

Original Research Article

## Comparative Study between At-Home & In-Office Bleaching on Color Stability and Teeth Sensitivity in Makkah City, Saudi Arabia

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### ABSTRACT

**Background:** Teeth whitening, known as dental bleaching, has increased in recent years. Several restorative modalities for better esthetics are applied; bleaching is considered one of the most conservative and easy-to-perform treatment modality. For cases with severe discoloration and rapid results are requested; in-office bleaching is the appropriate treatment modality. An alternative easy way for in-office bleaching is at-home bleaching. Relapse of the teeth color and increased teeth hypersensitivity are the most prominent problems that can associate vital teeth bleaching whether in-office or at home.

**Objective:** This research was conducted to compare between in-office and at home vital teeth bleaching in both postoperative color stability and postoperative teeth hypersensitivity.

**Materials and Methods:** A randomized control clinical trial study of randomly chosen 24 patients, they were divided into two groups 12 subjects were undergo in-office bleaching and the other 12 were undergoing at-home bleaching. Shade of the upper anterior teeth and sensitivity were evaluated for all patient pre and after treatment using Easy shade.

**Conclusion:** According to the results observed during the evaluated time, it was concluded that both of in-office power bleaching and at home bleaching are effective equally in producing color change of the teeth that can last with little change for at least one month. Meanwhile to avoid the aggressiveness of teeth sensitivity after bleaching, in home bleaching is preferred to be applied than power bleaching.

**Key words:** Tooth bleaching, color, hypersensitivity, easy shade, color stability, hydrogen peroxide.

### INTRODUCTION

Tooth discoloration results from varied and complex causes, these causes are usually classified as being intrinsic and extrinsic. <sup>[1]</sup> “Power bleaching” (in-office) and “at-home bleaching” are the frequently used techniques. Power bleaching utilizes a high concentration of bleaching agent (30-35% hydrogen peroxide) administered in a dental office setting, while at-home bleaching employs the use of low concentrations of whitening agent (10-20% carbamide peroxide placed in a custom-made mouth guard and administered daily over a 2-5week period. <sup>[2]</sup> Regression of

tooth whitening resulting from dental bleaching is a phenomenon that occurs following bleaching procedures and it was reported that the initial whitening of the tooth color may be due to enamel dehydration (*Dawson et.al 2011*). <sup>[3]</sup> (*Matis et al 2000*). <sup>[4]</sup> Showed a rebound effect associated with 10% and 15% concentrations of carbamide peroxide gels. *While (Giachetti et al 2010).* <sup>[5]</sup> Showed no clinically significant regression of bleaching efficacy with at-home and in-office bleaching techniques producing satisfactory and long-lasting bleaching results. Not only color regression is the post bleaching threat

that may cause discontinuing of the bleaching procedure but also hypersensitivity of the teeth and gingiva is the other hindrance. The presence of small microscopic enamel defects and subsurface pores is usually related to post-treatment sensitivity, thus allow the whitening agent to penetrate into the dental tubules and ultimately the pulp, causing reversible pulpitis and consequent teeth thermal sensitivity, but not causing permanent damage to the pulp. These responses are correlated with the peroxide concentration, time, frequency of gel application and pulp temperature rise after light activation. However, dentin exposure may be a factor in tooth sensitivity as it is often misdiagnosed as not being present. However, other researchers have correlated the incidence and severity of thermal sensitivity with gingival recession and the frequency of treatments, but not the actual duration, of the treatment.<sup>[6]</sup> While (Giachetti et. al 2010)<sup>[7]</sup> showed no clinically significant regression of bleaching efficacy with at-home and in-office bleaching techniques producing satisfactory and long-lasting bleaching results, (Schulte et. al 2010)<sup>[8]</sup> claimed that sensitivity after bleaching was severe enough to cause 14% of patients to discontinue bleaching treatments. The purpose of the present study is to find out if there is a difference between at-home bleaching with 16% carbamide peroxide and power bleaching( in -office) on teeth color stability and teeth sensitivity.

## MATERIALS AND METHODS

**Study design:** This randomized clinical study was conducted to assess the efficacy in terms of color stability and production of sensitivity after at-home bleaching, and in-office bleaching.

**Subjects:** This study included 24 subjects who were introduced to the outpatient clinics of the Faculty of Dentistry in Umm Al-Qura University seeking for teeth whitening, aged 19 to 50 years. Subjects were randomly distributed into two treatment groups: (A) home whitening

(n=12) combined with 16% carbamide peroxide; (B) in-office whitening combined with 40% hydrogen peroxide.

**Inclusion Criteria:** The criteria of the subjects participated in this study were: adult (19-50 years), available for the duration of the study, minimum of 20 uncrowned natural teeth, minimum of upper six anterior teeth without crowns or large restorations.

**Exclusion Criteria:** Subjects with the following criteria were excluded:

Presence of orthodontic bands/bracket, presence of removable partial dentures, tumor(s) of the soft or hard tissues of the oral cavity, advanced periodontal disease (consisting of purulent exudates, tooth mobility, and/or extensive loss of periodontal attachment or alveolar bone), five or more carious lesions requiring immediate restorative treatment, history of allergy to consumer or personal care products, use of a tooth whitening procedure up to one month before entry into the study.

This was a randomized, single-blind, clinical study. One clinician performed the bleaching, evaluated the teeth color changes, and evaluated teeth sensitivity. 24 patients were selected for this study, total of 144 teeth (from canine to canine) for the maxillary upper anterior teeth were analyzed. During the screening appointment all subjects were provided with a patient information sheet and informed consent signed before starting the study. The subjects then received a dental prophylaxis to remove any extrinsic stains. And also they were asked to brush at least twice a day in order to maintain a standardized home care regimen. Before active treatment begins, the following baseline measurements will be recorded at this appointment ("Baseline visit"): the degree of tooth sensitivity of each participant was evaluated before the treatment, and immediately after the treatment using the visual analog scale (VAS) on a scale from 1 to 10 with 1 correlating to no sensitivity and 10 correlating to unbearable sensitivity. Each person described the degree of

discomfort in response to the application of air sprayed from a dental syringe at a pressure about 45-60 psi and held 2 mm away from middle-third of facial surface of the maxillary anterior (from canine to canine) teeth for 3 seconds. The teeth on the mandibular arch were isolated from the air flow during testing using the operator's finger and cotton rolls.

Color recordings were performed by one clinician using a digitally Vita Easyshade spectrophotometer (Vita Easyshade Advance 4.0®; Vita Zahnfabrik). Before measuring tooth color with the ES, the selected teeth were polished using a rubber cup and polishing paste for approximately 10 seconds, after which the mouth was kept closed for at least 1 minute to allow rehydrating. A disposable infection-control polyurethane barrier (Vita Infection Control Sleeves; Vita Zahnfabrik) was used on the tip of the probe, and the device was calibrated for each participant by placing the probe with a diameter of 5 mm against a calibrated block inside the machine. Measurement proceeded by placing the probe on the previously determined area of the tooth and pressing the probe switch, taking in consideration that the probe was properly fixed in place during the measuring as well as set at a fixed angle, and the patient's head was properly stabilized, so each subject was placed with the head firmly supported in a straight position. The teeth were divided into three areas (cervical, middle and incisal from labial tooth surface). Readings were taken from the mid-position of the middle third and repeated three times till getting constant color shade, the mean of teeth color shade was obtained at least after four teeth readings obtained for each patient to be used for statistical analysis. [8] A total of 144 teeth were measured at the end. Teeth color expressed in CIE L\*a\*b\* values and the corresponding suggested Vita Classical shade and 3D master shade codes were also directly obtained for each position along the labial surface of each tooth. The tooth shade assessments were made for the upper six

anterior teeth at three intervals, at the baseline appointment (before treatment), immediately after the bleaching, and then after one month. In order to mimic a standardized clinical situation, all measurements were performed under the same light conditions of the dental units in the out-patient clinics of the Faculty of Dentistry at Umm Al-Qura University. Different treatment methods were randomly applied, as explained in the following paragraphs.

Group A: Home Whitening With 16% Carbamide Peroxide (at home teeth whitening kit Everbrite TM) this kit include 2 plastic syringe with bleaching material, dental floss and thermally fitted upper and lower plastic trays. Before treatment each subjects was informed to brush and floss just prior to bleaching the teeth, because the whitening gel is the most effective with clean teeth and then try the trays first without any bleach to check the fit and comfort. The plastic ready-made trays could be thermally formed for optimum fit on the arch. The subjects were asked to clean and dry bleaching trays before applying the whitening gel, because moisture could reduce the efficiency of the whitening gel and slow down the whitening process, while applying the gel subjects was also asked to make sure not to fill the trays. Subjects should place a small drop of tooth whitening gel half way up on the inner front surface of the tray (in the front of each tooth in the tray). The average treatment per arch required approximately 0.5ml of whitening gel. The whitening tray was inserted in the mouth over the teeth. Subjects had to seat the tray firmly against the teeth, wipe the excess gel, which seeped over the brim of the tray onto the gums, by holding the tray up with one hand, and wiped the excess gel off of the gums with fingers or tissue. After whitening, the tray was removed and the teeth were rinsed off and any remaining gel was removed away. Subjects were asked to brush, floss and continue routine dental cleaning. Subjects were informed to wear the whitening product for one hour

consecutive nights at four days. This was in keeping with the manufacturer's instructions. After a four days period of active treatment, the subjects were recalled, and information recorded at baseline will be updated at the post home bleach visit.

Group B: subjects were treated with In-office Whitening with A 40% hydrogen peroxide whitening gel, (Opalescence Boost) which was chemically activated through easy syringe-to-syringe mixing, so there were no light or laser required. Opalescence Boost contains PF (potassium nitrate and fluoride) that's been proven to reduce caries susceptibility, and improve the

micro hardness of the enamel. Protective lip cream was applied and the six upper anterior teeth to be treated were isolated with a light-cured resin barrier for gingival protection. The bleaching gel was applied and repeated for two individual 15-min cycles for a total exposure time of 30 min. Between treatment applications, the components were removed by suction. Information recorded at baseline and before chair side treatment was then updated immediately after treatment, and after one month for the final re-evaluation of both the color of teeth and hypersensitivity.

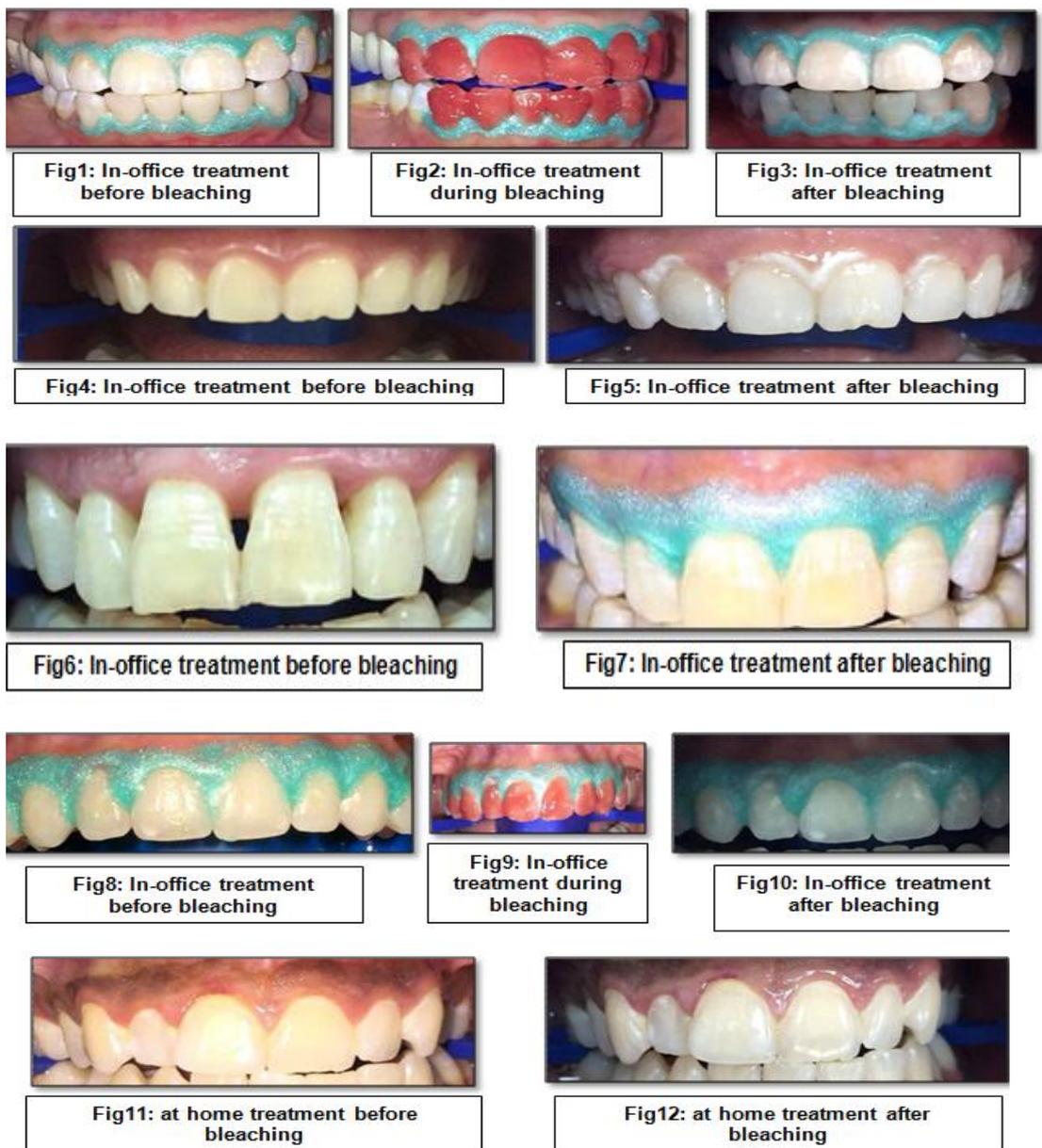




Fig13: in-office treatment before bleaching



Fig14: in-office treatment after bleaching



Fig15: Vita Easyshade Advance 4.0®; Vita Zahnfabrik



Fig16: in-office teeth whitening kit Opalescence Boost



Fig17: at home teeth whitening kit Everbrite TM

## RESULT

For objective measures of changes of color in the teeth during whitening, a spectrophotometer was used. The spectrophotometer measured and recorded the amount of visible radiant energy reflected from, or transmitted by, an object one wavelength at a time in the entire visible spectrum.<sup>[9]</sup> So under standardized clinical conditions, Vita Easy shade spectrophotometer (Vita Easy shade Advance 4.0®; Vita Zahnfabrik) was used to record the color of middle areas per tooth for the six upper maxillary anterior teeth in 24 participants. Each position was measured three times to attain an average for the CIE L\*a\*b\* coordinates, which is the one of the most commonly used systems is the CIE L\*a\*b\* color system, to jet the output of the color measurement quantitatively. Because it approximates uniform distances between color coordinates while entirely covering the visual color space, and this to attain the corresponding Vita Classical shade tab integrated in the software of the devices.<sup>[10]</sup> Direct comparison of the measured L\*a\*b\* values obtained with the instruments and

color difference was calculated and expressed in DE. The following equation was used:  $\Delta E^* = [(\Delta L^*)^2 + (\Delta a^*ab)^2 + (\Delta b^*ab)^2]^{1/2}$ . The current study is one of a few done with the digitally spectrophotometer Vita Easy shade Advance, as previous studies have used the visually evaluation of tooth whitening with Vita Classical shade guide or Trubyte Bioform to evaluate tooth color change. And such Color Measuring Devices (CMDs) eliminate the subjectivity related to color determination and increase the level of consistency in the color determination process.<sup>[11]</sup>

### Statistical analysis

The results were analyzed with computer software (SPSS) by calculating: means, median. A paired sample t test ( $p < 0.05$ ) was used to compare L, a, b at base line and immediately after, and at base line and after 1m for both at home and in office patients, on the other hand an independent sample t test was used to compare between in office and at home patients in respect to L, a, b.

### Color stability results

Table (1) change in teeth lighter (L) over one month for in-office treatment

	Mean	Median	Range ( mini- max)
Base -line	73.2	71.9	64.80 – 86.80
Immediately after	75.38	76.5	68.80-76.70
After 1M	75	76.4	68.80- 76.70

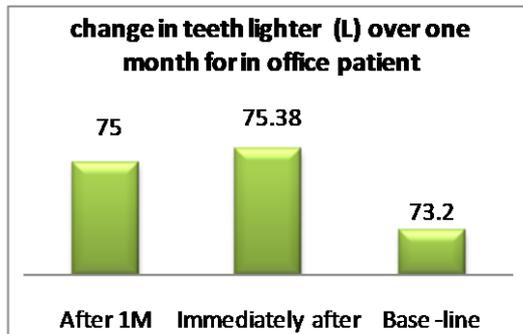


Fig18: change in teeth lighter over one month for in-office treatment

- Table (1) and fig( 18) shows that there is noticeable change in the value of (L) where it was (73.5) at base line then it rose to (75.38) immediately after bleaching , while after one month it reached (75), but this change was statistically non- significant at (p-value > 0.05) as shown in the table below:

Table (2) paired sample t test to measure the difference in teeth lighter (in-office treatment) over one month

	T	Sig
at base line- Immediately after	-1.19	0.257
base line- After 1M	-1.05	0.315

Table (3) change in teeth lighter(L) over one month for at home treatment

	Mean	Median	Range ( mini- max)
Base -line	72.3	71.9	64.80-76.70
Immediately after	74.5	76	68.80-78.90
After 1M	74.30	76	68.80-76.70

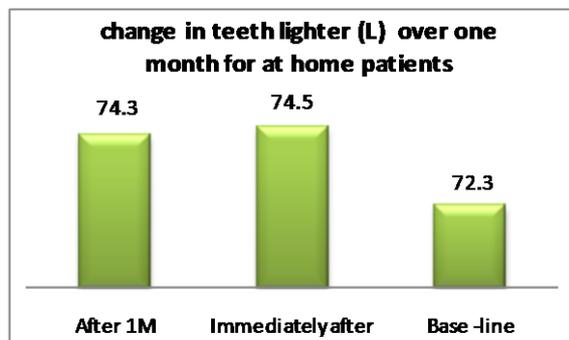


Fig19: change in teeth lighter over one month for at home treatment

Table (3) and fig (19) show that there is a noticeable change in the value of (L) where it was ( 72.3) at base line that rose to (74.5) immediately after bleaching , that fall to (74.3) after one month , this change was statistically non- significant at (p-value was> 0.05) as shown in the table below:

Table (4) paired sample t test to measure the difference in teeth lighter (at home treatment) over one month

	T	Sig
at base line- Immediately after	-1.35-	.202
base line- After 1M	-1.46-	.170

- Difference between in office and at home patient attributed to teeth lighter
- Independent sample t test is used to measure the difference in teeth lighter between in office and at home patients.

Table (5) independent sample t test to measure the difference between in-office and at home treatment attributed to teeth lighter

Sample		Mean	SD	p- value
L1 at base line	In office	73.20	5.23	.614
	At home	72.29	3.23	
L2 immediately after	In office	75.38	2.21	464
	At home	74.46	3.58	
L3 after 1m	In office	74.97	2.48	.562
	At home	74.30	3.09	

- With respect to the results in table (5) we can say there were not any statistical significant differences between in office & and at home patients attributed to teeth lighter over one month where (p>0.05).

Table (6) paired sample t test to measure the difference in teeth yellowness (in office treatment) at base line and Immediately after, After 1M

	T	Sig
at base line- Immediately after	0.547	0.595
base line- After 1M	0.299	0.770

- As showed in the table & the fig above there is Noticeable change in the value of (b) where it was ( 18.36) at base line then it decreases to (17.83) immediately after, then it risen to (18.2) after one month, but this change was not

statistically significant because (p-value was > 0.05) as shown in the table below.

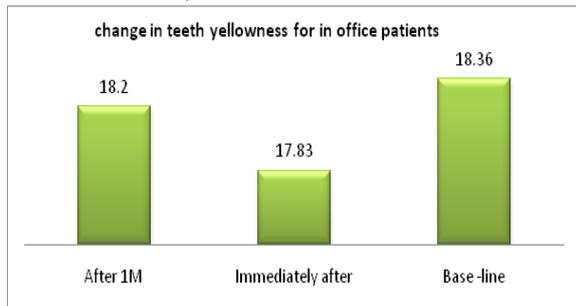


Fig20: change in teeth yellowness over one month for in-office treatment

Table (7) change in teeth yellowness (b) over one month for at home treatment

	Mean	Median	Range ( mini- max)
Base -line	18.79	17.8	16.1-22.30
Immediately after	17.34	16.7	12.30-22.30
After 1M	17.59	16.60	13.50-230

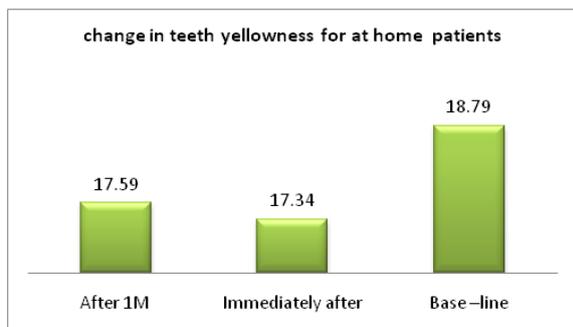


Fig21: change in teeth yellowness over one month for at home treatment

➤ As showed in the table & the fig above there is Noticeable change in the value of (b) where it was ( 18.79) at base line then it decreases to (17.34) immediately after, then it risen to (17.59) after one month, but this change was not statistically significant because (p-value was > 0.05) as shown in the table below:

Table (8) paired sample t test to measure the difference in teeth yellowness (at home treatment) at base line and Immediately after and After 1M

	T	Sig
at base line- Immediately after	1.22	0.245
base line- After 1M	1.23	0.243

- The difference between in office and at home patient attributed to teeth yellowness
- Independent sample t test is used to measure the difference between in office

and at home patient attributed to teeth yellowness and the results showed in the table below:

Table (9) independent sample t test to measure the difference between in-office and at home treatment attributed to teeth yellowness

➤ With respect to the results in table (9) we can say there were not any statistical

Sample		Mean	SD	p- value
b1 at base line	In office	18.36	2.70	0.702
	At home	18.79	2.66	
b2 immediately after	In office	17.82	2.25	0.615
	At home	17.34	2.37	
b3 after 1m	In office	18.01	2.87	0.705
	At home	17.59	2.53	

significant differences between in office & and at home patients attributed to teeth yellowness over one month where (p>0.05).

Table (10) change in red-green (a) over one month for in-office treatment

	Mean	Median	Range ( mini- max)
Base -line	0.03	0.5	0-1.6
Immediately after	-0.4	-1.05	-1.6-1.4
After 1M	-0.2	-1.02	-1.6-1.4

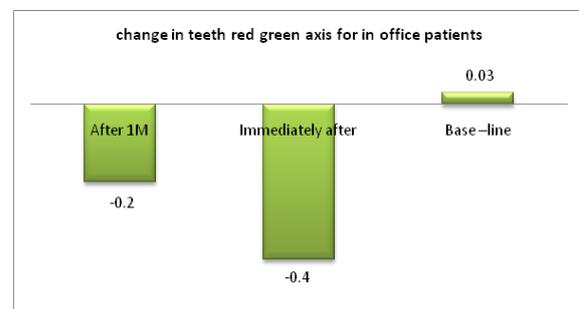


Fig22: change in red- green axis over one month for in office treatment

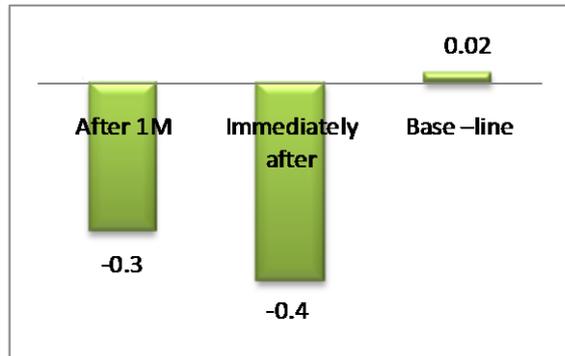
➤ As showed in the table & the fig above there is Noticeable change in the value of (a) where it was ( 0.03) at base line then it decreases to (-0.4) immediately after, then it reached (-0.2) after one month, but this change was not statistically significant because (p-value > 0.05) as shown in the table below:

Table (11) paired sample t test to measure the difference in red -green axis (in office treatment) over one month

	T	Sig
at base line- Immediately after	-0.897	0.754
base line- After 1M	-1.02	0.521

**Table (12) change in red-green axis (a) over one month for at home treatment**

	Mean	Median	Range ( mini- max)
Base –line	0.02	0.4	-0.5-1.6
Immediately after	-0.4	-1.05	-1.6-1.4
After 1M	-0.3	-1.02	-1.6 – 1.6



**Fig23: change in red-green axis over one month for at home treatment**

- As showed in the table & the fig above there is Noticeable change in the value of (L) where it was ( 72.3) at base line then it risen to (74.5) immediately after , then it less to (74.3) after one month , but this change was not statistically significant because (p-value was > 0.05) as shown in the table below:

**Table(13) paired sample t test to measure the difference in red-green axis (at home treatment) over one month**

	T	Sig
at base line- Immediately after	-.244	0.512
base line- After 1M	-.581	0.671

- The difference between in office and at home patient attributed to red- green axis:
- Independent sample t test is used to measure the difference between in office and at home patient attributed to red-green axis, the results showed in the table below:

**Table(14) independent sample t test to measure the difference between in office and at home treatment attributed to red-green axis**

Sample		Mean	SD	p- value
a1 at base line	In office	0.03	0.041	0.234
	At home	0.06	0.021	
a2 immediately after	In office	-.05	0.035	0.129
	At home	-.04	0.065	
a3 after 1m	In office	-0.06	0.028	0.157
	At home	-0.08	0.051	

- With respect to the results in table (14) we can say there were not any statistical significant differences between in office & and at home patients attributed to red green axis over one month where (p>0.05).

### Sensitivity results:

#### 1- Dental sensitivity before bleaching treatment

**Table (15) levels of dental sensitivity before bleaching treatment for in-office and at home treatment**

	Mean	median	Range
In office patients	0.833	0	0-4
At home patients	0.833	0	0-2

- According to the results in table(15) there wasn't any difference in the sensitivity level before bleaching treatment for in office and at home patients.

#### 2- Dental sensitivity after bleaching treatment

**Table(16) levels of dental sensitivity after bleaching treatment for in office and at home treatment**

	Mean	median	Range
In office treatment	5.1	4	0-10
At home treatment	1.7	2	0-2

- According to the results in table(16) there was difference in the sensitivity level after bleaching treatment for in office and at home patients, where the level of sensitivity is (5.1) for in office patient which greater than the level of sensitivity of at home patients which reported (1.7) , and this change was statistically significant because (p-value < 0.05) as shown in the table below:

**Table (17) independent sample t test to measure the difference between in-office and at home treatment attributed to dental sensitivity after bleaching treatment**

		mean	SD	P- value
dental sensitivity after bleaching treatment	In office	5.1	3.7	0.004
	At home	1.7	0.66	

## DISCUSSION

This clinical trial was designed to evaluate the color change and rebound effect of at-home bleaching and in-office

bleaching and to compare the two techniques within a maximum of 1 month after bleaching. Furthermore the degree of tooth hypersensitivity after bleaching was evaluated. It was hypothesized that both techniques would be the same regarding these clinical issues. The CIE LAB system was used for measurement of color difference in the bleached teeth. [12] This system is a 3D uniform color space with equal distances corresponding to equally perceived color differences. The spectrophotometer was considered more reliable by (Dahal et.al2003) [13] because this method is more objective and sensible than a visual scale and photos. Moreover they found that, the instrumental evaluation has been preferred over the visual evaluation because it makes the process more practical and statistically more reliable. For Groups 1(in-office), 2(at-home) patients, upper six anterior teeth were evaluated for each patient; this allowed measurements from each patient to become more precise in obtaining the color alteration ( $\Delta E$ ) in numeric values (CIELAB System) and provided normal distribution results. This is another advantage of this method (spectrophotometer) in comparison to a visual scale evaluation by operators. In a study done by (Kim et al 2009), [14] using the same methods, they confirmed that this method gives more confidence and standard results, with 96% accuracy.  $\Delta E$  is the color difference between two objects and can be calculated within the CIELAB color system. The naked eye is able to distinguish color differences if the  $\Delta E$  value is more than 3.3. [15] In addition, a value of  $\Delta E^*ab$  of 3.3 was previously reported as 50:50% acceptability threshold in other studies. [16] Based on the CIE\* L a\* b\* system the results of the current study showed that both treatment groups significantly lightened the teeth because  $\Delta E$  (Bleaching effectiveness) showed values more than 3.3 with power bleach (5.234) as well as with at-home bleach (6.781). This result was in agreement with Berga et. al 2006, Fatemeh et.al 2008 and Dahl et.al 2003 who attributed this

change to the action of hydrogen peroxide which is the main active ingredient of bleaching products by the dissociation of hydrogen peroxide into free radicals and the ability to penetrate through enamel and dentin producing the oxidation of polymeric organic pigments that cause tooth discoloration, and also carbamide peroxide decomposes into urea and hydrogen peroxide and the active process of bleaching does the same.

Results of the current study showed that the value of teeth lighter (l) changed over one month for both in office and at home patients, but there was no significant difference between the groups regarding the degree of teeth lighter, also the results indicated that the value of (l) is decreased after one month for both groups this decreasing in the value of (l) can be explained by the fact that extrinsic color is associated with the absorption of materials (e.g. tea, red wine, chlorhexidine, iron salts) onto the surface of enamel, and in particular the pellicle coating, and which ultimately cause extrinsic stain, [17] which affect the lighter of the teeth.

On the other hand the results indicated that the value of (a) indicated for redness and greenness and (b) indicated for yellowness and blueness have changed over one month for both in office and at home patient, but there was no significant difference between the groups. And by applying binary comparisons between the two groups the results indicated that there was no significant difference between the groups regarding teeth whitening and color stability. So that, both protocols were effective in promoting tooth bleaching. And this finding is in agreement with one previous study carried out by (Almeida et al2012), [18] who compared the effectiveness of at-home and in-office bleaching techniques and they found that this was due to the fact that the whitening gels contains hydrogen peroxide(the active ingredient) that dissociate and releases highly reactive molecules called free radicals, these molecules react with and break down the

colored compounds that have become entrapped in a tooth's enamel. Since the byproducts that result are colorless, the tooth receives a lightening effect. While it may take a low-concentration whitener more individual treatments to deliver the same total number of free radicals, either a low or high concentration product will create the same whitening end point. As stated in the statistical analysis of this study, there was no significant difference between both methods regarding regression of the whitening immediately after bleaching and 1 month follow-up periods. Further studies for longer periods of time for evaluation of color regression is suggested. Post-bleaching sensitivity differs from dentin hypersensitivity because it is related directly to the penetration of the sub-products of the bleaching gels in the dentin and pulp tissue, through the enamel, causing reversible pulpitis and consequent teeth thermal sensitivity, but not causing permanent damage to the pulp. These responses are correlated with the peroxide concentration, time, frequency of gel application and pulp temperature rise with light activation. [19] Within the limitations of this study in regard to dental sensitivity before treatment, the results showed that almost (70%) of the in office patient have mild level of sensitivity also (72%) of the at home patients have mild level of sensitivity, and the results indicated that there was no differences between the two groups in the pre-sensitivity test. The results showed that for post-treatment sensitivity of teeth the level of sensitivity increased for in office patient and become moderate, where the level of sensitivity for at home group still mild, and the results indicated that there was significant difference between both groups regarding tooth sensitivity, where in office patient is more sensitive than at home, this can be attributed to the difference in the concentration of the materials used as the hydrogen peroxide concentration for power bleaching was 40% while that for the carbamide peroxide was 16%. This finding was in agreement with these of (Leonard

et.al 2003). [20] Who found a range of 50 to 80% of patients experienced post-treatment tooth sensitivity after power bleaching. It is thought that during the chemical reaction occurring during teeth whitening, the dentinal plugs within the tubules are released. These plugs have been formed in the dentinal tubules to decrease sensitivity. When released, there is fluid flow internally, which excites the pulpal tissue and causes sensitivity. If this truly is how the process occurs, then replacing these plugs as the teeth are whitened, or before and after treatment, the pain sensations can be altered while accomplishing the goal of whitening. Also Bernardon, et al 2010 [21] found no difference in the bleaching result with regard to sensitivity and durability at the 6 month post-treatment interval. The result of Brandon's study is in contrast with the present findings regarding sensitivity effect, this difference could be probably due to either the mode of light activation or the frequency of power bleaching that was performed in that study. On the other hand (Bizhang, et al 2006) [22] concluded that at-home bleaching and in-office bleaching techniques were equally effective at the 3 months interval time after bleaching.

## CONCLUSION

According to the results observed during the evaluated time, it was concluded that both of in-office power bleaching and at home bleaching are effective equally in producing color change of the teeth that can last with little change for at least one month. Meanwhile to avoid the aggressiveness of teeth sensitivity after bleaching in home bleaching is preferred to be applied than power bleaching. Further studies to observe the color stability for longer time intervals is also recommended as well as other studies to compare the effectiveness of professionally observed home bleaching to the other technique totally held by the patient without a dentist observation.

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How to cite this article: Radi RE, Abdelwahab S, Abdelaleem N. Comparative study between at-home & in-office bleaching on color stability and teeth sensitivity in Makkah city, Saudi Arabia. *Int J Health Sci Res.* 2018; 8(2):89-100.

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