# Eating sweet foods habit and other factors that related to obesity on civil pilot in Indonesia

Risnandar Nasution,[1] Herqutanto,[1] Yuliana[2]

[1] Department of Community Medicine, University of Indonesia, Jakarta
[2] Aviation Health Center Ministry of Transportation, Jakarta

Corresponding address: dr. Risnandar Nasution
Email: dokternandar@yahoo.com

Received: September 05, 2016; Revised: Oktober 25, 2016; Accepted: November 28, 2016

## Abstrak

***Latar belakang:*** *Obesitas pada penerbang dapat menyebabkan inkapasitas mendadak dalam penerbangan. Penelitian ini bertujuan untuk mengetahui kebiasaan makan makanan manis dan faktor lainnya yang berpengaruh terhadap penerbang sipil obes di Indonesia.*

***Metode:*** *Desain potong lintang dengan sampel total dari data sekunder penerbang sipil yang melakukan pemeriksaan kesehatan berkala pada periode April 2016. Data yang dikumpulkan yaitu karakteristik demografi, pekerjaan, kebiasaan makan makanan manis, kebiasaan olahraga dan riwayat obesitas dalam keluarga. Penerbang dikategorikan sebagai obes I (IMT:25,0-29,9 kg/m$^2$) dan Obes II (IMT: ≥ 30,0 kg/m$^2$). Kebiasaan makan makanan manis dikategorikan menjadi empat kategori yaitu hampir tidak pernah, 1-3 kali/minggu, 4-5 kali/minggu, dan hampir setiap hari. Analisis menggunakan regresi Cox dengan waktu yang konstan.*

***Hasil:*** *Dari 644 data penerbang sipil yang dikumpulkan, sebanyak 256 data yang memenuhi kriteria untuk dianalisis. Sebanyak 55 penerbang (21,48%) mengalami obes II. Kebiasaan makan makanan manis dan status pernikahan merupakan faktor dominan yang berhubungan dengan risiko obes II. Jika dibandingkan dengan subjek yang hampir tidak pernah makan makanan manis, subjek yang memiliki kebiasaan makan makanan manis1-3x/minggu memiliki risiko* ***50% lebih rendah mengalami obes II (RRa=0,50; 95% CI= 0,30-0,85; p=0,011)****, subjek yang memiliki kebiasaan makan makanan manis 4-5x/minggu memiliki risiko* ***68% lebih rendah mengalami obes II (RRa= 0,32; 95% CI= 0,12-0,83; p=0,020)****. Selanjutnya jika dibandingkan dengan subjek yang tidak menikah, subjek yang menikah memiliki risiko* ***38% lebih rendah mengalami obes II.(RRa=0,62; 95% CI=0,38-0,99; p=0,046)****.*

***Kesimpulan:*** *Kebiasaan makan makanan manis dan status pernikahan berpengaruh terhadap risiko obes II diantara penerbang sipil obes di Indonesia.* ***(Health Science Journal of Indonesia 2016;7(2):134-9)***

***Kata kunci:*** *Obes, Kebiasaan makan makanan manis, pilot sipil, Indonesia*

## Abstract

**Background:** Obesity in pilot can cause sudden incapacity in flight. This study is purposed to determine factors that affecting obesity on civil pilot in Indonesia.

**Methods:** Cross-sectional design amongst male civil pilots who conducted periodic medical examinations in April 2016 at Aviation Medical Center. Data was collected for this study included demographic characteristics, occupation, habit of eating sweet foods, exercise and family history of obesity. Pilot was categorized as obese I when BMI: 25.0- 29.9 kg/m$^2$ and obese II when BMI: ≥ 30.0 kg/m$^2$. The habit of eating sweet foods was categorized into four categories: almost never, 1-3 times/week, 4-5 times/week, and almost every day. Data was analyzed by Cox regression with constant timing.

**Results**: From 644 pilot's data that had been collected, 256 data were qualified for the criteria of analysis. 55 pilots (21.48%) were obese II. Habit of eating sweet foods and marital status were the dominant factors that associated with risk of obese II. As compared to subject who never consumed sweet foods, subject who consumed sweet foods 1-3 times/week had a lower risk of 50% to experience obese II [RRa = 0.50; 95% CI = 0.30 to 0.85; p = 0.011]; subject who consumed sweet foods 4-5 times/week had a lower risk of 68% to experience obese II [RRa = 0.32; 95% CI = 0.12 to 0.83; p = 0.020]. In comparison with subject who was not married, married subject had a lower risk of 38% to experience obese II [RRa = 0.62; 95% CI = 0.38 to 0.99; p = 0.046].

**Conclusion:** The habit of eating sweet foods & marital status are affecting the risk of obese II among obese civil pilot in Indonesia. ***(Health Science Journal of Indonesia 2016;7(2):134-139)***

**Keywords:** Obese, habit of eating sweet foods, Indonesian civil pilots.

Obesity is a global issue in this modern age, whether in advanced countries or in developed countries, including Indonesia. Based on data from World Health Organization (WHO), obesity had been a global epidemic and became an important health problem that should be treated appropriately. WHO predicted in 2014 that more than 1.9 billion adults with age above 18 years old were overweight, and more than 600 millions of them had obesity.[1] Obesity is a main risk factor for cardiac diseases, hypertension, lungs diseases, metabolic diseases (such as diabetic mellitus and dyslipidemia), arthritis and some type of cancers.[2]

In aviation sector, obesity on civil pilot becomes an issue of safety when the shape of pilot's body affects the function of flight control manipulator or the use of safety equipment.[3] High body mass index led to an increased risk of health and flight safety.[4] *Sleep Apnea Syndrome* is the most common effect of obesity for men with age particularly between 40-60 years.[5]

Some factors that affecting obesity are age, marital status, habit of eating sweet foods, exercise, total flight hours and obesity history in family. Study that conducted by Laura et.al over 10,092 adults in Fenland, UK revealed a significant relationship between obesity and habit of eating sweet foods where respondents who had BMI > 25 kg/m$^2$ consumed higher amounts of sweets, chocolate and ice cream.[6] Another study by Greenberg et.al on 15,732 adults in America showed that more frequency of chocolate consumption was related to a significant increase on body mass index (BMI) where chocolate consumption of 1-4 times per month could increased body mass index as much as 0.26-0.39 kg/m$^2$ consecutively over 6 years period.[7] Data from study of civil flight at Aviation Medical Center in Jakarta on 2015 showed that 42% civil pilots (194 of 428 pilots) had obesity. Because eating sweet foods can increase obesity in flight crews and there is no study have been conducted in term of the relationship between eating sweet foods and obesity in civil pilots, therefore there is a need to conduct study to find out the effect of eating sweet foods and other factors toward obesity on civil pilots in Indonesia.

## METHODS

This study used cross-sectional design and total sampling methods. Data was collected from secondary data of civil pilots who conducted periodic medical examinations in Aviation Medical Center, Jakarta, on April 2016. Inclusion criteria was Asian male pilots with obese BMI, range of age between 17 to 65 years old and license holder of Private Pilot License (PPL), Commercial Pilot License (CPL) and Air Transport Pilot License (ATPL). Measure that being used to determine obesity on pilots was BMI based on body weight and height (body weight (kg) per square body height (m$^2$)). BMI cut-off-point for obesity based on International Obesity Task Force (IOTF) and World Health Organization (WHO) in 2000 for pacific region was: obese I (BMI 25.0-29.9 kg/m$^2$) and obese II (BMI $\geq$ 30 kg/m$^2$). Outcome of this study was obese II. Variables that collected were consisted of age, marital status, total flight hours, habit of eating sweet foods, exercise and family history of obesity. Habit of eating sweet foods and exercise were examined for period of 6 months. The habit of eating sweet foods was divided into four categories: almost never, 1-3 times/week, 4-5 times/week, and almost every day. Exercise habit was divided into two categories: appropriate and inappropriate. Age was divided into three categories: 17-39 years old, 40-49 years old, and 50-65 years old. Marital status was divided into two categories: married and not married. History of obesity in family was divided into two categories: Yes and No. Total flying hours divided into three categories: 60-1999 hours, 2000-14999 hours, and 15000-30500 hours. Study analysis was conducted by Cox regression with constant timing. Data analysis tool was software of STATA version 9. This study had been approved by Research Ethics Committee, Faculty of Medicine, University of Indonesia.

## RESULTS

From 644 secondary data of civil pilots that conducted medical examination on April 2016, it was obtained that 256 pilots had BMI obesity which was complied with inclusion criteria and became subjects for analysis. Subjects that excluded were non 31 Asian male pilots, 15 female pilots, 56 rotary wing pilots, 26 pilots with Student Pilot License (SPL), and 7 pilots with incomplete data admission.

Table 1 show that in comparison with subject who is not married, married subject has less risk to get into obese II. While subject which is obese I and II seems to be distributed equally regarded to age, total flight hours and family history of obesity.

In Table 2, in comparison with subject who almost never eat sugary foods, subject who has habit of eating sweet foods 1-3 times/week, 4-5 times/week and almost every day have less risk to have obese II. While subject which is obese I and II seems to be distributed equally regarded to exercise routine.

Table 3 as a final model from Cox regression appears that marital status and habit of eating sweet foods are two dominant factors that affecting the risk of obese II. Compared to subject who is not married, married subject has a lower risk of 38% to get obese II [RRa= 0.62; 95% CI: 0.38-0.99, p=0.046]. Furthermore, when compared to subject who never eat sweet foods, subject who eat sweet foods 1-3 times/week has a lower risk of 50% to experience obese II [RRa = 0.50; 95% CI = 0.30 to 0.85; p = 0.011]; subject who eat sweet foods 4-5 times/week has a lower risk of 68% to experience obese II [RRa = 0.32; 95% CI = 0.12 to 0.83; p = 0.020].

## DISCUSSION

This study had some constraints where the population in this study could not represented overall population of civil pilots in Indonesia because study samples were collected from secondary data of 644 civil pilots that conducted medical examination at Aviation Medical Center in Jakarta on April 2016. Another constraint was a probability of recall bias in this study about eating patterns and exercise routines, because instrument for data collection was self-completed questionnaire as measurement, therefore the content in the questionnaire only based on respondent's memory. However, this study had strength where there was no previous study about the effect of eating sweet foods for obese civil pilots in Indonesia.

Table 1. Characteristics demographic, work and family history of obesity and risk of obese II

| | Body Mass Index | | | | Crude Relative Risk | 95 % Confidence Interval | P |
|---|---|---|---|---|---|---|---|
| | Obese I (n = 201) | | Obese II (n = 55) | | | | |
| | n | % | n | % | | | |
| **Age group** | | | | | | | |
| 17-39 years | 123 | 76,9 | 37 | 23,1 | 1,00 | Reference | |
| 40-49 years | 49 | 79,0 | 13 | 21,0 | 0,90 | 0,48-1,70 | 0,761 |
| 50-65 years | 29 | 85,3 | 5 | 14,7 | 0,63 | 0,24-1,61 | 0,342 |
| **Marital status** | | | | | | | |
| Not married | 69 | 73,4 | 25 | 26,6 | 1,00 | Reference | |
| Married | 132 | 81,5 | 30 | 18,5 | 0,69 | 0,40-1,18 | 0,181 |
| **Total flight hours** | | | | | | | |
| 60-1999 hours | 77 | 78,6 | 21 | 21,4 | 1,00 | Reference | |
| 2000-14999 hours | 98 | 77,8 | 28 | 22,2 | 1,03 | 0,58-1,82 | 0,900 |
| 15000-30500 hours | 26 | 81,3 | 6 | 18,8 | 0,87 | 0,35-2,16 | 0,773 |
| **Family history of obesity** | | | | | | | |
| No | 189 | 79,1 | 50 | 20,9 | 1,00 | Reference | |
| Yes | 12 | 70,6 | 5 | 29,4 | 1,40 | 0,56-3,52 | 0,468 |

Table 2. Characteristic of eating habit and exercise and risk of obese II.

| | Body Mass Index | | | | Crude Relative Risk | 95% Confidence Interval | P |
|---|---|---|---|---|---|---|---|
| | Obese I (n = 201) | | Obese II (n = 55) | | | | |
| | n | % | n | % | | | |
| **Eating sweet food habit** | | | | | | | |
| Almost never | 22 | 62,9 | 13 | 31,1 | 1,00 | Reference | |
| 1-3x/week | 130 | 79,3 | 34 | 20,7 | 0,55 | 0,29-1,05 | 0,074 |
| 4-5x/week | 31 | 86,1 | 5 | 13,9 | 0,37 | 0,13-1,04 | 0,062 |
| Almost everyday | 18 | 85,7 | 3 | 14,3 | 0,38 | 0,10-1,34 | 0,136 |
| **Exercise habit** | | | | | | | |
| Appropriate | 80 | 77,7 | 23 | 22,3 | 1,00 | Reference | |
| Inappropriate | 121 | 79,1 | 32 | 20,9 | 0,93 | 0,54-1,60 | 0,811 |

Table 3. Relationship between marital status, habit of eating sweet food and risk of obese II

| | Body Mass Index | | | | Adjusted Relative Risk* | 95% Confidence Interval | P |
|---|---|---|---|---|---|---|---|
| | Obese I (n = 201) | | Obese II (n = 55) | | | | |
| | n | % | n | % | | | |
| **Marital status** | | | | | | | |
| Not Married | 69 | 73,4 | 25 | 26,6 | 1,00 | Reference | |
| Married | 132 | 81,5 | 30 | 18,5 | 0,62 | 0,38-0,99 | 0,046 |
| **Eating sweet food habit** | | | | | | | |
| Almost never | 22 | 62,9 | 13 | 37,1 | 1,00 | Reference | |
| 1-3x/week | 130 | 79,3 | 34 | 20,7 | 0,50 | 0,30-0,85 | 0,011 |
| 4-5x/week | 31 | 86,1 | 5 | 13,9 | 0,32 | 0,12-0,83 | 0,020 |
| Almost everyday | 18 | 85,7 | 3 | 14,3 | 0,35 | 0,11-1,05 | 0,063 |

* Adjusted between the two variables in this table

This study revealed that prevalence of obese II in Indonesia's civil pilots was high where amongst 256 obese pilots that examined, 55 pilots (21.48%) were in state of obese II. This number was higher than obesity in Indonesia's general population. Based on results of Basic Health Research (Riskesdas) of Ministry of Health in 2013, the prevalence of obesity in adult population in Indonesia was 15.4%.[8] While obesity percentage of FAA licensed civil pilot in the United States in 2003 was 21.11%.[4]

This study revealed a significant relationship between habit of eating sweet foods and risk of obese II on subject. As compared to subject who never consumed sweet foods, subject who consumed sweet foods 1-3 times/week has a lower risk of 50% to experience obese II [RRa = 0.50; 95% CI = 0.30 to 0.85; p = 0.011]; subject who consumed sweet foods 4-5 times/week has a lower risk of 68% to experience obese II [RRa = 0.32; 95% CI = 0.12 to 0.83; p = 0.020]. Study finding was not confirmed to study by Laura et.al over adult population in UK where they were confirmed that there was a significant relationship between sweet food consumption and body mass index (BMI). In Laura et.al study, respondents that consumed more frequently of sweet foods, such as sweets chocolate, and ice cream, had higher BMI (> 25 kg/m$^2$).[6] Another study by Greenberg et.al confirmed the same finding that frequency of eating sweet foods was related to increasing in BMI where respondent who ate chocolate 1-4 times/moth had an increased BMI as much as 0.26-0.39 kg/m$^2$ consecutively in 6 years period.[7] Theoretically, foods with sugar contents are sources of rich carbohydrate. When carbohydrate is over consumption, it will be stored as glycogen in limited quantities and the remaining is stored as fat.[9] Excessive intake of sugary foods can be an important contributor for obesity development.[10] However in this study, habit of eating sweet foods did not increase obesity in subjects of study. This might due to an existence of recall bias. This study was utilized self-completed questionnaire for respondent as measurement, therefore to discover foods that respondent consumed was solely based on respondent's memory and there was a chance of incomplete data. There was a probability of respondent reported small amount of foods intake and completed questionnaire inexactly, and led to alleviation of information.[11]

This study also showed a significant association between marital status and risk of obese II in subject. In comparison with subject who was not married, married subject had a lower risk of 38% to experience obese II [RRa = 0.62; 95% CI = 0.38 to 0.99; p = 0.046]. This finding was inexpedient to study by Tzotzas et.al over general population in Greece which confirmed that married man and woman have a greater risk to develop obesity than unmarried person.[12] Other study by Janghorbani et al also confirmed higher risk of obesity on married people compared to unmarried people.[13] Effect of marital status on Body Mass Index (BMI) is related to social responsibility of married couple where they are eating frequently and eat more calories.[12] Another fact showed that a person who was married did less physical activity[14] and tends to be unmindful for their diet because they got social/family support; this kind of marital support could increase body mass index (BMI) in regarded to diet and daily activities.[13] Nevertheless, in this study revealed that marital status did not increase obesity on study subject. This was probably attributed to obesity as multi-factorial disease and the existence of some diffusing-factors and interactive-factors in analysis.[15]

In this study, age was not significantly associated with the development of obese II for subject. This finding was unequal with some theories which mentioned that in older age, body metabolism became slower, physical activity tended to decrease and incurred energy accumulation.[15] Older person are less active to move and brought to deceleration of calories burning inside the body.[11] Nevertheless, in this study revealed that age was not significantly affected obesity in pilot. This was probably attributed to obesity as multi-factorial disease so that there was another dominant factor that affected obesity in pilots. These dominant factors undermined other factors.[15]

The total of flight hour was not significantly associated with the development of obese II for subject in this study. This finding was not matched with earlier studies that showed an effect between high total of flight hours to obesity which associated to cosmic radiation exposure of gamma rays on flight crews that caused lipid peroxide. Lipid peroxide produced the end product of 4-hidroxynonenal (4-HNE) where excessive production of 4-HNE incurred development of obesity.[16] But in this study, there was no significant relationship between total of flight hours with development of obesity in pilots. This might be due to genetic roles that involved in this interaction. Studies in China reveal that lots of experiments on animal prove that radiation can cause metabolism disruption of lipid and obesity, but the genuine mechanism for this condition is still not determined. Recent study proves that increasing of body mass on rats continually when radiated with gamma rays is related to adiposity without additional food consumption: lepton is a key protein that regulate lipid in tissues, and the absence of lepton can cause obesity. Therefore, they are assuming that activation of renewal process on radiation dosage is regulated by some key genes which are involving metabolism disruption. Indeed, long-term effect of radiation in low dosage on human body mass is still not verified. This phenomenon was seen on China's flight community where obesity incident on China's flight crews were higher than obesity incident of general male population in China. This study mentioned the effect of environment interaction (i.e. cumulative flight hours as environment contributor) and gene factor related to obesity.[17] Cosmic radiation on pilot also determined by some factors, which are height of flight (the higher of flight height brings more dosage of radiation), flight duration, flight timing of up and down, effect of latitude (more dosage of radiation on pole region), and effect of sun beam (less cosmic radiation regarded to temporary interaction with the sun.[18]

Result of this study showed that exercise routine was not associated with the development of obese II on subject. This finding did not match with theory that irregular exercise could decrease level of calories burning in the body, and could cause calories accumulation which led to obesity.[19] However, this study mentioned that there was no significant effect of inappropriate exercise to obesity in pilot. This was related to other dominant factors that influenced obesity and the existence of recall bias in questionnaire completion. Recently, experts on British Journal of Sports Medicine reveal that poor exercise is not causal-factor for obesity development, rather food intakes that contain high level of sugar and carbohydrate is the main factor. Poor eating pattern was expected to be responsible of obesity development higher than physical exercise. Many people are swept off by the massage that diet is not working for maintaining body weight, and many are mistaken to believe that obesity is fully attributed from poor exercise.[20]

In this study, history of family obesity did not relate to development of obese II on subject. Etiologically, genetic factors are believed to play a role in causing obesity. The genetic contribution to obesity has been studied through family studies, investigation of parent-children relationships, twins-relationship, and adopted children.[21] However, study finding was not revealed significant effect of family history of obesity in pilot. This might be caused by contribution of genetic factors to the occurrence of obesity was + 30% and 70% of obesity was influenced by environment such as life style, eating habit and activities.[9] Therefore, factors that came from environment gave more influent on pilot's obesity. Apart from the fact where children's obesity is increasing if their parent also suffered from obesity, genetic factor is mainly rejected as a principal factor of obesity development in population which is described in dramatic increasing of obesity in recent 20-30 years while our genetic is not experiencing transformation. The alteration of life style and environment is affecting energy imbalance of individual in all ages and responsible for alteration in population.[22]

In conclusion, the habit of eating sweet foods and marital status are affecting the risk of obese II development on obese civil pilots in Indonesia.

**Acknowledgments**

Thank you to all pilots who were participated in this study. Writers also send a gratitude to the Chairman of Aviation Medical Center in Jakarta for allowing us to conduct data collection.

## REFERENCES

1. World Health Organization. Obesity and overweight Overweight.[Internet] Available from: http://www.who.int/mediacentre/factsheets/fs311/en/
2. Walley JA, Blakemore IF, Froguel P. Genetics of obesity and the prediction of risk for health. J Human Molec Gen. 2006;15:124-30
3. Aeromedical Policy Letters: Overweight aircrew member 28 May 2014. [Internet] Available from : http://www.rucker.amedd.army.mil/
4. Bryman DA, Mills W. Co-morbid conditions in overweight and obese airmen: Trends and Aeromedical Implications. Aviat Space Environ Med. 2007;78:702–5.
5. Hardicsay G, Johnston R. Metabolic, Nutritional and Endocrine Systems (Amendment). Siedenburg J, Muff S, editors. JAA Manual of Civil Aviation Medicine. Joint Aviation Authorities (JAA);2009.
6. O'Connor L, Brage S, Griffin S, et al. The cross-sectional association between snacking behaviour and measures of adiposity: The Fenland Study, UK. J British Nutrition. 2015;114(8):1286-93.
7. Greenberg J, Buijsse B. Habitual chocolate consumption may increase body weight in a dose response manner. J Plos One. 2013;8(8):1-7.
8. Kementerian Kesehatan RI. Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar. Jakarta: Litbangkes;2013.
9. Soegih R, Wiramihardja K. Obesitas permasalahan dan terapi praktis. Edisi:I, Jakarta; Penerbit : Sagung Seto. 2009.
10. Drewnowski A, Kurth C, Wiltse JH, et al. Food preferences in human obesity: Carbohydrates versus Fats. J Appetite. 1992;18:207-21.
11. Widiantini W, Tafal Z. Physical activity, stress and obesity among civil servant J. Kesmas. 2014;8(7):330-36.
12. Tzotzas T, Vlahavas G, Papadopoulou SK, et al. Marital status and educational level associated to obesity in Greek adults: data from the National Epidemiological Survey. J. Public Health. 2010;10(1):2-8.
13. Janghorbani M, Amini M, Rezvanian H, et al. Association of body mass index and abdominal obesity with marital status in adults. J. Arch Iranian Med. 2008;11(3):274–81.
14. Jeffery RW, Rick AM. Cross-sectional and longitudinal associations between body mass index and marital-related factors. J Research Obesity. 2012;10(8):809-15.
15. Kantachuvessiri A, Sirivichayakul C, Kungwali JK, et al. Factors associated with obesity among workers in a metropolitan waterworks authority. J.Southeast Asian of Tropical Medicine and Public Health. 2005;36:1057-65.
16. Wibawanti R, Gathmyr D, Nasution A, et al. Total flight hours, eating fatty foods habits and risk of obesity among civil pilots in Indonesia. J. Health Science Indonesia. 2013;3(2):55-8.
17. Huang H, Liu J, Feng Y, et al. The distribution of apolipoprotein E gene polymorphism in Chinese civil aircrews, and a possible risk factor to their overweight and dyslipidemia is cumulative flight time. International J Clin Chemistry. 2013;416:36-40.
18. Federico CA, de Castilho Pereira HH, Pereira MA, et al. Estimates of cosmic radiation dose received by aircrew of DCTA's flight test special group. J Aerosp Technol Manag. 2010;2:137-44.
19. Harton TJ, Hill Jo. Exercise and obesity. Proceedings of the nutrition society.1998, 57: 85-91.
20. Malhotra A, Noakes T, Phinney S. It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet. J Sports Med. 2015;0:1-2
21. The Interrelationship between obesity, physical activity, nutrition and other determinates. National Nutrion Surveillance Centre. Eight in a series of position papers November 2009; 1-26
22. Chambers JA, Swanson V. A health assessment tool for multiple risk factors for obesity: age and sex differences in the prediction of body mass index. British J Nutrition. 2010;104: 298-307.