

ORIGINAL ARTICLE

Relationship Between Coffee Consumption and Dry Eye Syndrome in Adulthood

Konsumsi Kopi Berhubungan Dengan Sindrom Mata Kering

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 <https://doi.org/10.56186/jbk.5-12>

ABSTRACT

Background

Dry eye syndrome is an eye disorder that affect tear film and can causes damage to the surface of the eyes. This disease is one of the health burdens because of its high prevalence. There are various risk factors for dry eye syndrome, one of which is coffee consumption, due to its high caffeine content. The purpose of this study was to assess the association between coffee consumption and dry eye syndrome in adults.

Methods

An analytic observational study with a cross-sectional design was used for this research. The population in this study were adults (20 – 59 years old) in RW 07 Panaragan Pojok with sample size of 115 people who were taken using cluster random sampling and simple random sampling. Data were collected through filling out questionnaires regarding coffee consumption and filling out OSDI questionnaires. Research data was analyzed using the Chi-square test.

Results

The results of this study shows that subjects who have dry eye syndrome are dominated by late adults in age 30 – 9 years old and male sex. Of all subjects with dry eye syndrome, most of them have a habit of consuming coffee, especially in light consumption. There is no relationship between gender ($p = 0,776$) and age ($p = 0,221$) with dry eye syndrome. Meanwhile, it was found that there is a relationship between coffee consumption and dry eye syndrome ($p = 0,000$).

Conclusions

This study shows that coffee consumption is associated with dry eye syndrome in adulthood. However, it was found that there is no significant relationship between sociodemographic characteristics (age and gender) and dry eye syndrome.

Keywords: coffee consumption; dry eye syndrome; adulthood; gender

ABSTRAK

Latar Belakang

Sindrom mata kering merupakan kelainan pada lapisan air mata yang dapat menyebabkan kerusakan pada permukaan mata dan termasuk salah satu masalah utama kesehatan mata mengingat prevalensinya yang tinggi. Terdapat berbagai faktor risiko terjadinya sindrom mata kering, salah satunya adalah konsumsi kopi, dikarenakan oleh tingginya kandungan kafein pada minuman tersebut. Tujuan penelitian ini adalah menilai hubungan antara konsumsi kopi dan sindrom mata kering pada usia dewasa.

Metode

Penelitian ini menggunakan metode analitik observasional dengan desain *cross-sectional*. Populasi penelitian adalah subjek usia dewasa (20 – 59 tahun) di RW 07 Panaragan Pojok dengan besar sampel 115 orang yang diambil dengan teknik *cluster random sampling* dan *simple random sampling*. Data dikumpulkan melalui pengisian kuesioner SQ-FFQ mengenai konsumsi kopi dan kuesioner OSDI untuk menilai tingkat keparahan sindrom mata kering. Data penelitian dianalisis menggunakan uji *Chi-square*.

Hasil

Hasil penelitian ini menunjukkan bahwa subjek yang memiliki sindrom mata kering didominasi oleh usia dewasa akhir (30–59 tahun) dan jenis kelamin laki-laki. Dari keseluruhan subjek dengan sindrom mata kering, sebagian besarnya memiliki kebiasaan konsumsi kopi, dan yang paling banyak adalah konsumsi ringan. Tidak ditemukan adanya hubungan antara jenis kelamin ($p=0,776$) dan usia ($p=0,221$) dengan sindrom mata kering. Sedangkan terdapat hubungan antara konsumsi kopi dengan sindrom mata kering ($p = 0,000$).

Kesimpulan

Terdapat hubungan antara konsumsi kopi dengan sindrom mata kering pada usia dewasa. Namun tidak ditemukan adanya hubungan antara karakteristik sosiodemografi (usia dan jenis kelamin) dengan sindrom mata kering.

Kata Kunci: konsumsi kopi; sindrom mata kering; usia dewasa; jenis kelamin

INTRODUCTION

Dry eye syndrome is a disorder of the tear film due to a lack of tear production or excessive evaporation, which can cause damage to the surface of the eye.¹ Dry eye syndrome is a major health burden, given its prevalence. The prevalence of dry eye sufferers worldwide is around 5-34%, increasing significantly with age. According to the Korea Center for Disease Control and Prevention (KCDC), dry eye syndrome is more common in Asian countries than in Western countries.²⁻³ For example, in Indonesia, in 2017, the prevalence of dry eyes was 26.5%.⁴ The main symptom of dry eye syndrome is a dry and gritty feeling in the eyes. Other symptoms include burning, itching, redness, foreign body sensation in the eye, watery eyes, and photophobia. In addition, dry eyes that are not treated properly can cause an increased risk of infection in the eyes, corneal ulcers, and even blindness.⁵ There are various risk factors for dry eye syndrome, namely age, medical condition, history of refractive surgery, consumption of drugs, and consumption of coffee.⁶

Coffee is the most widely consumed caffeine drink worldwide.⁷ The International Coffee Organization (ICO) shows data on coffee consumption in Indonesia has continued to increase since 1990. In 2018-2019, coffee consumption in Indonesia reached 50.97% of its production. This amount

is the highest compared to other coffee-producing countries such as Vietnam, Brazil, Ethiopia and Colombia.⁸ Apart from the benefits, the caffeine content in coffee also poses health risks. Excessive caffeine consumption can cause side effects such as increased heart rate and blood pressure.⁹ Sympathetic activation by caffeine affects the lacrimal glands. In the lacrimal glands, sympathetic stimulation causes vasoconstriction of the glands resulting in a decrease in tear secretion.¹⁰ Until now, there have been several studies with conflicting results regarding the effect of coffee consumption on tear film, even though the complications caused by dry eye syndrome need attention. Therefore, researchers are interested in conducting this study to assess the relationship between coffee consumption and dry eye syndrome in adulthood.

METHODS

This study used an analytic observational method with a cross-sectional design. This research was conducted at RW 07 Panaragan Pojok, Panaragan Village, Bogor West Java, in October 2021. The population in this study were 115 adult subjects. The sample selection used cluster random sampling and simple random sampling techniques. The inclusion criteria were adults aged 20-59 years. Exclusion criteria were adults taking antihypertensive, antihistamine, and antidepressant drugs, having eye inflammation, history of refractive surgery, having a habit of using computers or gadgets for ≥ 8 hours per day continuously, regularly consuming tea, chocolate, and energy drinks every day.

Data was collected by filling out the Semi-Quantitative - Food Frequency Questionnaire (SQ-FFQ) regarding coffee consumption and the Ocular Surface Disease Index (OSDI) questionnaire to assess the severity of dry eye syndrome. The SQ-FFQ questionnaire consists of a list of types of caffeinated coffee that are commonly consumed, the frequency of coffee consumption, and serving sizes. Next, the caffeine content of coffee consumed per day will be calculated. The results obtained will be grouped into not consuming coffee, mild, where caffeine consumption is <200 mg/day (<2 cups of coffee per day), and moderate-severe, where caffeine consumption is ≥ 200 mg/day (≥ 2 cups of coffee per day). The OSDI questionnaire consists of 12 questions that broadly assess three components: eye symptoms, visual function, and environmental triggers.

The method used was the Chi-square test with a significance level of $p < 0.05$ which was analyzed using SPSS (Statistical Package for Social Science) version 23.0.

RESULTS

In Table 1, when viewed from the age distribution, more respondents were found in late adulthood (40-59 years), namely 69 people (60%). Male respondents, namely 59.1%, dominate the gender variable. Most respondents had a coffee consumption habit of 82.6% of the total respondents, with the most consuming light coffee at 47% and the least consuming heavy coffee at 10.4%. For dry eye syndrome, it was found that more respondents had dry eye syndrome, although the number of differences was only slightly when compared to respondents who had normal eyes. For example, 54.8% of respondents had dry eye syndrome, while with normal eyes, 45.2% of all respondents.

Table 1. Characteristics of respondents

Variable	Respondent (n)	Percentage (%)
Age		
Early adulthood (20 – 39 years)	46	40
Late adulthood (40 – 59 years)	69	60
Gender		
Male	68	59.1
Female	47	40.9
Coffee consumption		
Not consumption	20	17.4
Light consumption	54	47
Moderate consumption	29	25.2
Heavy consumption	12	10.4
Dry eye syndrome		
Yes	63	54.8
No	52	45.2

Table 2. Relationship between sociodemographic characteristics and dry eye syndrome

Variable	Dry eye syndrome				p-value
	No		Yes		
	n	%	n	%	
Age					
20 – 39 Years	24	52.2	22	47.8	0.221*
40 – 59 Years	28	40.6	41	59.4	
Gender					
Male	30	44.1	38	55.9	0.776*
Female	22	46.8	25	53.2	

*: Chi-square test

Table 2 shows that more respondents aged 40-59 years had dry eye syndrome, namely 59.4% (41 people), while more respondents aged 20-39 had normal eyes. However, the test results obtained a $p = 0.221$ ($p > 0.05$), meaning there is no relationship between age and dry eye syndrome. In the gender variable, it was found that the number of respondents who experienced dry eye syndrome was more male, although the difference was not too significant, namely 55.9% in males. However, the p-value obtained from the test results was 0.776 ($p > 0.05$), so it was concluded that there was no relationship between gender and dry eye syndrome.

Table 3. The relationship between coffee consumption and dry eye syndrome in adults

Variable	Dry eye syndrome				p-value
	No		Yes		
	n	%	n	%	
Coffee consumption					
Not consumption	18	90	2	10	0.000*
Light consumption	32	59.3	22	40.7	
Moderate-Heavy consumption	2	4,9	39	95.1	

*: Chi-square test

Based on Table 3, it was found that of the 95 people who had coffee consumption habits, the majority experienced dry eye syndrome, with the highest percentage being moderate-to-heavy consumption; namely, 95.1% of all subjects experienced dry eye syndrome. Meanwhile, most subjects who did not consume coffee did not have dry eye syndrome, with a percentage of 90%.

The test results obtained a value of $p = 0.000$ ($p < 0.05$), which indicates that there is a relationship between coffee consumption and dry eye syndrome in adulthood.

DISCUSSION

The results of the analysis of the relationship between gender and dry eye syndrome in this study yielded a value of $p = 0.776$ ($p > 0.05$); it was stated that there was no relationship between the two variables. These results are consistent with research conducted by Gierow J.P and Kacz L. in 2018, which stated that there was no relationship between gender and tear osmolarity ($p > 0.05$).¹¹ Different things were found in the study conducted by Schaumberg D.A. et al. in 2013, the results showed that women had a higher level of symptom severity than men ($p < 0.001$).¹² The mechanism by which gender influences dry eye syndrome is uncertain. However, research by Vehof J. et al. in 2018 said that the clinical findings of dry eye syndrome, which increased in women compared to men, could occur due to several underlying mechanisms. One of them is because there are differences in the ocular surface sensitivity between women and men. Several studies have shown evidence that women have increased sensitivity to the cornea and conjunctiva. However, this difference may depend on certain factors, such as hormonal factors, especially in pre- or postmenopausal women, and other factors.¹³

The difference in the results of this study when compared with the Schaumberg study could be due to the age difference in the subjects. Subjects in Schaumberg's study were aged 70 years and over, and it is likely that all female subjects have experienced menopause. The results of this study are more directed to Gierow and Kacz's research because there are several similarities, namely both in their research and in this study, the age of the subjects studied was over 20 years.

In the relationship between age and dry eye syndrome, the p-value obtained from the study's results was 0.221 ($p > 0.05$), which indicated no relationship between age and dry eye syndrome. These results align with research by Paulsen A.J. et al., which showed that although there was an increase in the prevalence of dry eye syndrome with increasing age, the results of this study obtained $p = 0.06$, which indicated no relationship between age and dry eye syndrome.¹⁴ The results of this study were also in line with research conducted by Gierow J.P and Kacz L. is in line with this study, namely that there is no significant relationship between age and dry eye syndrome.¹¹ Different results were obtained from research by Farrand K.F. et al., showed that there was a relationship between age and dry eye syndrome ($p = 0.002$), it was said that the risk of experiencing dry eye syndrome increased with age. Although there are differences in the results of the relationship analysis, research by Farrand K.F. et al. has similar results with this study, namely that the age group of 45-54 years is twice as likely to experience dry eye syndrome compared to the age group of 18-34 years. This is in accordance with research conducted by researchers, namely that more subjects aged in late adulthood (40-59 years) experienced dry eye syndrome.¹⁵ Older people are said to be more at risk of decreased tear production because they have decreased corneal sensitivity related to the mechanism of dry eyes. With increasing age, besides experiencing a decrease in tear secretion, there is also an increase in tear evaporation which is the etiology of dry eye syndrome. This occurs due to eye changes, such as atrophy of the meibomian glands and eyelid laxity. However, apart from physiological processes, other factors can affect the occurrence of dry eye syndrome in the elderly, such as medical factors (polypharmacy) and disease factors, especially autoimmune diseases (Sjogren's syndrome and rheumatoid arthritis).^{16,17} Differences in the results

of this study with Farrand's research because Farrand's research did not rule out the factors of drugs which can also increase the risk of dry eye syndrome.

Based on the results of an analysis of the relationship between coffee consumption and dry eye syndrome, a value of $p = 0.000$ ($p < 0.05$) was obtained, meaning there is a relationship between the two variables. The same thing was found in previous research conducted by Juddy A.U. et al. in 2014, and it was proven that coffee-containing caffeine was associated with dry eyes ($p < 0.05$), significantly reducing tear production. The difference is that this research uses experimental methods in collecting data. Although it was found that there was a decrease in tear production after consuming caffeinated coffee, the effect of caffeine did not last long because tear production returned to near-normal levels in the 90th minute after consuming coffee.¹⁸

The substances contained in coffee vary, most of which are caffeine. It is believed that the caffeine in coffee affects tear production because caffeine increases the activation of sympathetic nerves. Sympathetic stimulation affects various organs, including the glands in the body, one of which is the lacrimal gland. In the lacrimal glands, sympathetic stimulation causes vasoconstriction resulting in decreased tear secretion. Another effect is that it can increase kidney blood flow which results in the speed of excretion of body fluids (diuresis) and causes tear production to decrease faster, resulting in dry eyes.^{19,20}

Research with different results was conducted by Jeong K.J. et al. in 2012 in Korea, which showed that the prevalence of dry eye syndrome was higher in subjects who had a habit of consuming <1 cup of coffee per day (9.2%) when compared to subjects who consumed 1-2 cups of coffee per day (8.8%) or who consumed coffee > 3 cups per day (6.3%). The analysis results of this study said there was no relationship between coffee frequency and dry eye syndrome.⁶ This difference in results could occur because the study did not rule out other risk factors for dry eye syndrome, such as smoking, alcohol consumption, and drugs such as antihypertensives. The study also did not consider other foods and drinks containing caffeine, such as chocolate, tea, and others. This study used the consumption of other foods and beverages containing caffeine as an exclusion criterion, so they were omitted.

This study has limitations; several other factors have yet to be examined in this study and can influence the occurrence of dry eye syndrome, such as environmental factors, medications, medical conditions, habits of using gadgets or computers, and others. Furthermore, this study did not examine food and beverage factors other than coffee, which also contain caffeine. In addition, the research was carried out subjectively using a questionnaire and was not equipped with an objective examination.

Based on the results and limitations of the existing research, the researchers suggest future research complement the implementation of the study with objective examinations such as the Schirmer test or other ophthalmological examinations to diagnose dry eye syndrome. It is also suggested to develop research results by examining other factors that can cause dry eye syndrome. It is recommended that health workers take preventive action by implementing educational efforts regarding dry eye syndrome and informing the public, especially adults, that coffee consumption is related to dry eye syndrome so that it is hoped that the community can recognize early the symptoms of dry eye syndrome and the normal limits of coffee consumption so that not consumed in excess.

CONCLUSION

After analyzing the data from the research results that have been obtained regarding coffee consumption and dry eye syndrome, it can be concluded that there is no relationship between sociodemographic characteristics (age and gender) and dry eye syndrome. At the same time, there is a relationship between coffee consumption and dry eye syndrome in adulthood. By conducting this research, researchers hope that people, especially adults, will become more aware of eye health and be able to recognize symptoms and risk factors for dry eye syndrome. Those who have a habit of consuming coffee can consume it within normal limits.

ACKNOWLEDGEMENT

Thank you to the Panaragan Urban Village and RW 07 Panaragan Pojok, Bogor, West Java.

AUTHORS CONTRIBUTION

Research concept and design: APF and EK; data collection: APF; analysis, interpretation of results, preparation of manuscripts, review of final manuscripts: APF and EK.

FUNDING

None

CONFLICT OF INTEREST

The authors declare that there is no known conflict for this work.

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