

A study of fake eye lash extensions for microbial infestation and its associated ocular health risks on the wearers

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ABSTRACT

Background: Eyelash extension has become the latest cosmetic trend in almost every country of the world, because they are considered as a sign of femininity in some community culture. This study investigated the rationale for wearing fake eye lashes, evaluated the microbial composition of both used and unused fake eye lashes extension from selected volunteers, and relate it to ocular health risks on the wearers.

Methods: A cross-sectional survey of selected respondents were randomly sampled and examined. Questionnaires were served to investigate their rationale for wearing fake eye lashes, frequency of wearing eye lashes extension, level of education, discomfort and various problems associated with fixing and removal of fake eye lashes extension. Bacteriological examination of both used and unused fake eye lashes samples collected was carried out on selective, differential and enriched culture media separately for the isolation of bacterial of clinical status.

Results: Individual respondent's experiences from wearing fake eye lashes extension varied considerably. But the percentage responses of yes to discomfort were significant both from the questionnaires and graphical points of view. The percentage distribution of the isolates of bacterial from both used and unused fake eye lashes varied in ratios; coagulase negative staphylococci 10:40, *Staphylococcus aureus* 8:42, *Klebsiella spp* 5:30, *Pseudomonas spp* 3:18, *Streptococci spp* 0:8, *Enterobacter spp* 0:20.

Conclusion: Fake eyelashes extension harbor bacteria that could assume a pathogenic status, coupled with the pain associated with its fixing and removal. Eye care practitioners and general public should be informed by the ophthalmic care authority of its inimical effect on the ocular health of the wearers.

Keywords: Fake eye lashes, Microbial infestation, Ibadan metropolis, Ocular health risk,

1. INTRODUCTION

The eye is a sense organ designed to focus light onto receptor cells and to control the amount of light reaching these receptors. Its optimal functioning requires the presence of accessory structures which include the eyebrows, eyelids, eyelashes and the lachrymal apparatus. The eyeball is approximately 2.5cm in diameter and is bounded by a white fibrous, protective layer of connective tissues at the back and by a transparent fibrous layer at the front [1]. The function of the eyebrows and eye lashes

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is to protect the eyeballs from the direct rays of sun, foreign objects, and perspiration. The eyelids constitute an important component of the ocular antimicrobial defense system for a number of reasons; most importantly the blink reflex (usually 12 blinks/minute) provides protection against objects which would invariably be contaminated with microbes. And also, removes foreign debris together with any associated microbes and desquamated cells. The eyelids distribute tears (total volume approximately 7 μ l/eye with their broad-spectrum antimicrobial properties as a thin film over the surface of the eye [2]. Fake eyelashes are synthetic lashes made with a plastic fibre called Polybutylene Terephthalate (PBT) and some are made from human hair. These kinds of eyelashes tend to be thicker than normal eyelashes and usually heavier on eye than normal eyelashes because of the stiffer band. Fake eye lashes are popular among women globally as it enhances looks according to the user mentality, but they are not the best for the health of the eyes [3]. Different brands of fake eye lashes are available in the markets, which includes; Kylie lashes, Lashes by MUA, Ella lashes, Dolled lashes, Beauty line lashes, Lush lashes, Huda beauty lashes, 3D mink lashes, Faux mink lashes and Ardell lashes to mention just but a few. Fake eyelashes is sold for between ₦1000 to ₦3000 and can last for up to two weeks before the next fixing and it takes ₦2000 to ₦5000 to have a fix depending on the studio of choice, within a procedural time frame of 90 to 150 minutes for fixing[3]. Addicted wearers of fake eye lashes always strive to afford it at all cost and sacrifice for the procedure of suffering and smiling during fixing purposely to enhance their looks and command the attention of their targets. Eyelash extension has become the latest cosmetic trend in almost every country of the world, because they are considered as a sign of femininity in some country culture [4]. Wearing fake eye lashes to bed on daily basis can cause bacteria to accumulate around the eye lashes glue hence promotes infection and also, when the fix had been put in place, thorough washing of face becomes impossible, which reduces hygienic condition and may lead to microbe-laden dirt penetrating into the eyelid and cause infection. Purulent discharges experience by some people could be due to microbial infection of the eyelids [5]. Fake eye lashes are applied on hair by hair bases to one's natural lashes for a complete look which is of course natural to some and owlsh to others. The challenges or deterrence associated with false eye lashes fixing is that it does not allow frequent washing of the eyelids which could aid microbial build up, ocular discomfort and other associated eye diseases [6]. Superimposition of fake eyelashes on eye lid maximizes the proportion of microbes that can be isolated and arrays of diseases that can be caused by members of the ocular microbiota which includes; conjunctivitis, keratitis, blepharitis, and orbital cellulitis, and any of these infection can cause partial or complete blindness. Eyelids, the guards of human vision are lined with eyelashes which protect the eyes from dust and chemicals, but with the eyelash enhancing treatment, a build-up of bacteria and debris on the eyelids can lead to "irreversible eyelash loss" [7]. To the beautician, the disadvantage may be ignored, but to the ophthalmologist, intermittent fixing of eyelashes is a risk of public health of unimaginable proportion. The aim of this study therefore was to evaluate the rationale for wearing fake eye lashes extension, examines both used and unused fake eye lashes extension for microbial infestation and relates it to associated ophthalmic health risks on the wearers.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Equipment

Fake eye lashes (unused), fake eye lashes (used), consented volunteers, questionnaires, pen, language translators, beautician on transit (hawkers), beautician studios, ethical approval document, Petri-dishes and incubators.

2.1.2 Biological Materials

Mannitol salt agar, MacConkey agar medium, nutrient agar medium, sheep blood agar base medium ringer's solution, fermentable sugars, ethical approval number AD 13/479044305^B

2.1.3 Study Area

The study was conducted in some selected local government in Ibadan metropolis. Ibadan is situated between the latitude 7.3964 and longitude 3.9167 co-ordinates in Oyo state of Nigeria and are predominantly occupied with Yoruba language speaking people.

2.1.3 Study Design

Consented volunteers with fake eyelashes were given questionnaires to state the rationale for their preference for wearing fake eye lashes, after informing them the purpose of the findings.

2.1.4 Ethical Issues:



Ethical approval with reference number AD 13/479044305^B was obtained from the Department of Planning Research and Statistic Division, Oyo State Ministry of Health before the embarking on this study. The participants were informed that they can decided to concur or reject at will.

2.2 Methods

2.2.1 Collection of Samples

Questionnaires were served to 100 fake eye lashes wearers in salons, road side make-shift beautician shops, road side beauticians on transit (hawkers) that are also engaged in home services, all the respondents were females. The questionnaires contains a closed and open ended questions which was designed to access information on rationale for eye lash extension, problems associated or encountered during and after fixing, frequency of fixing fake eye lashes extension and other related information. And, also both used and unused eye lashes were collected in a sterile nylon for bacteriological examination.

2.2.2 Limitation

The state of health of the volunteers prior to eye lashes extension fixing were not known. But sequel to the complaints/ information obtained from the volunteers, there are tendencies that most of the complaints could be due to inherent factors capable of causing keratitis, blepharitis, conjunctivitis and others ocular challenges. The exact state of the volunteer's visual acuity cannot be deduced from these suspicions because there was no reference report from a registered ocular clinician.

2.2.3 Culture of Isolates

The unused and used fake eye lashes samples were suspended aseptically separately in 5mL of sterile ringers solution (physiological saline) for 1 hour, to enable the intertwined microbial loads shed in to the solution and thereafter sub-cultured by sterile swab onto differential, selective and enriched culture media namely MacConkey agar medium, mannitol salt agar medium and sheep blood agar base medium for the isolation of bacteria. The plate cultures were incubated aerobically at 36⁰C for 24 hours. Biochemical confirmatory tests that include; Gram staining, indole test, coagulase test, catalase test, Voges Proskauer test, oxidase test, other tests and fermentation of sugars were carried out on the bacterial isolates.

2.3 Statistical Analysis:

Data collected from questionnaires from the respondents was analyzed using SPSS 15 for windows and graph was plotted using Graph Pad prism Version 5 for Windows

3. RESULTS

Table 1: Percentage distribution of the studied population showing the effects of the eye lash extensions on the respondents..

Questions	Responses n (%)		
	Yes	No	Uncertain
Do you know that fake eye lashes can be infested with microbes?	20	75	5
Do you normally experience itchy eye after fixing fake eye lashes?	60	40	0
Do you normally experience burning sensation after fixing fake eye lashes?	45	55	0
Do you normally rub antimicrobial ointment on your eye (fake eyelashes inclusive)?	10	90	0
Do you normally do your fake eye lashes fixing in specific saloon/ studios?	60	40	0
Do you normally do your fake eye lashes fixing from the roadside beautician or hawkers?	72	28	0
Do you have a customize style you are used to and how frequent do you change your fake eye lashes?	10	86	4
Do you normally do your fake eye lashes fixing for a party or festive reason?	55	45	0
Do you normally do your fake eye lashes fixing to mask your shortened natural eye lashes?	5	95	0
Do you normally do your eye lashes to appeal to opposite sex?	50	50	0
Do you normally do your fake eye lashes to enhance your beauty and uniqueness?	80	20	0
Do you normally explore your itchy eyelashes with your fingernails?	62	30	8
Do you normally experience heavy eyelids after fixing eyelashes?	60	40	0
Do you normally experience purulent discharges after fixing eyelashes?	20	80	0
Does your extended fake eyelashes serves a deterrents to your duty?	10	90	0

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Do you normally experience pain and lid swelling after fixing eyelashes?	35	65	0
Do you normally experience tearing eye lashes casting a shadow on your vision after fixing eyelashes?	23	77	0
Do you normally experience dry eye after fixing fake eyelashes?	30	70	0
Do you normally experience eye lashes falling into eye after fixing eyelashes?	35	65	0
Is it economically convenient for you?	62	38	0
Are you more comfortable with fake eye lashes in comparison to natural eye lashes?	55	45	0



A



B



C

Figure 1 (A, B, C): A typical sample of unused and used, a displayed fake eye lashes on the road sides.

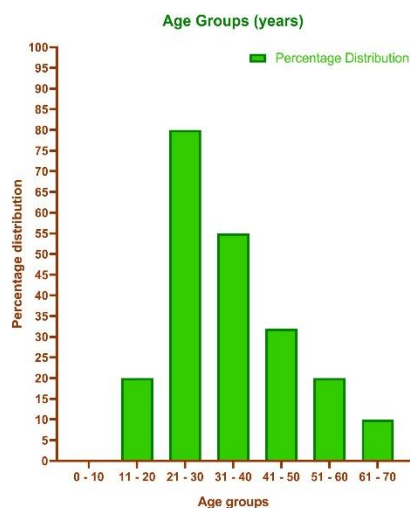


Figure 2: Percentage distribution of age of the Respondents in years of the beauticians

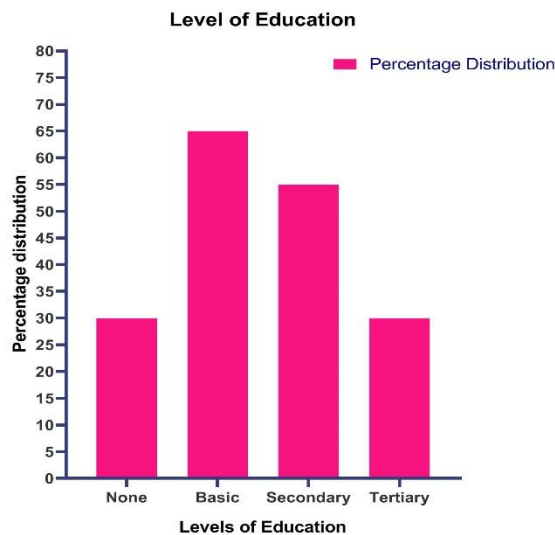


Figure 3: Percentage distribution of level of education

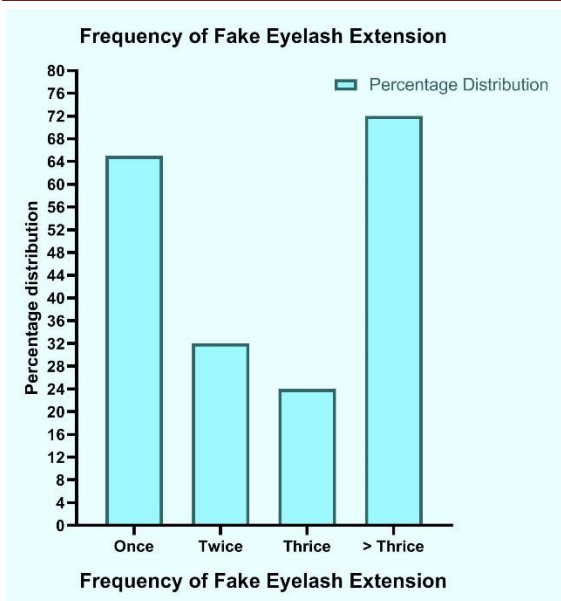


Figure 4: Percentage frequency of wearing

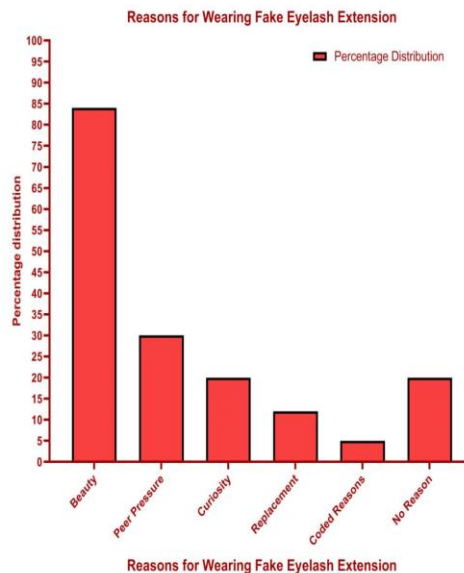


Figure 5: Percentage reasons for wearing eyelash extension eyelashes extension



A: Coagulase negative Staphylococci and Klebsiella spp



B: Staphylococcus aureus



C: Pseudomonas spp



D: Streptococcus spp



E: Enterobacter spp

Figure 6: Plates of growth of bacterial isolates (showing Isolates of bacterial from fake eye lashes extension)

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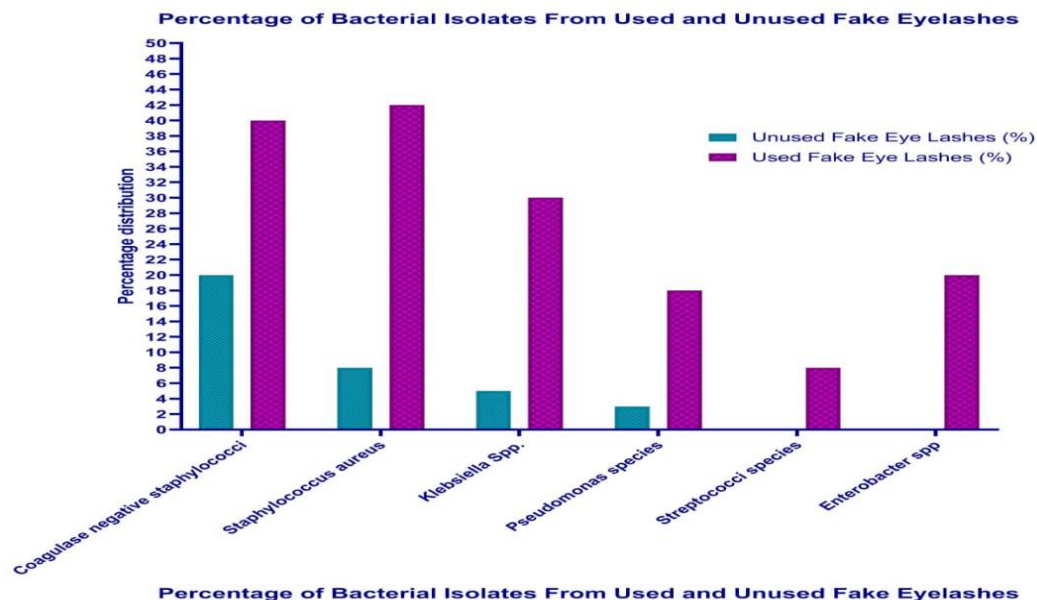


Figure 7: Percentage of bacterial isolates from used and unused fake eye lashes.

4. DISCUSSION

A total of 100 volunteers/respondents were sampled, all those sampled had arrays of discomfort associated with after-fixing, which includes; burning sensation, itchy eyelids, tearing, dry eye, shadowy vision and mild purulent discharges as reflected in the questionnaires. Figure 1A, B and C showed a typical display of eye lashes in various forms that are not immunized from microbial invasions, because they are carelessly exposed by the road sides, some are expired with reduced price to encourage quick sales and not properly preserved according to the manufacturers specification[8]. The percentage age distribution of the wearers as showed in figure 2 varied as the age advances, the highest age range percentage(80%) of the wearers in this study was between 21 to 30 years which could be attributed desire to be recognized and attended to by their peers and status of the strength and energy associated with this age range while the lowest age range percentage (8%) was recorded to between 61 to 70 years could be due to decline interest and sagging skin associated with advanced age. Other varied percentages of age range in this study could be due to many reasons privy to the subjects [9]. It was discovered in this study that 30% of the beautician were illiterate with no formal education, 66% with basic education, 56% with secondary education and 30% with tertiary education predominantly Diplomas holders (Figure 3)with no formal training, therefore, increases that chances of errors during the procedures of fixing and aggravate the suffering of their clients. Both literates and semi- illiterates of the same and different age range exploring this avenue to be fashionable or beautiful according to their own judgment, care less to learn more about the proper procedure and safety before engaging it nor its health implications on their eyes health [10]. The frequency of wearing and reasons for wearing fake eye lashes as shown in figures 4 and 5 respectively, varied from one individual to another. Some had worn it once(65%) while others twice(32%), the percentage that wore it thrice were (24%) but the percentage of those that had wear it more than thrice(72%) were the highest, some are not willing to wear it again while some are willing to put it on as informed. The reasons for wearing fake eye lashes extension also varied from one person to another, the reasons varies from beauty(84%), curiosity(20%), peer pressure(31%), replacement(12%) while (20%)some had no reason for wearing eye lash extensions[11]. Sixty two percent (62%) of the respondents investigated in this study were economically competent as informed, capable of financing the cost and adapting to the bearable discomfort and were sexually active by physical evidence of puberty. It takes to 90 to 150 minutes for fixing fake eye lashes and during the procedure of fixing, blinking of eye is reduced which limit the moisturizing function of the ocular, and could results in dry eye, tearing and burning sensation, incomplete closure of the eyelids during the sleep thereby exposing corneal surface to dust and aerosolized microbes that causes bacterial infections[12]. There is continuing debate as to whether the organisms that can be detected on the outer surfaces of the eye constitute a resident microbiota or are merely transients. However, the organisms that can be cultivated are usually typical of those found on the skin, both the unused and used fake eyelashes plated on different culture media grew one bacterial or the others in varied percentages ratios as follows; coagulase negative staphylococci 19:40, *Staphylococcus aureus* 8:42, *Klebsiella spp* 5:30, *Pseudomonas spp* 0:18, *Streptococci spp* 0:8, *Enterobacter spp* 0:20 as elicited in figure 8 in this study. All the microbes isolated has potential to become virulent and causes various eye infection that could lead to blindness.

Some bacterial growth observed from the unused ones could be due to composition of the eye lashes, poor storage or exposure to environmental fluctuations during hawking or home service visitation, some were displaced on a cardboard in a dusty sunny dirty environment, while some are stored on glassy shelves without putting into consideration storage temperature and tropical atmospheric deposition[13]. During the process of fixing fake eye lashes with glue, and the glue fumes melted thereafter with tears, this could cause burning sensation and watery eye due to the composition of formaldehyde thus induce allergic reaction in some individual wearers. Other complaints obtained from the respondents are misfixing of lashes and lashes falling independently on the eye of the clients when walking and tendency for calcification with glue to scratch the cornea and inflicts pains. If the eyelashes types fixed were too long and too many, it cast shadow on the vision of some individuals which agrees with the study of Jernigan, (2011) on side effects of eyelash extension [14]. Some responded also voiced out on the difficulty in removing the eye lash extension which are accompany with pains, injury to eye lash hair follicles and upper eyelids swelling after removal. Some clients do react to solvent used to dissolve the sealant glue which are potentially harmful, irritating to the follicles which agrees with the TBI (2012) on most common side effects of having fake eyelashes. Fake eye lashes wearing has become a norm for bride maid, flower girls for a wedding occasion, graduating students to enhance their beauty and made them feel accomplished as mentally oriented [15].

5. CONCLUSION

With all the challenges associated with fixing and removing of fake eye lashes, one would have thought these would limit the interest and the numbers of fake eyelash wearers, but the percentage was higher enough to be reckoned with in this study. However, that could not stop emphasizing the risk associated with intermittent fixing of fake eyelashes from the ocular point of view. Though uneasy lies the eyes that wears the lashes as a results overburden natural eyelids and excessive blinking- a price to pay for charming looks, it is advisable to stay natural and maintain an healthy eye, since most of the other parameters for determining beauty are beyond wearing fake eye lashes.

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Conflict of Interest: None

Contribution of the Authors

Olufemi L. Okunye: Conception, Design, Data collection, Analysis, Manuscript preparation; Philip A. Idowu: Design, Data collection, Analysis, Manuscript preparation; Babatunde M. Okanlawon: Data collection, Analysis, Manuscript preparation; Eunice M. Coker: Data collection, Analysis; Olufunmilayo E. Adejumo: Data collection, Analysis, Manuscript preparation; Michael O. Osungunna Design, Data collection, Analysis; Winifred A. Ojieabu: Design, Data collection.

6. REFERENCES

- [1] .Armstrong RA The immune system and the eye. *Ophthalmic and physiological optics* 1998;18:(Suppl 2)S40-S48
- [2] ArmstrongRAThe microbiology of the eye. *Ophthalmic and physiological optics* 1998;20: 29-41
- [3] Berry M, Harris A, Lumb R. AND Powell K. Commensal ocular bacteria degrade mucins *The British Journal of ophthalmology* 2002; 86: 1412-1416
- [4] Brook I., Ocular infection due to aerobic bacteria. *International Ophthalmology* 2001;24, 269-277
- [5].Chisary G., Cavallaro, G, Reibaldi M and Biondi SPre-surgical antimicrobial prophylaxis : effect on ocular flora in healthy patients. *International Journal of Clinical Pharmacology and Therapeutics*. 2004;42:35-38
- [6].Levine J and Snider RWPractical ophthalmic microbiology. *Journal of Ophthalmic Nursing and Technology* 1999;18: 50-59
- [7]Champion L. The pros and cons of false eye lashes. (2009).Livestrong.com[©Demand Media,

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Inc] Available at <http://www.livestrong.com/article/47240-pros-cons-false-eye>.

[8] Edwards R, Eyelash growth[eHow.com:©1999-2011]. Available from <http://www.ehow.com/about>(2011). 5403623 eye-lash-growth.html#

[9] Eyelash Extension Clinic(EEC), What are eyelash extensions? [©Medlash LLC 2008-2012]. 2012;Available at <http://www.eyelashextensionclinic.com/faqs.htm>.

[10] Go Ask Alice(GAA), Eyelash extensions: Are they safe![Copyright 2005-2012]. Available at: <http://gaskalice.columbia.edu/eyelash-extensions-are-they-safe>.

[11]. Jenigan K, Side effects of eyelash extension. Livestrong .com[© 2012 Demand Media Inc.] Available at <http://www.livestrong.com/article/297718>. (2011). -side-effects-of-eyelash-extensions.

[12] Patel B, Meyers AD. Eyelid Anatomy[WebMD LLC© 1994-2012] ,(2011). Available from: <http://emedicine.medscape.com/article/834932-overview>.

[13] Nickey Hambleton-Jones Ten years younger- Channel 4 makeover series P p.105-107 published by Channel 4 Books, a division of Transworld publishers(2005). [ISBN 1-905-02603-X, Germany.

[14].Sanford-Smith J, Eye diseases in hot climates, W Arrowsmith Ltd, Bristol, UK, 1986;5:22, 51-54.

[15] LoftES.Dry Eyes. WebMD[© 2005-2012 WebMD,LLC], (2011). Available at:<http://www.webmd.com/eye-health/eye-health-dry-eyes>.

[16] The Beauty Insiders.Three most common side effects of having fake eyelashes.[© 2012The Beauty Insiders]. (2012). Available at: <http://www.thebeautyinsiders.com/3-most-common-side-effects-of-having-fake-lashes.html>.

[17]Thielen,TL., Castle, SS., and Terry,JEAnterior ocular infections: an overview of pathophysiology and treatment. Annals of Pharmacotherapy. 2000; 34, 235-245

[18]. Wilcox, M and Stapleton, F. Ocular bacteriology. Medical Microbiology Reviews1996);7, 123-131.