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The Effect of Carbohydrate Diet Program on Urine Ketone Positivity with A Long Time on A Diet of One until Three Years

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Abstract: Carbohydrate diet is a diet pattern that reduces carbohydrate consumption. Therefore, the body will use fat as an alternative energy source. The continuous use of fat causes the accumulation of fatty acids so it is often the cause of ketone positivity in the urine. Objective: Find out the effect of a carbohydrate diet program on the positivity of urine ketones. Method this research is an analytic observational study with a cross-sectional approach. The sample used was urine from respondents who had been on a carbohydrate diet for 1 year, 2 years, and 3 years, then urine ketones were examined using the dipstick method. Data analysis was carried out using the Chi-Square test with a confidence value (α = 0.05). Result: The sample in this study amounted to 45 samples, with a total of 23 samples of positive ketones and 22 samples of negative ketones. The results of the Chi-Square test obtained an Asymp.sig value of 0.009 <0.05 (α) which indicates that the carbohydrate diet program has a significant effect on the positivity of urine ketones. The carbohydrate diet program affects urine ketone levels.

Keywords: Carbohydrate; Diet Program; Ketone Positivity.

Introduction

The carbohydrate diet or ketogenic diet was first introduced by Wilder in 1921 as a method for *treating epilepsy*. A carbohydrate diet is a diet that reduces carbohydrate consumption and increases fat consumption as an energy source. When doing a carbohydrate diet, the body will burn fat, not carbohydrates (Dewi, *et al.*, 2023). This condition is called ketosis. When the body is in a state of ketosis, there is often a positivity of ketones in the urine (Ngurah, et.al., 2017; Purnomo, et.al., 2021).

Ketones are products of fatty acid metabolism consisting of 3 compounds, namely acetone, acetoacetic acid, and beta-hydroxybutyric acid. The presence of ketones in urine and blood is a sign of the body that the body is lacking carbohydrates and glucose as an energy source. Thus, the body will convert non-carbohydrate substances into glucose. This process is called gluconeogenesis (Soraya, 2017). Ketones will be produced by the liver under normal circumstances as a result of fatty acid metabolism. When fatty acid levels increase, fatty acids will enter the liver so that an oxidation-β process occurs that produces acetyl-CoA, NADH, and ATP. NADH produced helps push oxaloacetate into malate (Karmila, et.al., 2019; Apriyani & Melani, 2023).

The small amount of oxaloacetate available is then catalyzed by citrate syntation and causes a buildup of acetyl-CoA. The two acetyl-CoA molecules formed will react to produce acetoacetyl CoA through the reversal of the thiolase reaction. Another acetyl-CoA will react with acetoacetyl CoA then produce 3-hydroxy-3methylglutaril CoA and liberate the unassimilated CoA. The catalyst in this reaction is the enzyme HMG-CoA synthase. Furthermore, there will be a reaction of HMG-CoA termination by HMG-CoA lyase to form acetyl-CoA and acetoacetate (Husna, 2018; Martini, 2023). Excess acetoacetic acid production that accumulates above normal levels will be converted into

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acetone and the presence of carbon dioxide will form beta-hydroxybutyric acid. These three compounds are known as ketone objects. This happens because the Krebs cycle works more optimally due to an increase in acetyl-CoA so that it will spur mitochondria to activate ketogenesis (Soraya, 2017). Ketogenesis generally occurs when carbohydrate stores decrease dramatically, such as when on a carbohydrate diet (Selima, et.al., 2023).

The number of people who are interested in losing weight by doing a carbohydrate diet in Indonesia motivates some people to form a community that focuses on carbohydrate diet programs (Widayani, et.al., 2021; Susanti & Bistara, 2022). One of them in Cakranegara District, Mataram, West Nusa Tenggara, has established a club that recommends the application of carbohydrate diets to its members. This club consists of ± 45 people consisting of men and women, from adolescence to adulthood with a period of carbohydrate diet for 1-3 years (Rahayuningrum & Yenni, 2018; Fitriani & Fadilla, 2020; Ludiana, et.al., 2022).

Based on this description, the author is interested in conducting research on the Effect of a Carbohydrate Diet on Urine Ketone Positivity with a Long Time on a Diet of 1 Year, 2 Years, and 3 Years. It is hoped that the results of this study can provide information about carbohydrate diet and its effect on urine examination (Irfan & Wibowo, 2015; Aisyiah, et.al, 2023; Tandjungbulu, et.al., 2023)

Method

This study is an analytical observational study designed by analytical observational research to determine the effect of carbohydrate diet programs on urine ketone positivity. The sample size was 45 samples divided into 3 groups. The tools used in this study were sample pots, dry tissue, and ketone examination strips. Data obtained by measuring urine ketone positivity by the dipping method are presented in table form. The data was analyzed with *the Chi-Square* statistical test with a confidence level of 95%.

Result and Discussion

The study was conducted by dividing 45 respondents into 3 groups, group 1 year on a diet, group 2 years on a diet, and group 3 years on a diet. This aims to determine the effect of carbohydrate diet programs on urine ketone positivity. The sample used was a urine sample from the respondent. The sample is then examined for urine ketones using ketone examination strips. Based on the results of Table 1, it is known that there were 4 positive ketone samples from a total of 16 sample respondents who had been on a carbohydrate diet for 1 year (Utami, et.al., 2022; Rahayu, et. al., 2023; Zarmila, et.al., 2023).

Table 1. Results of urine ketone examination in respondents who have been on a carbohydrate diet for 1 year.

Sample Code	Examination Results	
	Positive	Negative
KT030		(-)
KT031		(-)
KT032	(+)	
KT033		(-)
KT034		(-)
KT035	(+)	
KT036		(-)
KT037		(-)
KT038		(-)
KT039	(+)	
KT040		(-)
KT041		(-)
KT042		(-)
KT043		(-)
KT044	(+)	
KT045		(-)

Based on the results of Table 2, it is known that there were 7 positive ketone samples from a total of 14 samples in respondents who had been on a carbohydrate diet for 2 years.

Table 2. Results of urine ketone examination in respondents who have been on a carbohydrate diet for 2 years.

Sample Code	Examination Results	
	Positive	Negative
KT016	(+)	
KT017		(-)
KT018		(-)
KT019		(-)
KT020	(+)	
KT021		(-)
KT022	(+)	
KT023		(-)
KT024		(-)
KT025	(+)	
KT026	(+)	
KT027	(+)	
KT028		(-)
KT029	(+)	
Sum	7	7

Based on the results of Table 3, it is known that there were 12 positive ketone samples from a total of 15 samples in respondents who had been on a carbohydrate diet for 3 years.

Table 3. Results of urine ketone examination in respondents who have been on a carbohydrate diet for 3 years.

Sample Code	Examination Results	
	Positive	Negative
KT001	(+)	
KT002	(+)	
KT003	(+)	
KT004	(+)	
KT005	(+)	
KT006	(+)	
KT007	(+)	
KT008	(+)	
KT009	(+)	
KT010	(+)	
KT011	(+)	
KT012	(+)	
KT013		(-)
KT014		(-)
KT015		(-)
Sum	12	3

Table 4. Statistical Test Results (Chi-Square Tests)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.1382[A]	2	0.009

0 cells (0%) have an expected count of less than 5. The minimum expected count is 6,84.

Based on statistical results show a p-value of 0.009 < α which means there is an effect of carbohydrate diet programs on urine ketone positivity. This study used 45 respondents who had been on a carbohydrate diet for 1 year, 2 years, and 3 years and had agreed or signed *informed consent* as a statement that respondents were willing to follow this research procedure. According to the group of long-term dieters, out of 45 respondents, 15 of them were on a diet for 3 years, 14 people were on a diet for 2 years and 16 people were on a diet for 1 year (Sari, et.al., 2023). This is under the data that the author obtained when submitting a questionnaire before respondents signed *informed consent* (San, et.al 2020).

Based on this, it can be seen that currently, many people have an interest in doing a carbohydrate diet, in addition to being a means to lose weight as well as a healthy lifestyle through a balanced diet program (Naibaho & Kusumaningrum, 2020; Sri Mulia Sari & Hersianda., 2020).

The results of urine ketone examination on 45 respondents obtained the highest ketone value of (+1) or equivalent to 9 mg / dL and the lowest ketone value was negative (-) (Suhandi, et.al., 2020; Suprapti, et.al., 2021). In this study, the highest ketone positivity obtained was only (+1) or equivalent to 9 mg / dL because respondents carried out a carbohydrate diet pattern with a balanced portion, namely 30% carbohydrates, 30% fat, and 40% protein. Statistically using the *Chi-Square* test shows a significant difference with an *Asymp. Sig* value of 0.009, so it can be said that the carbohydrate diet program affects the positivity of urine ketones (Pratiwi & Rizky, 2023).

The carbohydrate diet program affects the positivity of urine ketones can be caused because respondents have reduced the consumption of carbohydrates which are the main source of energy for the body (Farhan & Hidayat, 2021; Daliyanti, et.al., 2022). When the body loses energy sources, the body will automatically use alternative energy sources such as fat. Excess fat metabolism in the body will cause a buildup of fatty acids and produce ketone objects. This often causes the positivity of ketone objects in urine (Naid, et.al., 2014; Pinontoan, et.al., 2023; Krisdianti, et.al., 2023).

Other factors that cause ketone positivity in urine are pregnancy conditions, diabetes mellitus, and taking vitamin C (Adam & Tomayahu, 2019; Bistara, et.al., 2019; Al Fatih, H. et.al., 2023). The presence of ketones in the urine (ketonuria) usually occurs in pregnant women with hyperemesis gravidarum disorder characterized by nausea, vomiting, and difficulty eating (Derek, et.al, 2017). This causes metabolism in the body to be disrupted and causes complications as well as hypokalemia, dehydration, weight loss up to more than 5%, and ketonuria. In this situation, the body will metabolize fat so that there will be an increase in ketone levels in the urine (Karmila, et al., 2019; Nababan, 2020; Haryono & Handayani, 2021).

Based on the results of this study, it is known that there are significant results on urine ketone examination in respondents who have been on a carbohydrate diet for 1 year, 2 years, and 3 years. So, statistically, it can be said that there is an effect of carbohydrate diet programs on urine ketone positivity (Sari, et.al., 2020; Putra Ritonga & Ningsih, 2021; Rini Hamsidi, et.al., 2023).

Conclusion

Based on research that has been done, it can be concluded that there is an influence of carbohydrate diet programs on urine ketone positivity.

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The author declares no conflict of interes

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