

The Relationship between chocolate consumption and the appearance of acne in female medical students at Wijaya Kusuma University Faculty of Medicine, Surabaya, November 2013 – January 2014

A relação entre o consumo de chocolate e o surgimento de acne em estudantes de medicina femininas da Faculdade de Medicina da Universidade Wijaya Kusuma, Surabaya, Novembro 2013 – Janeiro 2014

La relación entre el consumo de chocolate y la aparición de acné en estudiantes de medicina mujeres de la facultad de medicina de la Universidad Wijaya Kusuma, Surabaya, Noviembre 2013 – Enero 2014

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Abstract

Chocolate has increasingly become a part of modern lifestyle and personal enjoyment. Despite this, misconceptions persist regarding its effects on health, particularly its alleged role in causing acne. Chocolate is often perceived as a processed food that contributes to acne development, a belief that remains widespread. This concern is especially prevalent among young women, who are often highly conscious of their appearance and apprehensive about acne. The present study aimed to evaluate the relationship between chocolate consumption and the onset of acne. This study employed a cross-sectional, analytic observational design to examine the relationship between chocolate consumption and acne incidence. The population consisted of female medical students aged 18 to 20 years from the Faculty of Medicine at Wijaya Kusuma University Surabaya. A total of 44 participants were randomly selected and divided into two groups: one group consumed milk chocolate containing 30% cocoa, while the other group consumed dark chocolate containing 50% cocoa. Both groups were observed over a period of six weeks. The findings indicated a significant association between the type of chocolate consumed and the appearance of acne, with a p-value of 0.026 ($p < 0.05$), as determined by the Chi-Square test. These results suggest that the presence of acne is not directly caused by chocolate itself, but rather may be attributed to additional ingredients—particularly those with a high glycemic index—commonly found in certain types of chocolate products.

Keywords: Milk chocolate; Dark chocolate; Acne.

Resumo

O chocolate tornou-se um estilo de vida e uma paixão para algumas pessoas hoje em dia. No entanto, ainda há muitas pessoas que acreditam no mito sobre o efeito do consumo de chocolate. O chocolate é considerado uma causa da acne. Muitas jovens estão muito preocupadas com a sua aparência e realmente têm medo do surgimento da acne. O presente estudo teve como objetivo avaliar a relação entre o consumo de chocolate e o surgimento da acne. Este estudo utilizou um estudo transversal, que é um estudo observacional analítico, e as hipóteses foram testadas usando o teste do Qui-quadrado. A população deste estudo são estudantes do sexo feminino, com idade entre 18 e 20 anos, da Faculdade de Medicina da Universidade Wijaya Kusuma Surabaya, com uma amostra total de 44 alunas. A amostra foi retirada aleatoriamente e dividida em dois grupos. O primeiro grupo consumiu chocolate ao leite contendo 30% de cacau, e o segundo grupo consumiu chocolate amargo contendo 50% de cacau. Em seguida, cada grupo foi observado por 6 semanas. Os resultados indicam que há uma influência do tipo de chocolate consumido (chocolate ao leite e chocolate amargo) no surgimento de acne nas estudantes do sexo feminino, de 18 a 20 anos, da Faculdade de Medicina da Universidade Wijaya Kusuma Surabaya em 2013. Isso foi confirmado pelo valor de $p = 0,026$ ($< 0,05$), e pode-se concluir que a acne não é causada pelo chocolate em si, mas sim pelos ingredientes adicionais do chocolate que possuem alto índice glicêmico, que são causas do aparecimento da acne.

Palavras-chave: Chocolate ao leite; Chocolate amargo; Acne.

Resumen

El chocolate se ha convertido en un estilo de vida y una pasión para algunas personas hoy en día. Sin embargo, todavía hay muchas personas que creen en el mito sobre el efecto del consumo de chocolate. El chocolate es considerado una causa del acné. Muchas jóvenes están muy preocupadas por su apariencia y realmente temen la aparición del acné. El presente estudio tuvo como objetivo evaluar la relación entre el consumo de chocolate y la aparición del acné. Este estudio utilizó un estudio transversal, que es un estudio observacional analítico, y las hipótesis se probaron utilizando la prueba de Chi-cuadrado. La población de este estudio son estudiantes femeninas de 18 a 20 años de la Facultad de Medicina de la Universidad Wijaya Kusuma Surabaya, con una muestra total de 44 estudiantes. La muestra fue tomada aleatoriamente y luego dividida en dos grupos. El primer grupo consumió chocolate con leche que contiene un 30% de cacao, y el segundo grupo consumió chocolate oscuro que contiene un 50% de cacao. Luego, cada grupo fue observado durante 6 semanas. Los resultados indican que hay una influencia del tipo de chocolate consumido (chocolate con leche y chocolate oscuro) en la aparición del acné en estudiantes femeninas de 18 a 20 años de la Facultad de Medicina de la Universidad Wijaya Kusuma Surabaya en 2013. Esto está confirmado por el valor $p = 0,026 (< 0,05)$, y se puede concluir que el acné no es causado por el chocolate en sí, sino por los ingredientes adicionales del chocolate que tienen un índice glucémico alto, los cuales son causa de la aparición del acné.

Palabras clave: Chocolate con leche; Chocolate oscuro; Acné.

1. Introduction

For some individuals, chocolate represents not only a popular indulgence but also a lifestyle preference. Despite its popularity, persistent misconceptions surrounding chocolate consumption—particularly its assumed link to acne—lead many to avoid it, even when they desire to consume it. This concern is especially evident among adolescent females, who often express heightened anxiety over acne due to its perceived negative impact on physical appearance. As appearance plays a significant role in self-perception and social interactions, especially among young women, chocolate is frequently avoided based on the belief that it contributes to skin problems (Khomsan, 2005).

Chocolate is derived from the seeds of the cacao plant (*Theobroma cacao*), which is native to the rainforests of South and Central America (Morganelli, 2006). Numerous studies have documented the health-promoting properties of cocoa, attributing them primarily to its high flavonoid and antioxidant content (Afoakwa, 2010). Regular consumption of cocoa has been associated with a reduced risk of chronic diseases, including cardiovascular conditions, certain types of cancer, and other age-related health disorders (Afoakwa, 2010).

Chocolate producers generally manufacture three types of finished chocolate products: dark chocolate, milk chocolate, and white chocolate. These three types are differentiated based on their composition, namely the content of chocolate, sugar, and other additives (Brown, 2010). Additionally, there is couverture chocolate, a premium type often used by professionals in the industry for making pastries or cakes (Atkinson, Banks, France & McFadden, 2010).

1. Dark Chocolate

The quality of chocolate is partly assessed by a high percentage of solid chocolate content and low sugar content. The U.S. government requires a minimum of 35% cocoa solids for dark chocolate, while European standards set the minimum at 43% (Atkinson, Banks, France, & McFadden, 2010). However, to be considered high quality, chocolate must contain at least 60% cocoa solids. High-quality dark chocolate has a very low sugar content compared to other types of chocolate, which is why its taste is more bitter (Atkinson, Banks, France, & McFadden, 2010).

2. Milk Chocolate

Milk chocolate consists of solid chocolate, milk, sugar, vegetable fat, and a small amount of lecithin. The solid chocolate content in this type is lower than in dark chocolate, while its sugar content is much higher (Atkinson, Banks, France, & McFadden, 2010). This type of chocolate was first produced in Switzerland in 1875

by Daniel Peter (Atkinson, Banks, France, & McFadden, 2010). He thickened Henri Nestlé's formula milk and used it as a chocolate additive (Brown, 2010). This was done because fresh milk's acidity could spoil the chocolate's flavor. European milk chocolate still uses this recipe. In 1903, Milton Hershey founded the first company to mass-produce milk chocolate in the United States (Brown, 2010).

3. White Chocolate

White chocolate has a composition very similar to milk chocolate but does not contain solid chocolate; instead, it uses cocoa butter (Benjamin, 2003; Brown, 2010). White chocolate contains at least 20% cocoa butter, 14% milk, around 55% sugar, and other ingredients. Technically, white chocolate cannot be classified as chocolate because it does not contain cocoa solids or chocolate liquor (Brown, 2010). This chocolate is usually sold to produce various colors for chocolate candies or cakes (Atkinson, Banks, France & McFadden, 2010).

4. Couverture

Couverture chocolate is a high-quality chocolate used for coating and baking purposes. To make couverture chocolate, cocoa butter and sugar are added to cocoa mass, then mixed and ground into small granules. The mixture is then passed through a rolling machine to achieve a smooth texture. This process can last for several days depending on the desired smoothness. The final product undergoes a "tempering" process, where the chocolate's temperature is lowered to reach the desired consistency (Atkinson, Banks, France, & McFadden, 2010).

Most commercially available chocolate products are highly processed and typically formulated with added milk, sugar, and other ingredients. As a result, the proportion of pure cocoa content in these products is significantly reduced, which in turn diminishes the concentration of beneficial bioactive compounds naturally present in cocoa. Consequently, such products are not recommended for individuals seeking the therapeutic or health-promoting effects associated with cocoa consumption. In contrast, dark chocolate—characterized by its higher cocoa content and relatively low levels of sugar and calories—is considered the most suitable option for health-related dietary purposes (Khomsan, 2005).

Pure chocolate offers a range of health benefits, particularly for women. However, misconceptions about chocolate consumption remain prevalent among female consumers. When properly processed and consumed in its purer forms, chocolate can serve as a functional food with notable physiological advantages. A growing body of research has highlighted the positive health effects of chocolate, revealing that its benefits may outweigh its potential drawbacks (Lonchampt, 2004). These findings have contributed to an increase in chocolate consumption, as more individuals become aware of its therapeutic properties. Among its key bioactive compounds, chocolate contains agents that have a calming effect on the nervous system. As a result, chocolate consumption has been associated with reduced stress and relaxation, which may contribute to lowering blood pressure levels. Results from previous studies indicate that excessive consumption of fatty and high-sugar foods affects hormone production related to sebum (oil) secretion, which can lead to acne. However, no specific food has been scientifically proven to directly cause acne. Foods that influence hormone levels, such as dairy products, have been shown to contribute to the occurrence of acne (Lonchampt, 2004).

Acne is a common skin disease that occurs in many people, characterized by comedones (blackheads and whiteheads), papules, pustules, nodules, and scarring. Acne is caused by clogged pores or hair follicles, leading to inflammation and the formation of small sacs. The blockage of the follicles can be caused by several factors: excessive oil (sebum) production on the skin by sebaceous glands, dead skin cells that have not fully shed and stick together mixing with

sebum, and the accumulation of bacteria (*Propionibacterium acnes*). Besides the face, acne can also appear on other areas where sebaceous glands exist, such as the neck, shoulders, thighs, arms, legs, and buttocks (Nazir, 2005; (Andrew, 2000).

Acne appearance is highly associated with food intake and hormonal imbalance. Chocolate is frequently blamed for diet failures, acne, and dental problems, primarily due to its fat and sugar content. While some negative effects of chocolate consumption are valid, such as dental issues caused by high sugar levels, these can be mitigated with proper oral hygiene. Despite these concerns, chocolate also offers several health benefits.

The present study aimed to evaluate the relationship between chocolate consumption and the onset of acne. This study will investigate the effect of consuming milk chocolate and dark chocolate on the appearance of acne in female students aged 18-20 at the Faculty of Medicine, Wijaya Kusuma University Surabaya. The results of this study are expected to increase public knowledge about the various benefits and drawbacks of consuming chocolate.

2. Methodology

Design and Subjects

This study is an observational study with a cross-sectional design of quantitative nature (Pereira et al., 2018) using simple descriptive statistics (Shitsuka et al., 2014) with the use of data classes and absolute frequency and relative frequency percentage values. Target Population of this study are medical students of Wijaya Kusuma University Faculty of Medicine, class of 2013. Accessible Population are female students of the Faculty of Medicine, Wijaya Kusuma University Surabaya, aged 18-20 years. The sample consisted of the accessible population, which included 44 female medical students aged 18-20 years who met the inclusion and exclusion criteria and were selected through simple random sampling. The final sample consisted of participants who did not drop out during the study. The sample was then divided into two groups. The first group, consisting of 22 female students, consumed milk chocolate containing 30% cocoa, while the second group of 22 female students consumed dark chocolate containing 50% cocoa. Both groups were observed for 6 weeks to monitor the appearance of acne after chocolate consumption.

3. Results

The research was conducted on the campus of the Faculty of Medicine, Wijaya Kusuma University Surabaya, from November 2013 to January 2014. The sample size consisted of 44 students. The following are the results obtained from the study. Table 1 provides information regarding the frequency and percentage of the age range of the research participants.

Table 1 - Subject Age (n =44).

		Frequency	Percent
Age	18 years	14	31.8
	19 years	23	52.3
	20 years	7	15.9
	Total	44	100.0

Source: Research data (2014).

Based on age characteristics, majority of respondents were 19 years old (52.3%), followed by 18 years old (31.8%) and 20 years old (15.9%). In the following lines, Table 2 presents data on acne appearance after eating chocolate:

Table 2 - Acne Appearance After Eating Chocolate (n = 44).

		Frequency	Percent
Acne Appears	Yes	29	65.9
	No	15	34.1
	Total	44	100.0

Source: Research data (2014).

Based on the table above, 29 respondents (65.9%) reported experiencing acne following chocolate consumption, while 15 respondents (34.1%) did not report any acne after eating chocolate. In the following lines, Table 3 presents data the frequencies of consuming the type of chocolate:

Table 3 - Type of Chocolate (n = 44).

		Frequency	Percent
Type of Chocolate	Dark Chocolate	22	50.0
	Milk Chocolate	22	50.0
	Total	44	100.0

Source: Research data (2014).

This study was conducted with 44 students divided equally into two groups: 22 students who consumed dark chocolate and 22 students who consumed milk chocolate. In the following lines, Table 4 presents data on the effect of the type of chocolate to the appearance of acne:

Table 4 - The Effect of the Type of Chocolate Consumed on the Appearance of Acne in UWKS Medical Faculty Students in 2013 (n = 44).

	Acne Appearance n (%)	χ^2	OR (CI)
Dark Chocolate	11 (25.0)		0.517 (0.296, 0.903)
White Chocolate	18 (40.9)		2.328 (0.960, 5.646)
		0.026	50.0%

Source: Research data (2014).

The chi-square test results showed that there is an influence of the type of chocolate consumed on the appearance of acne in female students at FK UWKS in 2013, as evidenced by a p-value of 0.026 (< 0.05). Based on the table above, out of 22 respondents who consumed milk chocolate, 18 developed acne while only 4 did not. Meanwhile, out of 22 respondents who consumed dark chocolate, only 11 developed acne. Those who consumed dark chocolate had 48% lower odds of developing acne than other group. On the other hand, female students who consumed white chocolate had 2.3 times more likely to develop acne.

4. Discussion

Subject Characteristics

Based on the results of the conducted study, it was found that the type of chocolate consumed—milk chocolate or dark chocolate—has an effect on the appearance of acne in female students aged 18-20 at the Faculty of Medicine, Wijaya Kusuma University (FK UWKS) in 2013. This is supported by the Chi-square test result with a p-value of 0.026 (< 0.05). According to the table above, among 100% of respondents who consumed milk chocolate, 81.8% developed acne while only 18.2% did not. Meanwhile, among respondents who consumed dark chocolate, only 50% developed acne. Participants who consumed dark chocolate had 48% lower odds of developing acne compared to the other group. Conversely, female students who consumed milk chocolate were 2.3 times more likely to develop acne. However, only the dark chocolate group has significant results. This results was in line with recent study that stated white chocolate is linked to the worsening of acne vulgaris in adolescents and young adults who have the condition. White chocolate consists of cocoa butter (fat), sugar, and milk. These components are often linked to the worsening of acne vulgaris because they have a high glycemic index, which can lead to hyperinsulinemia and endocrine abnormalities, such as increased circulating androgens (Shelly, 2023).

The study also demonstrated that chocolate with a lower cocoa percentage is more frequently associated with the development of acne. Since the 19th century, researchers have explored the relationship between diet and acne, often implicating foods such as chocolate, sugar, and fat as potential contributors. However, two major studies conducted in the 1960s challenged this perspective (Nurk, 2009). Dermatologists and nutrition experts have revisited the relationship between acne and diet. There is even a growing trend of acne therapy through nutrition therapy, according to Dr. Jennifer Burris from the Department of Food Studies and Nutrition at New York University (2008). However, recent study indicate that consuming 50 g of chocolate with 85% cocoa daily, despite following an anti-inflammatory diet, might worsen acne lesions (Daszkiewicz, 2024). The 85% cocoa chocolate used in that study contained cocoa butter, cane sugar, vanilla extract, and soy lecithin. Of these ingredients, cocoa butter and sugar might contribute to worsening acne symptoms.

Foods with a high glycemic index (GI), which rapidly spiking blood sugar, are believed to have a direct effect on worsening acne because they trigger hormonal fluctuations. High GI foods can increase hormone levels in the body, including insulin, and stimulate oil gland production (Ingrid, 2010). Milk is also considered to have an impact on acne appearance due to its hormone content. A 2007 study conducted by Harvard University team showed a positive link between milk consumption and acne severity. Interestingly, those who consumed low-fat milk had experiencing more severe acne growth. This is suspected to result from the milk production process, which may elevate hormone levels that regulate sebum (oil) production. (Ingrid, 2010).

A common mistake when choosing chocolate is selecting cheap or very cheap branded chocolate. Such chocolate typically contains a low percentage of cocoa—on average less than 20%, sometimes less than 7%. This type of chocolate also contains high sugar, high saturated fat, and other harmful substances such as hydrogenated vegetable oil (HVO).

Implications for the Medical Field

From the results of this study, it was found that the type of chocolate consumed—milk chocolate and dark chocolate—affects the appearance of acne in female students aged 18-20 at the Faculty of Medicine, Wijaya Kusuma University (FK UWKS) in 2013. This can serve as a reference for dermatologists and nutritionists that chocolate has beneficial effects for the body; however, if the manufacturing process or the chocolate contains less than 50% cocoa, it carries a risk of increasing the occurrence of acne.

Research Limitations

The study conducted on the female students faced several challenges, including limitations of time and resources. Additionally, supervision of chocolate consumption could not be carried out strictly, which may have led to variations in results among the participants.

5. Conclusions

The findings of this study indicate a significant association between the type of chocolate consumed—milk chocolate versus dark chocolate—and the appearance of acne in female students aged 18–20 at FK UWKS in 2013, supported by a p-value of 0.026 (< 0.05). Among participants who consumed milk chocolate, only 18.2% did not develop acne, whereas in the dark chocolate group, acne incidence was evenly split, with 50% developing acne and 50% remaining unaffected. Those who consumed dark chocolate had 48% lower odds of developing acne than other group. On the other hand, female students who consumed white chocolate had 2.3 times more likely to develop acne

It can be inferred that acne is not caused by chocolate per se, but rather by additives with a high glycemic index commonly found in chocolate products, which may trigger acne development (Ingrid, 2010). Future research is recommended to further explore the differential effects of milk and dark chocolate consumption on acne occurrence in greater depth.

Conflict of interest

This scientific work was conducted independently. The authors declare that there are no conflicts of interest, either financial or personal, with any individuals or organizations that could improperly influence the content and results of this study.

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