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# **FADS GENE CLUSTER AND FTO GENE POLYMORPHISMS ARE ASSOCIATED WITH OBESITY AND MACRONUTRIENT INTAKES IN SELECTED INDONESIAN ADULTS**

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**GRADUATE SCHOOL  
IPB UNIVERSITY  
BOGOR  
2021**

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Bogor, May 2021

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## SUMMARY

ATHRAA ALAULDDIN ABDULLAH AL-JAWADI. FADS gene cluster and FTO gene polymorphisms are associated with obesity and macronutrient intakes in selected Indonesian adults. Supervised by I MADE ARTIKA and SAFARINA G. MALIK.

Obesity prevalence is increasing worldwide, including in Indonesian adults. The fatty acid desaturase gene cluster (FADS1, FADS2, FADS3) and fat mass and obesity-associated (FTO) single nucleotide polymorphism (SNP) rs1421085 have been reported to associate with obesity and macronutrient intake in different populations. This research aimed to investigate the association between obesity and single nucleotide polymorphisms in the FADS1, FADS2, FADS3, and FTO genes in the Indonesian adults. In addition, the study also aimed to investigate the interaction between macronutrient and SNPs in the FADS1, FADS2, FADS3, and FTO genes in influencing obesity in Indonesian adults. A total of 71 subjects (35 obese and 36 non-obese) living in Jakarta, Indonesia, were recruited. The FADS1 rs174547, FADS2 rs174575, and FTO rs1421085 SNPs were detected using amplification-refractory mutation system polymerase chain reaction (ARMS PCR). The FADS3 rs174450 SNP was detected using the DNA sequencing method. Genetic association of the FADS1 rs174547, FADS2 rs174575, FADS3 rs174450, and FTO rs1421085 SNPs with obesity and macronutrient intakes were evaluated using either linear regression or rank-based linear regression analyses depending on the data normality. Minor allele frequencies (MAF) of the FADS1 rs174547, FADS2 rs174575, FADS3 rs174450, and FTO rs1421085 SNPs were 0.32, 0.3, 0.46, and 0.22, respectively. Under the additive genetic model, the subjects who carried the minor T allele of rs174547 SNP were positively associated with increased protein intake ( $p = 0.009$ ). The subjects with the minor allele of FADS3 rs174450 SNP tended to associate with total protein intake. The subjects who carried the minor C allele of FTO rs1421085 SNP were positively associated with 4.18% increase in fat intake ( $p = 0.001$ ) and 1.96% increase in saturated fatty acid (SAFA) intake ( $p = 0.011$ ) in the additive genetic model. The present study indicated that the FADS1 rs174547 SNP minor T allele is associated with the high intake of dietary protein, while the FTO rs1421085 SNP minor C allele was positively associated with high intake of dietary fat, in particular high intake of dietary saturated fatty acid in adults Jakarta, Indonesia. We hope that the findings of this study will provide basic knowledge of the interaction between gene and macronutrients on increasing the obesity risk, particularly in Indonesian adults.

**Keywords:** Obesity, Macronutrient intake, FTO and FADS gene cluster, polymorphisms, Indonesia.

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Thesis submitted in partial fulfillment of the requirements  
for the award of  
Master of Science degree in  
Biochemistry

**GRADUATE SCHOOL  
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## FOREWORD

First of all many thanks to Allah because without Allah permission I would never have the ability to accomplish this thesis, and I ask God to make this research is beneficial for all human being all over the world. The topic of study is FADS gene cluster and FTO gene polymorphisms are associated with obesity and macronutrient intakes in selected Indonesian Adults.

Especial thankful to my supervisors, Professor I Made Artika and Dr. Safarina G. Malik for all supports, advice, guiding, and knowledge you provided to me until I completed this research.

I would like to also send my sincere thanks to Ms Sukma Oktavianthi, M.Biomed and Ms Lidwina Priliani, M.Si at Eijkman Institute for Molecular Biology and the Eijkman Institute administration for their acceptance of me to conduct my research in their laboratory.

Lastly, I hope that this scientific work contributes to the advancement of science.

Bogor, May 2021

*Athraa Alaulddin Al-Jawadi*



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