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## Dark and White Chocolate Consumption and Acne Vulgaris: A Case-Control Study

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### ABSTRACT

The association between chocolate consumption and acne vulgaris is a historical enigma. This study sought to investigate the effect of dark and white chocolate consumption on acne lesions. In this case-control, clinical trial, 57 volunteers with mild-to-moderate acne vulgaris were randomized in three groups, receiving 100 g of either white or dark (100%) chocolate bars daily for 30 consecutive days (case groups) or no chocolate (control group) during the study period. Facial acne noninflamed, inflamed and total lesions were counted at baseline, on week 2 and at endpoint (day 30). In white chocolate group, there were 11 males (61.1%) and 7 females (38.9%) with a mean age of  $17.9 \pm 7.2$  years (range: 12-29). In dark chocolate group, there were 14 males (73.7%) and 5 females (26%) with a mean age of  $17.6 \pm 6.0$  years (range: 12-29). In control group, there were 13 males (65%) and 7 females (35%) with a mean age of  $17.7 \pm 6.6$  years (range: 12-29). The three groups were comparable for sex ( $p = 0.71$ ) and age ( $p = 0.99$ ). No significant difference was found between the patients in dark chocolate group and those served as controls in terms of changes in acne lesions ( $p > 0.05$ ). All noninflamed ( $p = 0.02$ ), inflamed ( $p = 0.04$ ) and total ( $p = 0.02$ ) acne lesions in white chocolate group, however, increased significantly in comparison with the two other groups. According to this study, white but not dark chocolate consumption is associated with exacerbation of acne lesions.

**Key words:** Acne vulgaris, chocolate, facial lesion

### INTRODUCTION

Acne vulgaris is a very common skin condition, mostly seen in adolescents and young adults (Admani and Barrio, 2013). Although, the exact physiopathology of the disease is known and accordingly, many effective treatments have been supposed (Babaeinejad *et al.*, 2011; Fouladi, 2012, 2013; Khodaeiani *et al.*, 2012; Babaeinejad and Fouladi, 2013; Khodaeiani *et al.*, 2013), exacerbating factors are still under investigation (Navali *et al.*, 2011).

Among these factors, dietary etiologies have always been found interesting by both patients and physicians (Kumari and Thappa, 2013; Siniavskii and Tsoi, 2014).

Traditionally, patients with acne disease contribute their disease to consumption of certain materials including dairy products, chocolate, high-fat foods and sweet things (Pappas *et al.*, 2002; Adebamowo *et al.*, 2006, 2008; Halvorsen *et al.*, 2009; Davidovici and Wolf, 2010; Aksu *et al.*, 2012; Baharivand *et al.*, 2013).

Interestingly, there are only scarce scientific researches available in the literature that have examined such blames suggested by patients (Bett *et al.*, 1967; Fulton *et al.*, 1969; Pochi *et al.*, 1970; Mackie and Mackie, 1974), most of them outdated and methodologically flawed (Goh *et al.*, 2011).

The objective of the present study was to investigate a possible connection between chocolate (dark and white, separately) consumption with changes in acne severity in a case-control setting including patients with mild-to-moderate disease.

## **MATERIALS AND METHODS**

A total of 60 volunteers with moderate-to-severe acne vulgaris (Burke and Cunliffe, 1984) from a private clinic from April 2013 to June 2014 participated in this case-control, randomized clinical trial. The exclusion criteria were as the following: Secondary acne vulgaris, hypersensitivity to chocolate, pregnancy, presence of dermatologic diseases other than acne vulgaris and those on known anti-acne treatments started from the previous 3 months were excluded. White and pure (100%) dark Switzerland chocolate bars produced by a famous producer were purchased.

Patients were randomized in three 20-patient groups, receiving 100 g of either white or dark chocolate bars daily for 30 consecutive days (case groups) or no chocolate (control group) during the study period. Noninflamed, inflamed and total facial acne lesions were counted at baseline, on week 2 and at the endpoint. Within the 30 days of study period the patients were solicited to not take any anti-acne medication and all were on similar, conventional diet program. Three patients were lost for follow-up, including 2 patients in the group receiving white chocolate and 1 patient in the group receiving dark chocolate.

**Statistical analysis:** Using the SPSS software version 16.0 (SPSS Inc., IL, USA), the chi-square test, one-way ANOVA or Repeated Measures Analysis (RMA) were used for data analyzing, where appropriate.

The p-values  $\leq 0.05$  were considered as significant.

## **RESULTS**

Patients who received white chocolate were 11 males (61.1%) and 7 females (38.9%) with a mean age of  $17.9 \pm 7.2$  years (range: 12-29). In group consumed dark chocolate there were 14 males (73.7%) and 5 females (26%) with a mean age of  $17.6 \pm 6.0$  years (range: 12-29). In control group, there were 13 males (65%) and 7 females (35%) with a mean age of  $17.7 \pm 6.6$  years (range: 12-29).

The three groups were comparable for sex ( $p = 0.71$ ) and age ( $p = 0.99$ ). The mean duration of the disease was  $3.1 \pm 1.8$  years (range: 1-7),  $3.0 \pm 1.8$  years (range: 1-6) and  $3.5 \pm 1.7$  years (range: 1-6), respectively ( $p = 0.71$ ). The mean number of acne lesions on the face of patients in the three groups are summarized in Table 1.

From baseline to the endpoint, changes of the mean count of noninflamed, inflamed and total acne lesions on the face were not significantly different between dark chocolate receivers and controls ( $p = 0.98, 0.88$  and  $0.96$ , respectively).

In contrast, the mean number of noninflamed, inflamed and total acne lesions on the face of patients received white chocolate increased significantly within the study period in comparison with the two other groups ( $p = 0.02, 0.04$  and  $0.02$ , respectively).

No significant complications were reported by any participant.

Table 1: Mean facial acne lesions at baseline, on week 2 and at endpoint in three groups receiving white chocolate, dark chocolate and no chocolate (controls)

| Lesion/Time        | White chocolate group (n = 18) |       | Dark chocolate group (n = 19) |       | Control group (n = 20) |       |
|--------------------|--------------------------------|-------|-------------------------------|-------|------------------------|-------|
|                    | Mean                           | Rang  | Mean                          | Rang  | Mean                   | Rang  |
| <b>Noninflamed</b> |                                |       |                               |       |                        |       |
| Baseline           | 21.1±4.7                       | 15-29 | 23.5±3.7                      | 15-29 | 22.0±4.0               | 14-29 |
| Week 2             | 23.5±4.2                       | 16-29 | 23.0±3.5                      | 14-28 | 20.9±3.4               | 14-25 |
| Endpoint           | 25.6±4.2                       | 17-33 | 24.2±2.0                      | 18-27 | 22.0±4.4               | 15-27 |
| <b>Inflamed</b>    |                                |       |                               |       |                        |       |
| Baseline           | 24.8±5.4                       | 17-36 | 26.0±6.4                      | 17-36 | 23.9±4.8               | 17-32 |
| Week 2             | 26.6±4.8                       | 19-36 | 25.4±6.8                      | 19-36 | 22.5±3.4               | 19-32 |
| Endpoint           | 29.0±4.4                       | 23-37 | 26.7±5.6                      | 18-36 | 22.5±4.2               | 18-36 |
| <b>Total</b>       |                                |       |                               |       |                        |       |
| Baseline           | 45.9±8.6                       | 36-65 | 49.5±8.9                      | 36-65 | 45.9±6.8               | 36-60 |
| Week 2             | 50.1±7.4                       | 38-65 | 48.4±8.5                      | 3-62  | 43.4±4.3               | 33-51 |
| Endpoint           | 54.6±6.7                       | 41-68 | 50.8±6.8                      | 36-61 | 44.4±6.9               | 34-61 |

Data is presented as Mean±Standard deviation

## DISCUSSION

In this study, the effect of chocolate consumption on acne lesions was tested in three groups of patients with mild-to-moderate acne vulgaris. This is the first study in the literature that examined a possible connection between white and dark (pure) chocolates and acne vulgaris, individually. Based on these findings, pure chocolate had no significant influence on acne lesions, whereas consumption of white chocolate significantly exacerbated both noninflamed and inflamed facial acne lesions in comparison to controls.

In conformity with our results (Fulton *et al.*, 1969) in the first study in this regard in the literature found that eating chocolate had no effect on acne vulgaris. But it should be noted that they only evaluated the effect of dark chocolate in their study. No association between [dark] chocolate consumption and acne severity has been also suggested by other studies (Anderson, 1971; Chiu *et al.*, 2003).

In a very recent study by Caperton *et al.* (2014), it was concluded that unsweetened, 100% cocoa may exacerbate acne lesions only in males that are acne-prone. They performed their study on only 14 men with a wide age range (18-35 years), which may be considered as a large limitation in this regard.

As emphasized earlier, this is the first study that examined connection between white chocolate consumption and acne vulgaris. Unlike pure dark chocolate, white chocolate is generally consisted of cocoa butter (fat), sugar and milk. All these three components have been blamed as acne exacerbating factors by previous studies: Adebamowo *et al.* (2006) in two separate studies (Adebamowo *et al.*, 2006, 2008) showed that high intake of milk may exacerbate acne lesions.

In a study by Halvorsen *et al.* (2009), frequent consumption of sweet chocolates was along with acne exacerbation. They proposed that low-glycemic content may be beneficial to arrest the development of acne vulgaris. Both oily or fatty foods and foods with high sugar content have been nominated as causative or exacerbating factors in terms of acne vulgaris by Davidovici and Wolf (2010). Aksu *et al.* (2012) showed that frequent fat and sugar intake is associated with development of acne and its exacerbation. It has been described that high glycemic index lead to hyperinsulinemia, endocrine abnormalities (such as increased androgens and altered retinoid signal

pathways) and finally development or exacerbating of acne (Cordain *et al.*, 2002; Thiboutot and Strauss, 2002). On the other hand, both high carbohydrate and fat content of foods may be along with increase facial sebum secretion, which in turn lead to obstruction of pilosebaceous follicles, comedogenesis and finally emergence of acne lesions (Pappas *et al.*, 2002).

Whatever the physiopathology of connection between white chocolate consumption and acne exacerbation is, the results of this study may be found instructive by both physicians and patients, because it denied the dogma of association between dark chocolate and acne and the same time corroborated the hypothesis of the connection between fat, sugar or milk with this common dermatological disease. Further studies with larger sample sizes and longer durations of intervention and follow-up are recommended (Fattahi *et al.*, 2011; Shakeri *et al.*, 2011a, b; Amirnia *et al.*, 2012; Feiz *et al.*, 2012; Tarzamni *et al.*, 2012; Pouriesa *et al.*, 2013; Daghighi *et al.*, 2014; Sabeti *et al.*, 2013).

## CONCLUSION

White but not dark chocolate consumption is associated with exacerbation of acne lesions in patients with mild-to-moderate acne vulgaris.

## REFERENCES

- Adebamowo, C.A., D. Spiegelman, C.S. Berkey, F.W. Danby and H.H. Rockett *et al.*, 2006. Milk consumption and acne in adolescent girls. *Dermatol. Online J.*, Vol. 12.
- Adebamowo, C.A., D. Spiegelman, C.S. Berkey, F.W. Danby and H.H. Rockett *et al.*, 2008. Milk consumption and acne in teenaged boys. *J. Am. Acad. Dermatol.*, 58: 787-793.
- Admani, S. and V.R. Barrio, 2013. Evaluation and treatment of acne from infancy to preadolescence. *Dermatol. Ther.*, 26: 462-466.
- Aksu, A.E.K., S. Metintas, Z.N. Saracoglu, G. Gurel, I. Sabuncu, I. Arikan and C. Kalyoncu, 2012. Acne: Prevalence and relationship with dietary habits in eskisehir, Turkey. *J. Eur. Acad. Dermatol. Venereol.*, 26: 1503-1509.
- Amirnia, M., E. Khodaeiani, R.F. Fouladi and A. Hashemi, 2012. Topical steroids versus PUVA therapy in moderate plaque psoriasis: A clinical trial along with cost analysis. *J. Dermatol. Treat.*, 23: 109-111.
- Anderson, P.C., 1971. Foods as the cause of acne. *Am. Family Phys.*, 3: 102-103.
- Babaeinejad, S., E. Khodaeiani and R.F. Fouladi, 2011. Comparison of therapeutic effects of oral doxycycline and azithromycin in patients with moderate acne vulgaris: What is the role of age? *J. Dermatol. Treat.*, 22: 206-210.
- Babaeinejad, S.H. and R.F. Fouladi, 2013. The efficacy, safety and tolerability of adapalene versus benzoyl peroxide in the treatment of mild acne vulgaris: A randomized trial. *J. Drugs Dermatol.*, 12: 1033-1038.
- Baharivand, N., A. Mahdavi and R.F. Fouladi, 2013. Intravitreal clindamycin plus dexamethasone versus classic oral therapy in toxoplasmic retinochoroiditis: A prospective randomized clinical trial. *Int. Ophthalmol.*, 33: 39-46.
- Bett, D.G., J. Morland and J. Yudkin, 1967. Sugar consumption in acne vulgaris and seborrhoeic dermatitis. *Br. Med. J.*, 3: 153-155.
- Burke, B.M. and W.J. Cunliffe, 1984. The assessment of acne vulgaris-the leeds technique. *Br. J. Dermatol.*, 111: 83-92.

- Caperton, C., S. Block, M. Viera, J. Keri and B. Berman, 2014. Double-blind, placebo-controlled study assessing the effect of chocolate consumption in subjects with a history of acne vulgaris. *J. Clin. Aesthetic Dermatol.*, 7: 19-23.
- Chiu, A., S.Y. Chon and A.B. Kimball, 2003. The response of skin disease to stress: Changes in the severity of acne vulgaris as affected by examination stress. *Arch. Dermatol.*, 139: 897-900.
- Cordain, L., S. Lindeberg, M. Hurtado, K. Hill, S.B. Eaton and J. Brand-Miller, 2002. Acne vulgaris: A disease of Western civilization. *Arch. Dermatol.*, 138: 1584-1590.
- Daghighi, M.H., M. Pouriesa, M. Maleki, D.F. Fouladi, M.Z. Pezeshki, R.M. Khameneh and A.M. Bazzazi, 2014. Migration patterns of herniated disc fragments: A study on 1,020 patients with extruded lumbar disc herniation. *Spine J.*, 14: 1970-1977.
- Davidovici, B.B. and R. Wolf, 2010. The role of diet in acne: Facts and controversies. *Clin. Dermatol.*, 28: 12-16.
- Fattahi, E., M.H. Somi, M.R. Moosapour and R.F. Fouladi, 2011. Independent predictors of in-hospital re-bleeding, need of operation and mortality in acute upper gastrointestinal bleeding. *Pak. J. Biol. Sci.*, 14: 849-853.
- Feiz, H.H., A. Afrasiabi, R. Parvizi, A. Safarpour and R.F. Fouladi, 2012. Scoliosis after thoracotomy/sternotomy in children with congenital heart disease. *Indian J. Orthop.*, 46: 77-80.
- Fouladi, R.F., 2012. Aqueous extract of dried fruit of *Berberis vulgaris* L. in acne vulgaris, a clinical trial. *J. Diet. Suppl.*, 9: 253-261.
- Fouladi, R.F., 2013. A single case report using an antiacne topical medication for severe foot odor. *JAMA Dermatol.*, 149: 250-251.
- Fulton, Jr., J.E., G. Plewig and A.M. Kligman, 1969. Effect of chocolate on acne vulgaris. *J. Am. Med. Assoc.*, 210: 2071-2074.
- Goh, W., K.J. Kallianpur, D. Chow, P.G. Almeida, A.C. Brown, S. Pager and P. Sil, 2011. Chocolate and acne: How valid was the original study? *Clin. Dermatol.*, 29: 459-460.
- Halvorsen, J.A., F. Dalgard, M. Thoresen, E. Bjertness and L. Lien, 2009. Is the association between acne and mental distress influenced by diet? Results from a cross-sectional population study among 3775 late adolescents in oslo, norway. *BMC Public Health*, Vol. 9. 10.1186/1471-2458-9-340
- Khodaeiani, E., R.F Fouladi, N. Yousefi, M. Amirnia, S. Babaeinejad and J. Shokri, 2012. Efficacy of 2% metronidazole gel in moderate acne vulgaris. *Indian J. Dermatol.*, 57: 279-281.
- Khodaeiani, E., R.F. Fouladi, M. Amirnia, M. Saeidi and E.R. Karimi, 2013. Topical 4% nicotinamide vs. 1% clindamycin in moderate inflammatory acne vulgaris. *Int. J. Dermatol.*, 52: 999-1004.
- Kumari, R. and D.M. Thappa, 2013. Role of insulin resistance and diet in acne. *Indian J. Dermatol., Venereol. Leprol.*, 79: 291-299.
- Mackie, B.S. and L.E. Mackie, 1974. Chocolate and acne. *Aust. J. Dermatol.*, 15: 103-109.
- Navali, N., S. Pourabolghasem, R.F. Fouladi and M.A. Nikpour, 2011. Therapeutic effects of biguanide vs. statin in polycystic ovary syndrome: A randomized clinical trial. *Pak. J. Biol. Sci.*, 14: 658-663.
- Pappas, A., M. Anthonavage and J.S. Gordon, 2002. Metabolic fate and selective utilization of major fatty acids in human sebaceous gland. *J. Invest. Dermatol.*, 118: 164-171.

- Pochi, P.E., D.T. Downing and J.S. Strauss, 1970. Sebaceous gland response in man to prolonged total caloric deprivation. *J. Invest. Dermatol.*, 55: 303-309.
- Pouriesa, M., R.F. Fouladi and S. Mesbahi, 2013. Disproportion of end plates and the lumbar intervertebral disc herniation. *Spine J.*, 13: 402-407.
- Sabeti, S., F. Malekzad, M. Ashayer, R.F. Fouladi, K.K. Hesari, M.P. Toutkaboni and S. Younespour, 2013. The rate and pattern of bcl-2 and cytokeratin 15 expression in trichoepithelioma and nodular basal cell carcinoma: A comparative study. *Indian J. Dermatol.*, 58: 331-336.
- Shakeri, A., M. Abdi, H.T. Khosroshahi and R.F. Fouladi, 2011a. Common carotid artery intima-media thickness and atherosclerotic plaques in carotid bulb in patients with chronic kidney disease on hemodialysis: A case-control study. *Pak. J. Biol. Sci.*, 14: 844-848.
- Shakeri, A., M.B. Bazzaz, A. Khabbazi and R.F. Fouladi, 2011b. Common carotid intima-media thickness in patients with late rheumatoid arthritis: What is the role of gender? *Pak. J. Biol. Sci.*, 14: 812-816.
- Siniavskii, I.A. and N.O. Tsoi, 2014. Influence of nutritional patterns on the severity of acne in young adults. *Voprosy Pitaniia*, 83: 41-47.
- Tarzamni, M.K., N. Eshraghi, R.F. Fouladi, A. Afrasiabi, M. Halimi and A. Azarvan, 2012. Atherosclerotic changes in common carotid artery, common femoral artery and ascending aorta/aortic arch in candidates for coronary artery bypass graft surgery. *Angiology*, 63: 622-629.
- Thiboutot, D.M. and J.S. Strauss, 2002. Diet and acne revisited. *Arch. Dermatol.*, 138: 1591-1592.