

DIETARY CARBOHYDRATE INTAKE AND FASTING BLOOD GLUCOSE AMONG PEOPLE VISIT NON-COMMUNICABLE DISEASE RISK FACTOR SURVEILLANCE IN PUSKESMAS KEDUNGMUNDU

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Abstract: Long lasting elevation of blood glucose concentrations, can result blindness, renal failure, vascular disease and neuropathy. Therefore, blood glucose concentration need to be maintained within narrow limits. The source of carbohydrate which has high dietary glycemic index causes stronger blood glucose response. The objective was to describe the dietary carbohydrate intake profile and fasting blood glucose profile among adult people. In this cross sectional study, the 100 subjects used were taken randomly from people who visit non communicable disease risk factor surveillance in PuskesmasKedungmundu, Semarang city. Fasting blood glucose was measured by glucose test strips and dietary carbohydrate intake was measured by 24 hours food recall. The data were analyzed using descriptive analysis by SPSS 20 and Nutrisurvey software. Results showed that the prevalence of impaired fasting glucose was 35%, and the prevalence of excess dietary carbohydrate intake was 17%, the average mean value of blood glucose among subjects was 104,20 mg/dl, while the mean of daily carbohydrate intake was 234,85 gram. The highest level of fasting blood glucose was 388 mg/dl and the lowest one was 60 mg/dl. The maximum value of carbohydrate consumption in one day was 481,70 gram while the minimum value was 80,30 gram. Reduction in carbohydrate intake in food and drink may be considered to decrease the problem of impaired fasting glucose.

Keywords: Dietary Carbohydrate, Fasting Blood Glucose

INTRODUCTION

Long lasting elevation of blood glucose concentrations, can result blindness, renal failure, vascular disease and neuropathy. Therefore, blood glucose concentration need to be maintained within narrow limits. This maintenance is achieved through a balance of several factors, including the rate of consumption and intestinal absorption of dietary carbohydrate.⁽¹⁾ The amount of carbohydrate that people ate and the source of the carbohydrate from food, influence how high blood glucose goes after meal. The American Diabetes Association gives some guidance to get about half (45-65%) of total calories from carbohydrate and the limit of average carbs in one day should be less than 130 grams. Many types of foods count as carbohydrate such as sweets, starches, and fruit⁽²⁾

The source of carbohydrate which has high dietary glycemic index causes stronger blood glucose response. Rice is one of starches which has been a staple food in Asian countries for century with number of glycemic index about 64.⁽³⁾ The other source of carbohydrate comes from usual sugar-sweetened beverage consumption.⁽⁴⁾ The aim of this study is to evaluate dietary carbohydrate intake habit for their association with impaired fasting glucose in a cross sectional survey in Semarang city population at PuskesmasKedungmundu working area.

METHODS

The study procedure was a cross sectional survey of men and women who were participated in non-communicable disease risk factor surveillance called PROLANIS and POSBINDU at PuskesmasKedungmundu during

July-August 2016. Among 74 females and 26 males who aged 18 years old and above agreed to participate the study. After excluding subjects who didn't take overnight fasting or had a history of diabetes, the subjects were given questionnaires regarded to gender, age, education, occupation, dietary carbohydrate intake, and fasting blood glucose. 24 hour Food Recall questionnaire was used to ask subject about their daily meals, then the data was input in Nutrisurvey software to give dietary carbohydrate information. *Auto-check* glucometer with glucose test strip were used to measure fasting blood glucose. Written informed consent was obtained from study participants. The study protocol was approved by the ethics committee of Diponegoro University. All statistical analysis were performed by SPSS version 20 using descriptive analysis

RESULT

Demographic data were defined by characteristics including gender, education, occupation and age. Based on gender, women respondents were 74%. The respondents who attained senior high school were 44%. Most respondents were employed as governmental organization worker (29%), respondents in the age 45-54 years old were 30%.

Figure 1. Gender, Education, Occupation, and Age level among Subject

Sub variable	N	%
Gender		
Women	74	74
Men	26	26
Education		
Uneducated	9	9
Elementary school	8	8
Junior high school	6	6
Senior high school	44	44
College	33	33
Occupation		
House wife	22	22
Governmental org.	29	29
Entrepreneur	23	23
Service worker	3	3
Others	23	23
Age		
65-74	4	4
55-64	15	15
45-54	30	30
35-44	23	23
25-34	18	18
15-24	10	10

The average mean value of blood glucose among subjects was 104,20 mg/dl, while the mean of daily carbohydrate intake was 234,85 gram. The highest level of fasting blood glucose was 388 mg/dl and the lowest one was 60 mg/dl. The maximum value of carbohydrate consumption in one day was 481,70 gram while the minimum value was 80,30 gram.

Figure 2. Mean, Deviation Standard, Minimum and Maximum value of FBG and Carbohydrate Intake

Variable	Fasting Blood Glucose (mg/dl)	Carbohydrate Intake (gram/day)
Mean	104,20	234,85
SD	48,5	86,61
Minimum	60	80,30
Maximum	388	481,70

The prevalence of impaired fasting glucose was 35%, and the prevalence of excess dietary carbohydrate intake was 17%. The prevalence of impaired fasting glucose among respondents who had excess carbohydrate intake was 29,4%, lower than the prevalence among respondents who had normal carbohydrate intake (36,1%).

Figure 3. Proportion of Carbohydrate Intake with Fasting Blood Glucose

Carb Intake (gr/day)	Fasting Glucose				Total	
	Impaired Fasting Glucose		Normal Blood Glucose			
	N	%	N	%	N	%
Excess Carbs Intake	5	29,4	12	70,6	17	100
Normal Carbs Intake	30	36,1	53	69,3	83	100
Total	35	35	65	65	100	100

DISCUSSION

Recent study in Mandalay city, Myanmar, used fingertip prick to measure fasting blood glucose.⁽⁵⁾ Similar with this study, our study also use capillary fasting blood glucose that had taken in the morning after subjects had overnight fasting. The study in Mandalay city defined blood glucose status basic on WHO 2006 criteria where abnormal blood glucose status classified as FBG more than 126 mg/dl.⁽⁵⁾ In our study, we categorized blood glucose status into normal blood glucose (FBG lower than 101 mg/dl) and impaired fasting glucose (FBG more than 100 mg/dl).

The recent study among middle-aged adults in Myanmar showed that the average value of dietary carbohydrate intake was about 200 gram/day.⁽⁵⁾ The study in Malaysia also reported that the mean of dietary

carbohydrate intake was 221 gram/day.⁽⁶⁾ This result is similar with our study where the mean of carbohydrate intake was 234,85 gram/day. Measurement of dietary intake that is used in our study was 24 hours food recall, while in Myanmar used 4 days recorded diary of dietary intake and Myanmar food composition Table.

In United States, the increase of total energy intake was due primarily to increase in dietary carbohydrate specifically, nearly 80% of the increase in total energy. In the same time, in United States, the prevalence of type 2 Diabetes increased by 47% and the prevalence of obesity increased by 80%.⁽⁷⁾ In this study, prevalence of subject having excess dietary carbohydrate intake was only 17%. The difference in our result was caused by our study limitation in food recall interview method. During the interview, most subjects were caught difficult to remember their meals, especially the amount of sugar in their coffee or tea drinks.

Recent study about fasting plasma glucose level among Malaysian adults show that 17,8% of subjects had impaired glucose tolerance basic on the guidelines of the World Health Organization for definition of intermediate hyperglycemia.⁽⁶⁾ Our study result show bigger prevalence of impaired fasting glucose (35%). Among Malaysian population, rice contributed to 85% of dietary carbohydrate. This result is similar with our study, that mostly Indonesian consume rice as their staple food.

CONCLUSION

The prevalence of excess carbohydrate intake among subjects

was 17% while the prevalence of impaired fasting glucose was 35%. This study has some similarities results with the study in many Asian countries like Myanmar and Malaysia, but has differences with result from the study in US with the same blood glucose topic. Reduction in carbohydrate intake in food and drink may be considered to decrease the problem of impaired fasting glucose.

REFERENCE

1. Szableswski L. *Glucose Homeostasis-Mecanism and Defects*. In: Prof. Everlon Rigobelo, editor. *Diabetes and Damage Treatment*. Croatia: INTECH; 2011. p. 227–33.
2. John Hopkins University. *No More Carb Confusion* [Internet]. 2016. Available from: http://www.hopkinsmedicine.org/diabetes/diabetes_education/patient_education_material/no_more_carb_confusion.pdf
3. Qi Sun M sCd. *White Rice, Brown Rice, and Risk of Type 2 Diabetes in US Men and Women*. Am Med Assoc. 2010;170(11).
4. Robert L, Hugues P LJ. *High-sugar Drink Consumption: An Associate of Obesity and Impaired Fasting Glucose in Canadian Indigenous*. J Nutr Metab Cardiovasc Dis. 2012;
5. Hlaing TL. *Dietary intake, food pattern, and abnormal blood glucose status of middle-aged adults: a cross-sectional community-based study in Myanmar*. Food Nutr Res. 2016;
6. Zhi Yee Lee JC. *Influence of rice and added sugar intakes on fasting plasma glucose and*

triacylglycerol levels amongst a population sample of Malaysian adults. JSME. 2015;9(1):26–31.

7. Lee Gross LL. *Increased consumption of refined carbohydrates and the epidemic of type 2 diabetes in the United States: an ecologic assessmen. Am J Clin Nutr. 2004;79:774–9.*

