

The Incidence of Diabetes in Indonesian Young Adults: The Importance of Lifestyle Compared to Family History

Lina Antono ¹⁺, Astri Kurniati ¹, Amelinda Angela ¹, Kamalita Pertiwi ¹ and Susana ¹

¹ Nutrifood Research Center, Jakarta, Indonesia

Abstract. The prevalence of type-2 diabetes in the world is increasing with family history and unhealthy lifestyle as the well-known risk factors. Cross sectional study was performed by interviewing seventy nine young adults with diabetes family history (age 20-40 years, Body Mass Index (BMI) 16.8-39.5 kg/m², forty nine of which have diabetes and thirty subjects are healthy without diabetes) regarding their dietary patterns, physical activity level, and sleeping patterns. It was observed that before being diagnosed with diabetes, respondents with diabetes followed an unhealthier eating pattern and had a lower sleeping duration. Their daily fat, carbohydrate, and added sugar intake were also higher than their healthy counterparts and were above the recommended amount by Indonesian Health Ministry. However, no difference was observed in physical activity level as both groups could be considered as sedentary. Although this study did not directly show a causal relationship, this unhealthy lifestyle could be correlated with the incidence of diabetes in the groups through increased BMI or other mechanisms. Seeing how both groups had similar family history but were different in diabetes status and lifestyle, it could be suggested that lifestyle may play a bigger role than family history in the onset of diabetes.

Keywords: Type-2 diabetes, family history, eating pattern, sleeping duration, lifestyle

1. Introduction

The prevalence of type-2 diabetes in the world is increasing with 371 million people diagnosed with diabetes in 2012 [1]. A review of ten studies on the association between family history and type-2 diabetes concluded that there was a twofold to sixfold increased risk of type-2 diabetes associated with a positive family history compared with a negative family history of diabetes. Other than family history as the non-modifiable risk factor, the risk of diabetes is also influenced by lifestyle factor as the modifiable risk factor. Statement from the American Diabetes Association (ADA) showed that simple lifestyle modifications such as a healthy diet and increased physical activity can significantly decrease the incidence of diabetes in high-risk populations [2]. The objective of this research is to examine the differences in dietary eating pattern, physical activity level, and sleeping duration between diabetic young adults with diabetes family history and their healthy counterparts. Specifically, this study aims to show how lifestyle may be correlated with the onset of diabetes in young Indonesian adults with diabetes family history.

2. Subjects and Methods

2.1. Subjects

Seventy nine young adults with diabetes family history in first degree relatives (mother, father, and siblings) and grandparents (age 20-40 years, Body Mass Index [BMI = weight (kg) / height² (m²)] 16.8-39.5 kg/m²) were recruited: forty nine of which have diabetes and thirty subjects are healthy without diabetes. Their diabetes status was confirmed by asking their personal history of physician-diagnosed type-2 diabetes and their fasting blood glucose level (fasting blood glucose level ≥ 126 mg/dl was considered as diabetes and

⁺ Corresponding author. Tel.: +62-21-4605780; fax: +62-21-46829506
E-mail address: lina.antono@nutrifood.co.id.

fasting blood glucose level <100 mg/dl was considered as healthy without diabetes). Detailed profile of all the respondents is shown in Table 1.

Table 1: Subjects Profile

	Respondents with Diabetes (n=49)	Healthy Respondents (n=30)
Age	37 years (20-40 years)	34.7 years (20-40 years)
BMI	26.1 kg/m ² (20.3-39.5 kg/m ²)	22.3 kg/m ² (16.8-34.2 kg/m ²)
Gender	33 female, 16 male	24 female, 6 male

2.2. Study Design

A cross-sectional study was performed. Survey on daily eating patterns and physical activity level was conducted by Qualified Research Analysts (QRA), a private marketing research company in Indonesia. All of the respondents were personally interviewed by trained interviewers from QRA.

The survey included questions about personal history of physician-diagnosed type-2 diabetes ('Have you ever been diagnosed by your doctor as having type-2 diabetes?'), diabetes family history in first degree relatives (mother, father, and siblings) and grandparents, as well as physical and medical conditions such as body weight, height, and fasting blood glucose level. The survey also assessed the respondents' lifestyle habits through several questions related to their dietary eating patterns, physical activity levels, and sleeping patterns. Current lifestyle habits were assessed for healthy respondents without diabetes, while lifestyle habits before being diagnosed with diabetes were assessed for respondents with diabetes.

2.3. Food Intake Analysis

Food intake analysis was performed by calculating weekly consumption frequency and daily nutrient intake. Included in weekly consumption frequency analysis were (white) rice, bread, noodle, instant noodle, pasta, deep fried foods, foods with coconut milk condiment, processed foods, tea (with/without sugar), coffee (with/without sugar), juice, sweet beverages, sweet desserts, soda, flavoured syrup drinks, candies, sweet snacks, chocolate, ice cream, chips, fried peanut, French fries, puff snacks, fruits and vegetables intake frequency.

Daily nutrient intake was obtained from the nutritional information and consumption frequency of the food. Nutritional information for the food was obtained from USDA National Nutrient Database, www.nutrition.com.sg, food packaging, and Nutrient Composition of Malaysian Foods. For each food group from the consumption frequency analysis, one representative food (assumed to be the most common in Indonesia) was used as a reference in calculating the nutritional content for the group. Included in daily nutrient intake analysis were total carbohydrate, total fat, and added sugar intake.

2.4. Statistical Analysis

Differences between samples for weekly consumption frequency were tested for significance by using Mann-Whitney U Test, while differences between samples for daily nutrient intake data were tested for significance by using Independent Samples T-Test. A p-value <0.05 was regarded as statistically significant. Statistical procedures were performed using SPSS version 21.0 (SPSS, Inc., Chicago IL).

3. Results

3.1. Weekly Food Frequency

Differences in weekly (white) rice, bread, instant noodle, pasta, foods with coconut milk condiment, soda, flavoured syrup drinks, chips, and vegetables consumption was statistically significant (p<0.05). Fig. 1 showed that before being diagnosed with diabetes, respondents with diabetes had higher weekly consumption on (white) rice, bread, instant noodle, foods with coconut milk condiment, soda, and flavoured syrup drinks; while their vegetables weekly consumption was lower. Overall, before being diagnosed with diabetes, respondents with diabetes appeared to follow an unhealthier eating pattern, compared with their healthy counterparts.

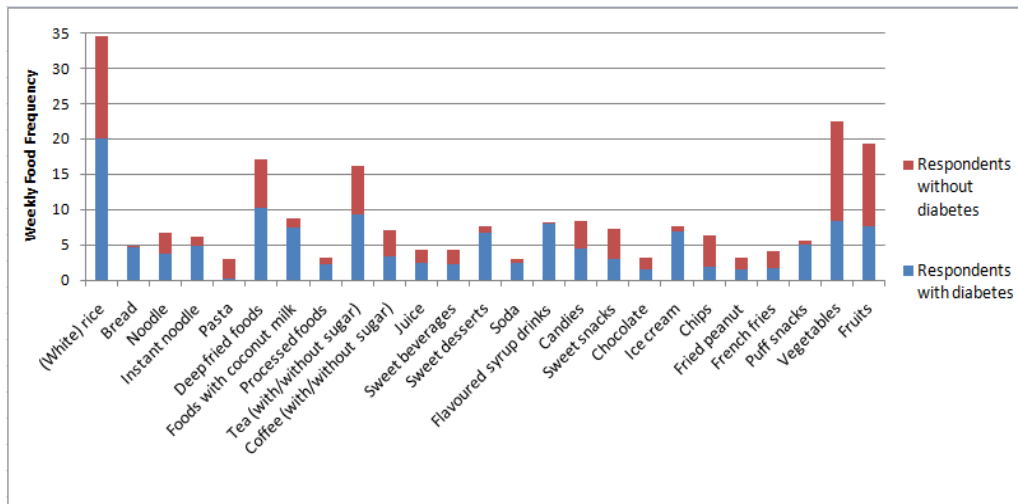


Fig. 1: Weekly food frequency comparison between respondents with and without diabetes

3.2. Total Daily Nutrient Intake

Differences in total carbohydrate, total fat, and added sugar intake per day was statistically significant ($p < 0.05$), as shown in Fig. 2. Respondents with diabetes had higher daily total carbohydrate, total fat, and added sugar intake compared to their healthy counterparts. Unlike respondents without diabetes, their total carbohydrate and total fat intake before being diagnosed with diabetes above the daily recommendation by Indonesian Health Ministry (*Angka Kecukupan Gizi*: 300 gram of carbohydrate per day and 62 gram of fat per day). Added sugar was found to be higher than the recommended amount by Indonesian Health Ministry (*Pedoman Umum Gizi Seimbang*: max. 25 gram per day) in both subjects with and without diabetes.

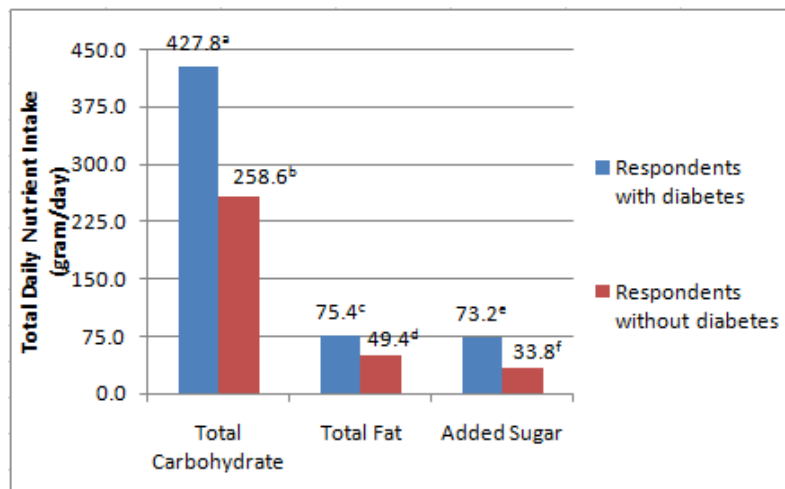


Fig. 2: Total daily nutrient intake comparison between respondents with and without diabetes. All data showed significant differences ($p < 0.05$). Different letter marked significant difference.

3.3. Other Lifestyle

Differences in weekly eating out of home frequency and sleeping duration were statistically significant, as described in Fig. 3. Before being diagnosed with diabetes, respondents with diabetes were reported to eat out of home more frequently and to sleep less, compared to their healthy counterparts ($p < 0.05$). However, no difference was observed in their physical activity pattern.

4. Discussions

In this study, two groups of young adults with diabetes family history were recruited as respondents to have their lifestyle being compared. One group had diabetes, while another one was healthy without diabetes. Overall, it was observed that before being diagnosed with diabetes, respondents with diabetes had an unhealthier eating pattern with lower vegetables consumption and higher weekly consumption on (white) rice, instant noodle, foods with coconut milk condiment, soda, and flavoured syrup drinks compared to their

healthy counterparts. This unhealthy eating pattern may be related to the incidence of diabetes in this group, as has been shown in other studies.

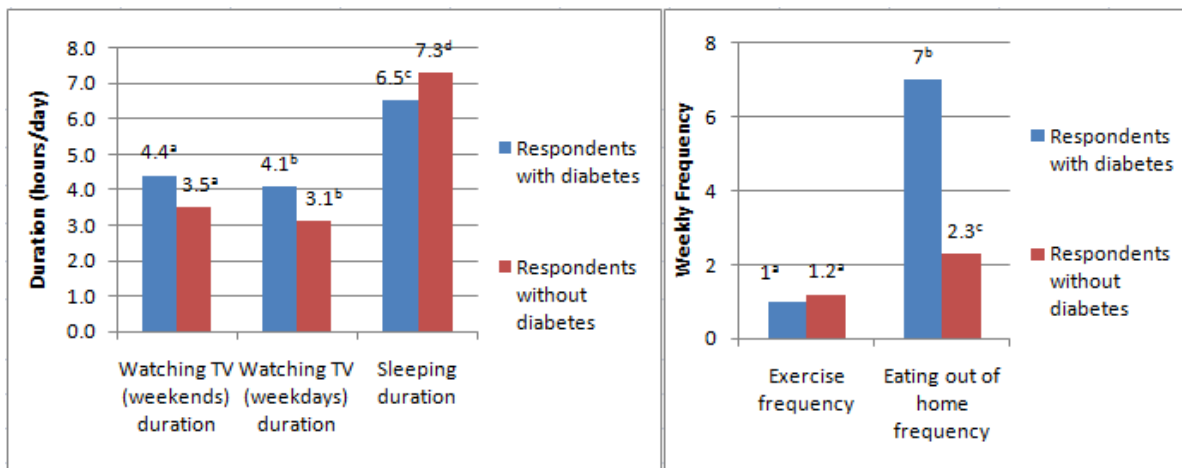


Fig. 3: Comparison between respondents with and without diabetes **A.** Daily watching TV and sleeping duration **B.** Weekly exercise and eating out of home frequency. Different letter marked significant difference.

High consumption of white rice has been shown to be related to increased risk of type-2 diabetes. A review on four prospective cohort studies concluded that higher white rice consumption was associated with a significantly elevated risk of type 2 diabetes, especially in Asians populations. A dose-response analysis found that each serving per day of white rice consumption was associated with 11% increase in risk of diabetes [3]. Instant noodle and coconut milk condiment are high in fat. Although some studies found no correlation between saturated fat and the incidence of diabetes, several studies found that high fat diet was related to a decrease in insulin sensitivity [4]. Sugar sweetened beverages consumption, including soda and flavoured syrup drinks, were also found to be associated to increased risk of type-2 diabetes. Three studies concluded that consuming ≥ 1 serving sugar sweetened beverages was related to 26%-83% higher risk of type-2 diabetes [5]-[7]. Sugar sweetened beverages may contribute to type-2 diabetes in part by their ability to induce weight gain and from their high amounts of rapidly absorbable carbohydrate content [6].

Nutrient intake analysis confirmed how before being diagnosed with diabetes, respondents with diabetes followed an unhealthier eating pattern than their healthy counterparts. In addition to have a higher daily intake of total carbohydrate, fat, and added sugar; their consumptions were also above the daily recommendation by Indonesian Health Ministry (*Angka Kecukupan Gizi*: 300 gram of carbohydrate per day and 62 gram of fat per day and *Pedoman Umum Gizi Seimbang*: max. 25 gram per day). This high intake of carbohydrate, fat, and added sugar; combined with a higher weekly eating out of home frequency (mostly comprised of high calorie foods); may contribute to higher Body Mass Index (BMI) in diabetes respondents. Increased BMI was found to be related to increased risk of type-2 diabetes [8], and obesity was known as the most important single risk factor for type-2 diabetes [9]. However, it must be noted that added sugar consumption was also higher than the recommended amount in healthy subjects. This result emphasized the importance of educating Indonesian society on limiting added sugar intake.

Sleeping duration may also be taken into importance. Respondents with diabetes were reported to have a shorter sleeping duration, compared to their healthy counterparts. Short sleep duration (< 7 hours/night) was related to increased risk of type-2 diabetes in several studies. Sleep deprivation may decrease brain glucose utilization, cause hormonal dysregulation (growth hormone and cortisol), increase inflammation and overactivity of the sympathetic nervous system which could lead to insulin resistance [10]. No difference was observed in physical activity level, including exercise frequency and duration of watching television, between respondents with and without diabetes. Both groups could be considered as sedentary, and thus should be advised to increase their physical activity level.

A major limitation of the present study is due to its cross-sectional nature and shares all the limitations of this study type, especially in regards to causality. The small number of subjects should be noted with the consequences that result of this study may not be generalized to wider populations. Also, memory may

misrepresent what really happened and thus causing some inaccuracy when respondents with diabetes were interviewed regarding their lifestyle before diagnosed with diabetes. In addition, nutrient intake analysis was performed by using one representative food (assumed to be the most common in Indonesia) as a reference and thus may not represent the real amount. The results of this study should be seen as suggestions for future research, rather than the end results of a research process.

In conclusion, this study showed that before being diagnosed with diabetes, young adults with diabetes and diabetes family history followed an unhealthier lifestyle compared to their healthy counterparts. Although this study did not directly show a causal relationship, it could be possible to speculate that unhealthy lifestyle may be related to the incidence of diabetes in the group. Specifically, unhealthy eating pattern (low vegetables consumption and high weekly consumption on (white) rice, instant noodle, food with coconut milk condiment, soda, and flavoured syrup drinks), eating out of home, and sleep deprivation may play a role either through increased BMI or other direct effects. Seeing how both groups had similar family history but were different in diabetes status and lifestyle, it could be suggested that lifestyle may play a bigger role than family history in the onset of diabetes. Therefore, it may be beneficial to promote healthy lifestyle including healthy eating pattern and sufficient sleep duration in people with diabetes family history.

5. Acknowledgements

The authors wish to thank all Qualified Research Analysts crews for their assistance in performing the survey and to all respondents for their contributions in this study.

6. References

- [1] Anonym. IDF Diabetes Atlas 5th Edition. 2012. International Diabetes Federation.
- [2] T. A. Harrison, L. A. Hindorff, H. Kim, R. C. M. Wines, D. J. Bowen, B. B. McGrath, and K. L. Edwards. Family history of diabetes as a potential public health tool. *AJPM*. 2003, **24** (2): 152-159.
- [3] E. A. Hu, A. Pan, and Q. Sun. White rice consumption and risk of type 2 diabetes: meta-analysis and systematic review. *British Medical Journal*. 2012, **344**: e1454.
- [4] F. B. Hu, R. M. van Dam, and S. Liu. Diet and risk of Type II diabetes: The role of types of fat and carbohydrate. *Diabetologia*. 2001, **44**: 805-817.
- [5] V. S. Malik, B. M. Popkin, G. A. Bray, J. P. Despres, W. C. Willet, and F. B. Hu. Sugar-Sweetened beverages and risk of metabolic syndrome and Type 2 diabetes: A meta-analysis. *Diabetes Care*. 2010, **33**: 2477–2483.
- [6] V. S. Malik, B. M. Popkin, G. A. Bray, J. P. Despres, and F. B. Hu. Sugar-Sweetened beverages, obesity, Type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation*. 2010, **121**: 1356-1364.
- [7] M. B. Schulze, J. E. Manson, D. S. Ludwig, G. A. Colditz, M. J. Stampfer, W. C. Willet, and F. B. Hu. Sugar-sweetened beverages, weight gain, and incidence of Type 2 diabetes in young and middle-aged women. *JAMA*. 2004, **292**: 927-934.
- [8] K. M. V. Narayan, J. P. Boyle, T. J. Thompson, E. W. Gregg, and D. F. Williamson. Effect of BMI on lifetime risk for diabetes in the U.S. *Diabetes Care*. 2007, **30**: 1562–1566.
- [9] K. G. G. G. Alberti, P. Zimmet, and J. Shaw. International diabetes federation: A consensus on Type 2 diabetes prevention. *Diabetic Medicine*. 2007, **24**: 451-463.
- [10] C. Touma and S. Pannain. Does lack of sleep cause diabetes? *CCJM*. 2011, **78** (8): 549-558.