PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

OPEN ACCESS Pakistan Journal of Nutrition

ISSN 1680-5194
DOI: 10.3923/pjn.2018.255.259

Research Article
Non-communicable Diseases and its Association with Body Composition and Nutrition among General Population in Subnag Jaya, Selangor: Community-Based Study

Hasanain Faisal Ghazi, Maged Elnajeh, Mohammed A. Abdalqader, Mohammed Faez Baobaid and Indang Ariati Ariffin

International Medical School, Management and Science University, Selangor, Malaysia

Abstract

Objective: The aim of the present study was to measure the association between non-communicable diseases, body composition and nutrition among the general population of Subang Jaya, Malaysia. **Methodology:** This cross-sectional study was conducted using self-administered questionnaires with anthropometric measures and collection of blood pressure and glucose levels. **Results:** Of the 518 respondents, the majority were female (60%), of Malay ethnicity (74.9%) and currently employed (59.7%). Most respondents had up to a secondary school education (45.9%) and exhibited a moderate ability to self-regulate their eating (65.1%). However, there was no association between dietary habits and development of hypertension ($p = 0.368$), diabetes mellitus ($p = 0.5888$), heart disease ($p = 0.496$), or cancer ($p = 0.656$) in this sample population. Most of our respondents had normal stress levels (69.5%) and there was no association with development of hypertension ($p = 0.747$), diabetes mellitus ($p = 0.300$), heart disease ($p = 226$), or cancer ($p = 0.702$). **Conclusion:** Majority of respondents had normal stress levels and moderate self-regulation of eating. While there was an association between body fat percentage, visceral fat and diabetes status, no association was found between eating regulation behavior and both hypertension and diabetes.

Key words: Non-communicable disease, associated factors, body composition, nutrition, community-based study

Received: January 30, 2018 Accepted: March 17, 2018 Published: April 15, 2018

Citation: Hasanain Faisal Ghazi, Maged Elnajeh, Mohammed A. Abdalqader, Mohammed Faez Baobaid and Indang Ariati Ariffin, 2018. Non-communicable diseases and its association with body composition and nutrition among general population in Subnag Jaya, Selangor: community-based study. Pak. J. Nutr., 17: 255-259.

Corresponding Author: Hasanain Faisal Ghazi, International Medical School, Management and Science University, Selangor, Malaysia

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Non-communicable diseases (NCD) and injuries are replacing communicable diseases as the most common causes of morbidity, disability and premature disability among people aged 18-65 years-old. This has resulted in an epidemiological transition for low and middle income countries, such as Malaysia. Leading NCDs are cancer, diabetes, hypertension, cardiovascular disease, stroke, mental disorders and trauma[1].

Demographic transitions (e.g., increase in aging populations), epidemiological transitions (e.g., increased incidence of NCDs versus communicable diseases) and social transitions (e.g., eating, smoking and alcohol habits) pose serious challenges to the ability of health systems to provide treatment, care and support. Moreover, industrialization, urbanization and globalization are also contributing to the NCD epidemic by increasing risk factor levels. This multi-dimensional effect on households, health systems and at macroeconomic levels has resulted in NCDs being considered a "chronic emergency" that requires multisector action with heightened political commitment[1].

The prevalence of NCDs has increased throughout the years in many developing countries due to rapid social and economic growth, becoming a serious health problem[2]. Data from the World Health Organization (WHO) shows that NCDs caused approximately 63% of all deaths worldwide in 2008 and almost 80% of deaths in 2008 from NCDs occurred in low and middle income countries. Driven by population growth and aging, deaths from NCDs are projected to increase by 15% globally between 2010 and 2020, accounting for approximately 70% of global deaths by 2030. It is estimated that NCDs currently account for 67% of all deaths in Malaysia, a trend that has increased in recent decades[3].

It would seem that apathy towards pursuing or maintaining a healthy lifestyle among young adults may be significantly influenced by the broader distal determinant of life stress. A high cost of living is suggested to be the main "push factor" for young working adults towards attaining better financial security to improve their livelihood. However, this leads to a more stressful lifestyle with less time to focus on attaining better health literacy and healthier lifestyle choices. These findings resonate with the growth of NCDs in low and middle income countries like Malaysia[4].

Alarmingly, these risk factors are also becoming rampant in adolescents, which will contribute to a higher NCD management and treatment costs in future[5]. Distal determinants include socioeconomic status, ethnicity, religion, gender, education and urbanization, whereas proximal determinants are dietary factors (e.g., high fat, sugar and/or fast-food consumption), physical inactivity and a sedentary lifestyle[4]. Excess adiposity is also an important risk factor for mortality and morbidities, including cardiovascular diseases, diabetes mellitus, several cancers and musculoskeletal disorders[6]. Furthermore, a previous study examined body fat percentage in nearly 40,000 individuals and identified two new genetic loci (near *IRS1* and *SPRY2*) associated with cardio metabolic diseases, such as type 2 diabetes and coronary artery disease[7]. The aim of the present study was to measure the prevalence of NCDs, as well as their relationships with dietary habits and stress levels among adults in Subang Jaya, Malaysia. Current findings will provide important insights for the design of appropriate intervention programs aimed at prevention, management and treatment of NCDs in Malaysia.

MATERIALS AND METHODS

Study design and subjects: The present study used a cross-sectional design. A total of 518 adults living in Subang Jaya, Malaysia, participated in this study, which was carried out in July, 2017. A full explanation of the study and its measures were given to each respondent before obtaining verbal and written consent. Ethics approval was obtained from the Management and Science University (Shah Alam, Malaysia) and local shopping malls. Participation was completely voluntary and participants were allowed to withdraw at any time without any repercussions. The target population was 18-65 years-old visitors and/or shoppers of Subang Jaya hypermarkets that had been living in the Subang Jaya area for the past year. A non-probability convenient sampling method was used to recruit respondents. Pregnant mothers and mentally disabled persons were excluded from the study.

Study tools: Semi-structured questionnaires were used to obtain study data. A DASS-21 questionnaire was used to measure stress levels with the following cut-off points[8]: normal: 0-14, mild: 15-18, moderate: 19-25, severe: 26-33, extremely severe: 34+. Dietary status was determined using a self-regulation of eating behavior questionnaire (SREBQ) with the following cut-off points (Kliemann ET AL. 2016)[9]: low: <2.8, medium: 2.8-3.5, high: >3.6. A glucometer (On Call Plus, California, USA), automatic sphygmomanometers (Omron, Kyoto, Japan) and a body composition analyzer (Tanita, model BC-545N, Tokyo, Japan) were used for body composition measurements.

Statistical analysis: Data analysis was done using statistical package for social sciences (SPSS) version 20.0 (IBM, NY,

USA)[10]. A Chi-square test was used for categorical data, while a Pearson's correlation test was used to determine correlations between body composition variables, SREBQ scores and body mass index status. Significance was set at a $p<0.05$.

RESULTS

Of the 518 respondents, 312 were female (60.2%) and 206 were male (39.8%). The ethnicities of respondents included 388 Malays (74.9%), 64 Indians (12.4%), 39 Chinese (7.5%) and 27 other races (5.2%). The majority of participants were currently working (59.7%). Regarding disease history, 46.7 and 46.3% of respondents had family histories of hypertension and diabetes, respectively; only 12.2% had a positive family history of cancer. Based on DASS-21 results, 360 (69.5%) participants reported normal stress and ability to self-regulate eating, with the majority (65.1%) reporting medium self-regulatory eating skills (Table 1).

The mean±standard deviation systolic blood pressure, blood sugar, heart rate, body weight and body mass index of participants was 128.16±19.64 mmHg, 7.29±3.65 mmol L^{-1}, 80.4±12.14 beats min^{-1}, 68.54±16.03 kg and 26.87±5.67, respectively (Table 2). Body composition analysis revealed a mean±standard deviation body fat, body water, visceral fat and basal metabolic rate of 32.83±12.68, 49.15±8.36, 9.20±5.00 and 1345.56±265.07, respectively (Table 3). Table 4 shows the association between body composition variables and diabetes. Only body fat percentage, visceral fat and metabolic age were significantly associated with diabetes ($p = 0.004$, $p<0.001$ and $p<0.001$, respectively). There was a significant association between the mean SREBQ score and basal metabolic rate ($p = 0.042$) and body mass index was significantly associated with all body composition (Table 5). The mean SREBQ score was not significantly associated with hypertension ($p = 0.368$) or diabetes ($p = 0.588$; Table 6).

Table 1: Socio-demographic characteristics of the respondents

Variables	Frequency	%
Gender		
Male	206	39.8
Female	312	60.2
Race		
Malay	388	74.9
Chinese	39	7.5
Indian	64	12.4
Other	27	5.2
Working status		
Yes	309	59.7
No	209	40.3
Family history		
Hypertension	242	46.7
Diabetes mellitus	240	46.3
Heart disease	103	19.9
Cancer	63	12.2
Stress levels		
Normal	360	69.5
Mild	75	14.5
Moderate	47	9.1
Severe	26	5.0
Extremely severe	10	1.9
Eating self-regulatory skills		
Low level	56	10.8
Medium	337	65.1
High	125	24.1

Table 2: Blood pressure, glucose and anthropometric measurement

Reading	Minimum	Maximum	Mean	Standard deviation
Systolic BP (mmHg)	76.00	206.00	128.16	19.641
Diastolic BP (mmHg)	48.00	130.00	80.32	10.66
Heart rate (bpm)	39.00	125.00	80.40	12.14
Blood sugar (mmol L^{-1})	2.00	31.60	7.29	3.652
Weight (kg)	38.40	132.20	68.54	16.03
Height (cm)	116.50	186.00	159.54	8.48
BMI	14.34	52.29	26.87	5.67

Table 3: Body composition analysis

Body composition measures	Minimum	Maximum	Mean	Standard deviation
Body fat (%)	4.60	78.30	32.83	12.684
Muscle mass	2.90	76.30	43.55	10.029
Body water (%)	2.10	80.60	49.15	8.360
Bone mass (kg)	1.60	4.10	2.54	0.484
Visceral fat	1.00	40.00	9.20	5.009
Basal metabolic rate	914.00	2440.00	1345.56	265.076
Metabolic age	15.00	90.00	47.13	17.524

Table 4: Association between body composition variables and diabetes mellitus status

Variables	Diabetes: No diabetic (Mean±SD)	Diabetes: Diabetic (Mean±SD)	p-value	95% CI
Body fat (%)	31.6842±12.94869	35.0545±11.87660	0.004	-5.66581 to -1.07486
Muscle mass	43.2789±9.81210	44.0710±10.44750	0.395	-2.62041 to 1.03626
Body water (%)	49.6184±8.48435	48.2420±8.05835	0.076	-0.14400 to 2.89675
Bone mass (kg)	2.5367±0.47818	2.5556±0.49661	0.674	-0.10723 to 0.06937
Visceral fat	8.4447±4.68089	10.6591±5.30851	<0.001	-3.10787 to -1.32083
Basal metabolic rate	1340.3129±259.06990	1355.7614±276.84506	0.530	-63.78654 to 32.88955
Metabolic age	44.2164±18.01563	52.7784±15.03564	<0.001	-11.67181 to -5.45226

*Level of significance at p<0.05, independent t-test was performed

Table 5: Correlation between body composition variables with SREBQ and BMI status

Variables	Pearson's correlation: SREBQ mean	p-value	BMI mean	p-value
Body fat (%)	-0.004	0.932	0.571	<0.001*
Muscle mass	-0.006	0.892	0.328	<0.001*
Body water (%)	0.027	0.544	-0.387	<0.001*
Bone mass (kg)	-0.018	0.678	0.446	<0.001*
Visceral fat	-0.011	0.798	0.696	<0.001*
Basal metabolic rate	-0.89	0.042*	0.509	<0.001*

*Level of significance at p<0.05, pearson's correlation test was performed

Table 6: Association between dietary habits (SREBQ) with hypertension and diabetes

Variables	Hypertension, n (%): Yes	No	X^2 (df)	p-value
Eating habits score				
Low	7 (12.5)	49 (87.5)	1.998	0.368
Medium	57 (16.9)	280 (83.1)		
High	26 (20.8)	99 (79.2)		
	Diabetes mellitus, n (%): Yes	No		
Eating habits score				
Low	5 (8.9)	51 (91.1)	1.061	0.588
Medium	42 (12.5)	295 (87.5)		
High	18 (14.4)	107 (85.6)		

*Level of significance at p<0.05, Chi-square test was performed

DISCUSSION

The current study revealed that the majority of respondents aged 18-65 years in Subang Jaya, Malaysia, had normal stress levels and medium ability to self-regulate their eating. While an association was found between body fat percentage, visceral fat and diabetes status, none was found between eating regularity behavior and hypertension or diabetes. Furthermore, there was no significant interaction between dietary habits and hypertension (p = 0.368). Current results were in agreement with those reported in the American Journal of Clinical Nutrition, showing no association with blood pressure and raw fruit intake in participants from Western countries[11]. On the other hand, the SALTURK study reported a relationship between salt intake and blood pressure, wherein consumption of 100 mmol salt/day resulted in a 5.8 and 3.8 mmHg increase in systolic and diastolic blood pressure, respectively[12].

Current results also revealed that there was no significant interaction between dietary habits and diabetes mellitus. Previously, Sami *et al.*[13] investigated the relationship between various dietary components (e.g., fat, fiber and sucrose) and risk of developing type 2 diabetes among two groups of women. Their study showed no associations between intake of fat, sucrose, carbohydrates, or fiber and risk of diabetes in either group. However, according to the American Diabetes Association, there is an association between eating habits, such as drinking sugar-sweetened beverages and diabetes. Individuals who drink 1-2 servings of sugar-sweetened beverages per day have been shown to have a 26% greater risk of developing type 2 diabetes[14].

Interestingly, the stress level among working adults between the ages of 18 and 65 years in the present study was relatively low, with 69.5% of respondents reporting normal stress levels and 14.5% reporting mild stress levels. The number of people reporting moderate, severe and extreme stress levels was 9.1, 5.0 and 1.9%, respectively. A few prospective studies have reported a connection between emotional stress and increased risk of developing type 2 diabetes. Meanwhile, working immoderate amounts of overtime and other over commitment to work have been reported to correspond with a 4-fold higher risk of developing type 2 diabetes in Japanese men[15]. Together with previous studies, the present results contribute to current knowledge regarding critical associations between NCDs, body composition and nutrition that will facilitate formulation of new approaches for early prevention and treatment of NCDs.

CONCLUSION

In conclusion, the majority of respondents in the current study had normal levels of stress and medium self-regularity

of eating. While an association was found between body fat percentage, visceral fat and diabetes status, none was found between eating regularity behavior and hypertension or diabetes mellitus. Increased public awareness of NCDs and their risk factors is necessary and current findings provide important insights into the design of appropriate programs aimed at prevention, management and treatment of NCDs in Malaysia.

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