, traffic, peasants, furnace workers, and service and construction workers. When asked why they choose this frame over others frame, 53% said because they think it is better for their skin, 25% said it is because of durability, which is preferred by those working in the engineering field, 16% said it is lightweight, which adults and athletes prefer, 5% said it is for aesthetic reasons, and 1% said it is for other reasons. As a result, it concludes that patients are eager to use frames to prevent skin sensitivities at high temperatures. The demographic results detailed in Table 2.

Table 2 shows all details of the demographic respondents

Category		Sub-category	Percentages (%)	Qty
Iraqi citizen	1	Yes	100%	100
	2	No	0%	0
Gender	1	Male	63%	63
	2	Female	37%	37
Age	1	20 -25	32%	32
	2	26- 30	40%	40
	3	31-35	24%	24
	4	36-50	4%	4
Preferred the frames	1	Better for skin	53%	53

2	Durability	25%	25
3	Lightweight	16%	16
4	Aesthetic	5%	5
5	other	1%	1

When asked about the type of frames used, the results showed that 5% of patients only used titanium frames, the use of stainless-steel frame 53% and plastic frame were 24%, while the lowest percentage for the type of supra nylon frame is 18%. It appears to be the main reason patients do not use titanium frames because it is very costly compared to other frames, as shown in Figure 1.

Patients approached the presenting physician to change the eyeglasses frame due to the incidence of skin sensitivity after exposure to high temperatures, and after the doctor discussed the benefits of titanium frames, some patients agreed to change the frame, even though it was costly, in order to take care of their skin. It has waited until the end of the summer season (Almost more than three months) and contacted patients again to determine how many patients used titanium frames and the magnitude of the difference and improve the titanium frame's effect on the sensitivity of the face. The results showed that 40% of patients used titanium frames, most of them are male based on classic frames because it does not need to maintain and clean the frame from time to time; also, it is strong, flexible, and has a long life. Also, the use of stainless-steel frame and the plastic frame decreased to 25% and 14%, respectively. While the tiny increasing percentage for the type of plastic frame is 21% because it is a cheap and aesthetic frame compared to others, but it affects the skin in high temperatures, as shown in Figure 2

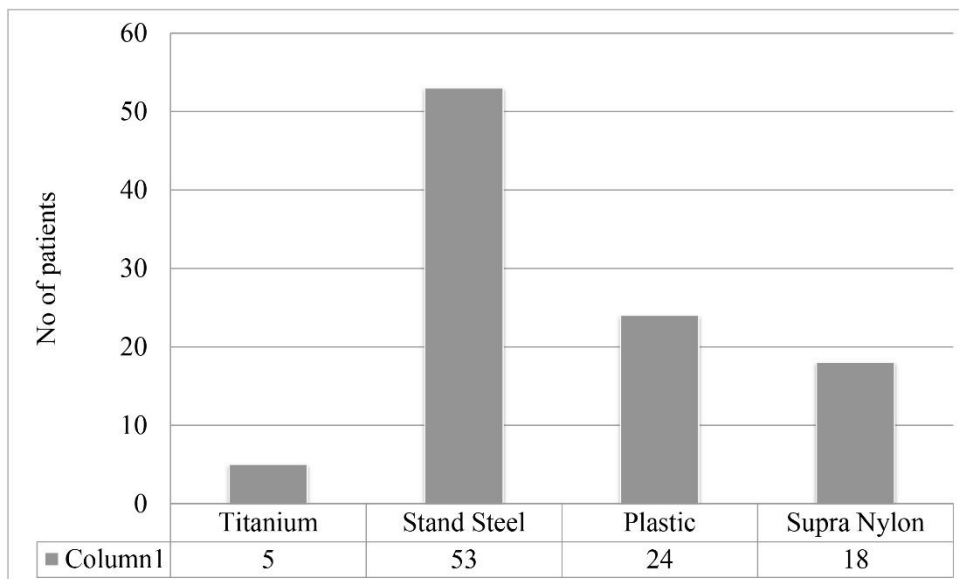


Figure 1 shows the number of patients who wear various frames that cause skin sensitivity in the summer

(Before guiding)

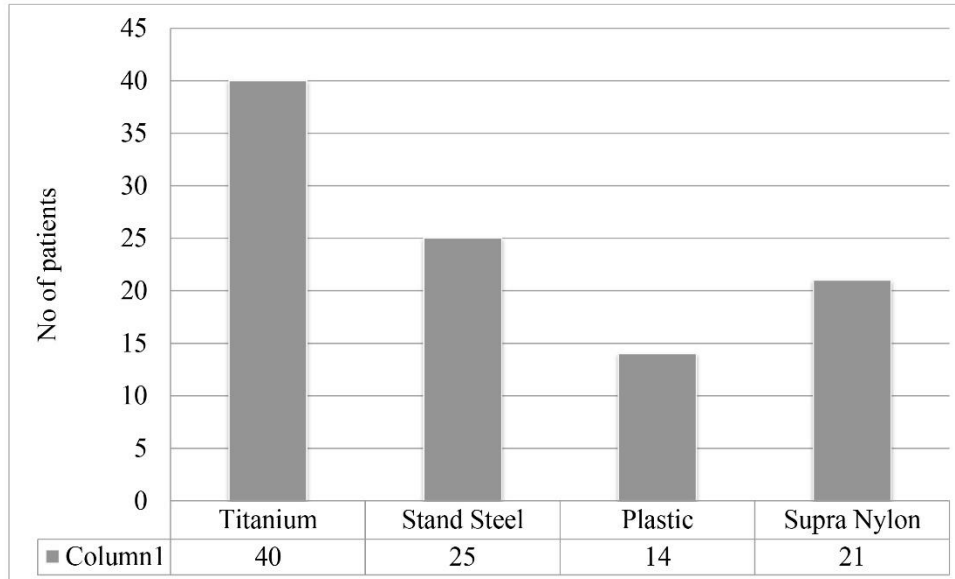


Figure 2 shows the number of patients who wear various frames that cause skin sensitivity in the summer

(After guiding)

Subsequently, the number of patients increases wearing titanium frames after guiding and giving them instructions according to their working conditions, teaching them how to replace the old frames and the damaged parts of it, and how to maintain them because they are expensive. Titanium frames absorb the ambient heat and lose it quickly according to material specifications and cause no skin allergy. That means avoiding damage caused by direct contact of the frame with the skin. It appears most of the patients that they noticed that the titanium frames are skin-friendly, without the effect of the frame on the skin, light, durable, and strong. Also, it can be folded back to its original shape; it is an outstanding feature of eyeglasses.

4. Conclusion

For a long time, eyeglass frame materials have ranged from metal and plastic to titanium material. Plastic and metal widely used as traditional materials, but one disadvantage is that these materials' frames bend easily, cannot be used for long periods, and cause allergy to the face at high temperatures. As for titanium frame, it is the most recent material to be established in the modern world of eyeglass frames. Titanium is very thin, very flexible, and outperforms most other frames, but it is also very costly. Titanium frames are more expensive than other frame types; however, the long-term benefits far outweigh the cost difference. Also, the most

important characteristics are flexible and lightweight material, providing excellent choices for people who have an active lifestyle, such as athletes. Likewise, titanium eyeglass frames are suitable for modern designs because they are strong, have excellent wear resistance, scratch-resistant, and do not cause sensitivity to the patient's skin when exposed to high temperatures. In general, most workers exposed to high temperatures (furnace workers, service workers, farmers, etc.) have instructed to wear eyeglasses with titanium frames to avoid exposure to allergy skin, therefore called titanium called is a skin-friendly material. As a result, 100% titanium eyeglass frames are a safe option for people who are allergic to metals at high temperatures. Thus, we must investigate the materials used in eyeglass frames and urge physicians and optometrists to recommend titanium frames to patient. Finally, this study will help ophthalmologists, dermatologists, and optometrists determine which frames are best for their patients' skin.

ETHICAL CLEARANCE

The author teaches at the College of Health and Medical Technologies in Baghdad, and he is in charge of the test unit and the manufacturing of medical glasses in accordance with the administrative order numbered in the authority to conduct research in the Optical Clinic NO. 11/1113 at 04/03/2019.

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