

Type of flight and other factors related to plain water consumption habit among civilian pilots in Indonesia

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Abstrak

Latar belakang: Pilot dapat mengalami dehidrasi ringan yang akan mempengaruhi performa kognitif dan keselamatan penerbangan, sehingga pilot perlu mengonsumsi air putih yang cukup. Tujuan penelitian untuk mengetahui faktor dominan yang berhubungan dengan kebiasaan konsumsi air putih pada pilot sipil.

Metode: Studi potong lintang menggunakan data sekunder Survei Kebiasaan Hidup Sehat Pada Pilot Sipil di Indonesia Tahun 2016. Data yang dikumpulkan meliputi karakteristik demografi, pekerjaan, pengetahuan, kebiasaan konsumsi sayur dan buah, aktivitas fisik dan indeks massa tubuh (IMT). Kebiasaan konsumsi air putih dikategorikan cukup (≥ 8 gelas/hari) dan kurang (< 8 gelas/hari). Jenis penerbangan dikategorikan jarak dekat (< 2 jam), menengah (2-6 jam), jauh (> 6 jam). Analisis menggunakan regresi Cox dengan waktu yang konstan.

Hasil: Dari data 644 pilot, terdapat 528 data yang memenuhi kriteria. Jenis penerbangan, pengetahuan tentang hidrasi, aktivitas fisik dan IMT merupakan faktor dominan yang berhubungan dengan kebiasaan konsumsi air putih. Pilot sipil dengan jenis penerbangan jarak menengah memiliki kebiasaan konsumsi air putih cukup 16% lebih tinggi dibandingkan dengan jenis penerbangan jarak dekat [RRa= 1,16; IK95% 1,00-1,35; p= 0,045]. Pilot yang memiliki pengetahuan baik tentang hidrasi memiliki kebiasaan konsumsi air putih cukup 20% lebih tinggi dibandingkan dengan pilot pengetahuan kurang [RRa= 1,20; IK95% 1,05-1,38; p= 0,006]. Pilot dengan aktifitas fisik aktif memiliki kebiasaan konsumsi air putih cukup 34% lebih tinggi dibandingkan kurang aktif [RRa= 1,34; IK95% 1,16-1,54; p= 0,000]. Dibandingkan pilot dengan IMT $< 18,5$ kg/m², pilot dengan IMT 18,5-23 kg/m² memiliki 4,14 kali lipat [RRa= 4,15; IK95% 1,15-14,88 ; p= 0,029] dan IMT > 23 kg/m² [RRa= 4,33; IK95% 1,20-15,59; p= 0,025] memiliki 4,33 kali lipat lebih terbiasa mengonsumsi air putih yang cukup.

Kesimpulan: Pilot dengan penerbangan jarak menengah, pengetahuan baik tentang hidrasi, aktivitas fisik aktif dan indeks massa tubuh $\geq 18,5$ kg/m² lebih memiliki kebiasaan konsumsi air putih yang cukup. (*Health Science Journal of Indonesia 2016;7(2):123-8*)

Kata kunci: Kebiasaan konsumsi air putih, jenis penerbangan, pilot sipil, Indonesia

Abstract

Background: Pilots could risk mild dehydration that would affect cognitive performance and flight safety, so they should have adequate plain water consumption. The purpose of this study was to determine the dominant factor associated with plain water consumption habit among civilian pilots.

Methods: A cross-sectional study using secondary data of Healthy Habits Survey on civilian pilot in Indonesia 2016. The data collected were demographic, job characteristics, knowledge, fruit and vegetable consumption habit, physical activity and body mass index (BMI). Plain water consumption habit was categorized adequate if water consumption ≥ 8 glasses / day (@ glass = 250 ml) and inadequate when < 8 glasses / day. Type of flight was categorized short haul (< 2 hours), medium haul (2-6 hours), long haul (> 6 hours). Data was analyzed using Cox regression with constant time.

Results: Out of 644 data, 528 met inclusion criteria. Type of flights, knowledge about hydration, physical activity and body mass index were dominant factors associated with plain water consumption habit. Compared to short haul flight, pilots with medium haul flight were 16 % more consume adequate plain water, [RRa = 1.16; p = 0.045]. Compared to poor knowledge, pilots with good knowledge were 20% higher to consume adequate plain water [RRa = 1.2; p = 0.006]. Compared to sedentary, active pilots were 34% higher to consume adequate plain water [RRa = 1.34; IK95% 1,16-1,54; p= 0,000]. Compared to pilots whose BMI $< 18,5$ kg/m², pilots with BMI 18,5-23 kg/m² and BMI > 23 kg/m² were respectively 4,14 times [RRa= 4,15; IK95% 1,15-14,88 ; p= 0,029] and 4,33 times [RRa= 4,33; IK95% 1,20-15,59; p= 0,025] higher to have adequate plain water consumption habit.

Conclusion: Civilian pilots who operate in medium haul flight, had good knowledge about hydration, active physical activity and BMI ≥ 18.5 kg/m² had more adequate plain water consumption habit. (*Health Science Journal of Indonesia 2016;7(2):123-8*)

Keywords: plain water consumption habit, type flight, civilian pilots, Indonesia

During flight, pilots could risk stressor including mild dehydration. The “mild” means they are below the level that is generally considered to affect cognition, decision making, job performance, and mood.¹ Federal Aviation Association (FAA) recommends that to prevent dehydration, pilots need to consume water two quart (1.9 liters) in 24 hours.² Plain water is the best fluid for optimal hydration and has no negative effects on health. The increased consumption of sugary drinks is now closely associated with health risks.³

Plain water consumption was related to several factors, including age, type of flight, knowledge about hydration, fruit and vegetable consumption habit, physical activity and body mass index. Study in Korea revealed that the exposure duration of hot environment was associated with plain water consumption. Environmental exposure was analogous to the type of flight that described flight environmental exposure duration to pilots. Compared to older, young adults had more consumption of water.^{4,5} Compared to underweight, overweight subjects were associated with increased consumption of plain water.⁴ Study in the United State (US) general population found that fruit and vegetable consumption habit are closely related to drinking plain water habit. Active adult have higher plain water consumption than those who are sedentary.⁵

Study of the factors associated with drinking water habitat civilian pilots in Indonesia had not been done before. In addition, study about biopsychosocial factors associated with plain water consumption habit was scarcely done.⁴ Therefore; the purpose of this study was to determine the dominant factor associated with plain water consumption habit among civilian pilots in Indonesia.

METHODS

Cross sectional study design was used to elaborate the study data. This study was conducted in June 2016 using 644 secondary data from Healthy Habits Survey on Civilian Pilots in Indonesia 2016 in Civil Aviation Medical Center Jakarta. The inclusion criteria were male data, Asian race, age 19- 65 years, holding an Private Pilot License (PPL), Airline Transport Pilot License (ATPL) or Commercial Pilot License (CPL) and fixed wing aircraft pilots.

The outcome of this study was the plain water consumption habit obtained from data of plain

water consumption per day during duty day. It was categorized as adequate (≥ 8 glasses consumption per day (@ glass = 250 ml) and inadequate (< 8 glasses per day).

Type of flight was defined as the number of flying hours for each sector i.e. one take-off and one landing at different airports. It was categorized into short haul (< 2 hours), medium haul (2-6 hours), long haul (> 6 hours).⁶

The age was categorized into 19-29 years, 30-39 years, 40-65 years.⁴ Knowledge of hydration was measured from 3 questions, which true answer was given 1 score and false answer was given 0 score. The questions consist of: (1) Should replace fluids (drink plain water) before, during and after flying (Agree / Disagree); (2) Should Rely on thirst to Ensure fluid replacement (Agree / Disagree); (3) Dehydration decreases performance (Agree / Disagree). It was categorized as good knowledge (if the score ≥ 3) and poor knowledge (score of < 3).

Physical activity was assessed from the data frequency of physical exercise per week as recommended by Ministry of Health.⁷ It was categorized active physical activity if subjects exercise ≥ 3 days per week, sedentary physical activity if exercise < 2 days per week.

Fruit and vegetable consumption habit was obtained from the data of consumption frequency of fruits and vegetables per day and categorized into 3: ≤ 2 times/day, 3-4 times/day, ≥ 5 times/day. Body mass index (BMI) was categorized according to Ministry of Health in 2014 for a Indonesian population. Underweight: < 18.5 kg/m², normal: 18.5 to 25 kg/m², overweight: ≥ 25 kg/m².⁸

The relative risk was used in the proportion of adequate plain water consumption habit among civilian pilots Indonesia more than 10%, with 95% confidence intervals based on the Cox regression analysis with constant time. Data were analyzed using STATA version 9. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia, Jakarta.

RESULTS

From 644 secondary data, 528 data met inclusion criteria and included in data analysis.

Table 1 General characteristic of the subjects

Subject	n	%
Type lisenca		
PPL	51	9,7
CPL	306	58
ATPL	171	32,4
Total flight hour		
<4500	360	68,2
≥4500	168	31,8
Aged		
19-29 years	298	56,4
30-39 years	86	16,3
40-65 years	144	27,3
Type of flight		
Short	195	36,9
Medium	290	54,9
Long	43	8,1
Physical activity		
Sedentary	303	57,4
Active	225	42,6
Knowledge about hidration		
Poor	365	69,1
Good	163	30,9
Fruit and vegetable consumption habit		
≤ 2 times/day	288	54,5
3-4 times/day	193	36,6
≥ 5 times/day	47	8,9
Body Mass Index		
Underweight	15	2,8
Normal	249	47,2
Overweight	264	50,0
Plain water consumption habit		
inadequate	215	40,7
adequate	313	59,3

Table 1 showed general characteristics of the subjects. Most of subjects were CPL holder (58%), mean flight hours <4500 (68,2%), aged 19-29 years old (56,4%), medium haul flight (54,9%). A number of 57,4% subjects were inactive, 54 ,5% had fruit and vegetable consumption habit had ≤ 2 times/day, 69,1% had poor knowledge about hydration and 50% were overweight. Most of pilot (59.3%) had adequate plain water consumption habit with mean consumption 1910 ± 600 ml/day.

Table 2 showed factors associated with plain water consumption habit. Subjects who had adequate and inadequate plain water consumption habit were similary distributed among age 19-29 years, aged 30-39 years and long haul flight, fruit and vegetable

consumption habit 3-4 times/day. Compared to the respective reference groups, pilots with medium haul flights, good knowledge about hydration, fruit and vegetable consumption habit ≥ 5 times/day, active physical activity, normal BMI and overweight were more likely to have adequate plain water consumption habit.

Table 3 was the final analysis model shows that the type of flight, the knowledge about hydration, physical activity and body mass index were the four dominant factors associated with plain water consumption habit. Civilian pilots with medium-haul flight have adequate water consumption habit 16% higher than those with short-haul flights. Pilots with good knowledge about hydration had adequate water consumption habit 20% higher than those with poor knowledge. Pilot with active physical activity had adequate water consumption habit 34% higher than the sedentary ones. Compared to underweight pilots, pilot with normal body mass index had a 4.14 times more accustomed to consume adequate plain water. Compared to underweight pilots, overweight pilots had 4.33 times higher more accustomed to consume adequate plain water.

DISCUSSION

The limitations of this study was using cross-sectional design which assessed exposure and outcome simultaneously, therefore it could not determine the causality these variables. Second, using secondary data with limited variables to be analyzed. Third, “recall bias” which plain water consumption was obtained by asking the question “*how many glass of plain water do you usually consume per day on your flight schedule?*” while nutrient and food consumption were estimated by a 24 hour recall or food frequency questionnaire (FFQ). Physical activities should be estimated by International Physical Activity Questionnaire (IPAQ) or physical activity level (PAL).

The mean plain water consumption among Indonesian civilian pilot was 1910 ± 600 ml/day. It showed that the consumption of civilian pilots in Indonesia had met FAA recommendations. Compared to Indonesian adult population, the consumption of plain water among the pilot was higher. Bardosono study in Indonesia showed an average consumption of plain water per day was 1.78 L/ day.⁹

Table 2 Factors associated with plain water consumption habit

	Plain water consumption habit				Crude risk relatif	95% confidence interval	p
	Inadequate (n = 215)		Adequate (n = 313)				
	n	%	n	%			
Age							
40-65 year	58	40.3	86	59.7	1.00	Reference	
30-39 year	26	30.2	60	69.1	1.16	0.79-1.11	0.115
19-29 year	131	44	167	56	0.93	0.96-1.41	0.457
Type of flight							
Short	89	45.6	106	54.4	1.00	Reference	
Medium	104	35.9	186	64.1	1.18	1.01-1.38	0.036
Long	22	51.2	21	48.2	0.89	0.64-1.25	0.527
Knowledge about hidration							
Poor	165	45.2	200	54.8	1.00	Reference	
Good	50	30.7	113	69.3	1.26	1.00-1.59	0.046
Fruit and vegetable consumption habit							
≤ 2 times/day	123	42.7	165	57.3	1.00	Reference	
3-4 times/day	79	40.9	114	59.1	1.03	0.88-1.22	0.698
≥ 5 times/day	13	27.7	34	72.3	1.26	1.03-1.55	0.024
Physical activity							
Sedentary	148	48.8	155	51.2	1.00	Reference	
Active	67	29.8	158	70.2	1.29	1.09-1.71	0.005
Body Mass Index							
Underweight	13	86.7	2	13.3	1.00	Reference	
Normal	103	41.4	146	58.6	4.39	1.09-17.75	0.037
Overweight	99	37.5	165	62.5	4.68	1.16-18.90	0.030

Tabel 3 The dominan factors associated with plain water consumption habit

	Plain water consumption habit				adjusted risk relatif *	95% confidence interval	p
	Inadequate (n = 215)		Adequate (n = 313)				
	n	%	n	%			
Type of Flight							
Short	89	45.6	106	54.4	1.00	Reference	
Medium	104	35.9	186	64.1	1.16	1.00-1.35	0.045
Long	22	51.2	21	48.2	0.95	0.69-1.31	0.755
Knowledge about hidration							
Poor	165	45.2	200	54.8	1.00	Reference	
Good	50	30.7	113	69.3	1.20	1.05-1.38	0.006
Physical activity							
Sedentary	148	48.8	155	51.2	1.00	Reference	
Active	67	29.8	158	70.2	1.34	1.16-1.54	0.000
Body mass index							
Underweight	13	86.7	2	13.3	1.00	Reference	
Normal	103	41.4	146	58.6	4.14	1.15-14.88	0.029
Overweight	99	37.5	165	62.5	4.33	1.20-15.59	0.025

* Adjusted each other between the variables in this table

Type of flight was associated with drinking water habit. This was consistent with previous study which found that subjects exposed to sunlight <5 hour/day consume 6.1 ± 3.8 cups / day and subjects exposed ≥ 5 hours / day consume more water i.e 6.4 ± 4.2 cups / day.⁴ Flight environmental exposure such as hypoxia, low humidity, low temperatures in the cockpit will affect the physiology of the body. Exposure to hypoxia and low humidity increase insensible water loss (IWL) through perspiration and breathing. Exposure to hypoxia and low temperature could increase atrial natriuretic peptide (ANP) that lower aldosterone secretion resulting in diuresis.¹⁰ If these condition continues without adequate water consumption, they can cause dehydration. Hasiguchi suggested that hypobaric-induced hypoxia, similar to the conditions in the air cabin environment, may increase blood viscosity and its combination with low humidity increase IWL.¹¹ Subjects with long-haul flights were not associated with the consumption of water because the number of subject was just a few so it might influence the results. Recall bias may occur because there were pilots operating in both medium and long haul flight so the answers to type of flight and the consumption of plain water could be inconsistent.

Knowledge of hydration was the dominant factor associated with the consumption of plain water. This was consistent with previous studies in general population that found half of the subject with poor knowledge were followed by the number of subjects who were dehydrated.¹² Knowledge-based behavior would be more imperishable than the behavior that was not based on knowledge.¹³ Without knowledge, individuals would not have a basis for decisions making and finding the action to the problems.

Physical activity was significantly associated with plain water consumption habit. This was supported by research conducted Rhonda (2011) on the US population. Water consumption was higher in people who are active than sedentary ($P < 0.001$).¹⁴ Physical activity causes increased hydration due to the sweating process. The fluid loss will cause thirst, thus encouraging people to drink.^{4,5}

There was a tendency that the higher the body mass index, the higher the plain water consumption. This was consistent with previous studies that found body mass index was associated with the consumption of water ($p < 0.0001$). Obese people had lower body fluid than normal people. This was due to higher

percentage of body fat than muscle, where muscles contents more fluid than fat cells. Currently water consumption was promoted in management weight loss.¹⁵ This condition made obese people tend to consume more water than any other beverage.

Although our study found no association between age and plain water consumption habit, previous studies indicate that plain water consumption decreases with age.^{5,16} Older adults have lower fluid consumption primarily due to a decrease in thirst.¹⁶

In bivariate analysis, fruits and vegetables consumption habit was associated with the consumption of plain water ($p = 0.024$). But in multivariate analysis, it was not a dominant factor because the result was also affected by another dominant factors. Plain water consumption was associated with the practice of a healthy diet such as fruit vegetable consumption habits. To promote increased plain water should keep in mind that that low water consumption may be closely tied to other unhealthful behaviors.⁵

In conclusion, civilian pilots who operate in medium haul flight, good knowledge about hydration, active physical activity and BMI ≥ 18.5 kg/m² had more adequate plain water consumption habit.

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