EFFECT OF AMINO ACID INTAKE WITH PROTEIN FOOD ON THE DEVELOPMENT OF DYSLIPIDEMIA AMONG KOREAN ADULTS: TWO PROSPECTIVE COHORT STUDIES

Sangah Shin[1*], Sangwon Chung[2], Hyojee Joung[3] and Kyungho Ha[4]

[1]Department of Food and Nutrition, Chung-Ang University, Gyeonggi-do 17546, South Korea

[2]Personalized Diet Research Group, Korea Food Research Institute, Jeollabuk-do 55365, South Korea

[3]Department of Public Health, Graduate School of Public Health, Seoul National University, Seoul 08826, South Korea

[4]Department of Food Science and Nutrition, Jeju National University, Jeju 63243, South Korea

*Corresponding author email: ivory8320@cau.ac.kr

I. INTRODUCTION

Dyslipidemia, which can lead to stroke, coronary heart disease, and ischemic heart disease, is a significant risk factor for cardiovascular diseases (CVD) and can influence their incidence [1]. Maintaining a balanced intake of energy sources, including an appropriate proportion of protein in one's diet, has been a long-standing concern for managing various diseases and is considered crucial for a healthy diet [2]. The purpose of this study was to investigate how the incidence of dyslipidemia in Korean adults is related to the consumption of amino acids, including both essential and non-essential types, as well as the sources of these amino acids from food.

II. MATERIALS AND METHODS

Total of 35,478 study subjects without dyslipidemia at baseline from the Ansan and Ansung study and Health Examinee study [3] were used for the analysis. Data from the valid semi-quantitative food frequency questionnaire [4] were used to estimate amino acids, protein, and food intake. The amino acid database consisted of 19 amino acids and amino acids were categorized into two types; essential and non-essential. Participants were diagnosed with dyslipidemia if they satisfied one of the following four factors at each follow-up: (1) hyper-triglyceridemia with a blood TG level ≥200 mg/dL; (2) hyper-cholesterolemia with a TC level ≥240 mg/dL; (3) hyper-LDL cholesterolemia with an LDL-C level ≥160 mg/dL; and (4) hypo-HDL cholesterolemia with an HDL-C level <40 mg/dL. The participants were categorized into quartiles based on their intake of amino acids and plant/animal based proteins. The Cox proportional hazard regression model was used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for dyslipidemia and its components across quartiles of amino acid and plant/animal based protein intake

III. RESULTS AND DISCUSSION

On average, the follow-up period lasted for 5.7 years. The two major food groups contributing to half of the intake for each type of amino acid were whole grain mixed rice and white rice. Compared to the lowest quartile group, the highest quartile groups of essential (men: HR 0.78, 95% CI 0.63–0.97, p for trend=0.0088; women: HR 0.86, 95% CI: 0.76-0.99, p for trend=0.0201) and non-essential amino acid (men: HR 0.75, 95% CI 0.03-0.94, p for trend=0.0069, women: HR 0.81, 95% CI 0.71-0.93, p for trend=0.0024) intake had a decreased risk of dyslipidemia (Table1). Plant based protein intake showed negative association and animal based protein intake showed non-significant association with dyslipidemia after energy-adjusted fat intake.

Table 1 Hazard ratios (HRs) and 95% confidence intervals (95% CIs)[a] for incidence of dyslipidemia and its components according to quartiles of amino acid intake

	Amino acid intake (g/day)				
	Q1[b]	Q2	Q3	Q4	P for trend[c]
Men					
Essential amino acid					
Hyper-triglyceridemia	Ref[d]	1.08 (0.86-1.35)[e]	0.94 (0.72-1.21)	0.92 (0.65-1.31)	0.4645
Hyper-cholesterolemia	Ref	0.90 (0.72-1.12)	0.75 (0.58-0.97)	0.66 (0.46-0.95)	0.0157
Hyper-LDL cholesterolemia	Ref	0.88 (0.68-1.13)	0.69 (0.52-0.93)	0.69 (0.46-1.02)	0.0436
Hypo-HDL cholesterolemia	Ref	1.01 (0.80-1.26)	0.90 (0.70-1.16)	0.73 (0.51-1.04)	0.0563
Dyslipidemia	Ref	1.00 (0.88-1.15)	0.86 (0.74-1.01)	0.78 (0.63-0.97)	0.0088
Non-essential amino acid					
Hyper-triglyceridemia	Ref	1.10 (0.87-1.39)	0.97 (0.75-1.26)	0.91 (0.63-1.32)	0.4409
Hyper-cholesterolemia	Ref	0.81 (0.65-1.02)	0.72 (0.56-0.93)	0.57 (0.39-0.83)	0.0035
Hyper-LDL cholesterolemia	Ref	0.84 (0.65-1.08)	0.65 (0.48-0.87)	0.60 (0.40-0.90)	0.0082
Hypo-HDL cholesterolemia	Ref	0.95 (0.76-1.20)	0.98 (0.76-1.27)	0.80 (0.56-1.15)	0.2617
Dyslipidemia	Ref	0.96 (0.84-1.10)	0.87 (0.75-1.02)	0.75 (0.60-0.94)	0.0069
Women					
Essential amino acid					
Hyper-triglyceridemia	Ref	0.98 (0.82-1.18)	0.88 (0.72-1.08)	0.79 (0.60-1.04)	0.0688
Hyper-cholesterolemia	Ref	0.98 (0.88-1.09)	0.88 (0.78-0.99)	0.90 (0.77-1.07)	0.1448
Hyper-LDL cholesterolemia	Ref	0.99 (0.87-1.13)	0.90 (0.78-1.05)	0.93 (0.76-1.13)	0.3370
Hypo-HDL cholesterolemia	Ref	0.83 (0.67-1.03)	0.91 (0.72-1.15)	0.75 (0.55-1.02)	0.1207
Dyslipidemia	Ref	0.96 (0.88-1.04)	0.89 (0.80-0.98)	0.86 (0.76-0.99)	0.0201
Non-essential amino acid					
Hyper-triglyceridemia	Ref	0.99 (0.83-1.18)	0.87 (0.71-1.08)	0.81 (0.61-1.08)	0.1038
Hyper-cholesterolemia	Ref	0.92 (0.82-1.02)	0.88 (0.77-0.99)	0.83 (0.70-0.99)	0.0349
Hyper-LDL cholesterolemia	Ref	0.92 (0.81-1.05)	0.92 (0.79-1.06)	0.87 (0.71-1.07)	0.2111
Hypo-HDL cholesterolemia	Ref	0.80 (0.64-0.99)	0.85 (0.68-1.08)	0.70 (0.51-0.96)	0.0510
Dyslipidemia	Ref	0.90 (0.83-0.98)	0.87 (0.78-0.96)	0.81 (0.71-0.93)	0.0024

[a] All values were adjusted for age, energy intake, body weight, education level, household income, physical activity, alcohol drinking status, and smoking status; [b] Q: Quartile; [c]P for trend across amino acid intake quartile categories were calculated by chi-square tests for categorical variables and general linear regression for continuous variables.; [d]Ref: Reference; [e]Values are Hazard ratios (HRs) and 95% confidence intervals (95% CIs).

IV. CONCLUSION

In conclusion, the intake of all types of amino acids including essential and non-essential amino acids was inversely associated with the incidence of dyslipidemia and its components in the Korean adult aged more than 40 years independently of plant and animal based protein food sources.

ACKNOWLEDGEMENTS

This research was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No.2022R1F1A1074279). MSIT: Ministry of Science and ICT.

REFERENCES

1. Kopin L., Lowenstein C. (2017). Dyslipidemia. Annals of Internal Medicine 167: ITC81-ITC96.
2. Astrup A., Meinert Larsen T., Harper A. (2004). Atkins and other low-carbohydrate diets: hoax or an effective tool for weight loss? Lancet 364: 897-899.
3. Kim, Y., Han, B. G., The KoGES Group (2017). Cohort Profile: The Korean Genome and Epidemiology Study(KoGES) Consortium. International Journal of Epidemiology 46:1350.
4. Ahn Y., Kwon E., Shim J. E., Park M. K., Joo Y., Kimm K., Park C., Kim D. H. (2007). Validation and reproducibility of food frequency questionnaire for Korean genome epidemiologic study. European Journal of Clinical Nutrition 61:1435-1441.