



Original research

Socio-environmental and behavioral risk factors associated with obesity in the capital (Honiara), the Solomon Islands; case-control study

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ABSTRACT

Objective: This study aims to evaluate the characteristics, nutrition status, consciousness of health of subjects in the Solomon Islands, and to assess the factors that contribute to obesity, whether socio - environmental or behavioral in the capital city of the Solomon Islands, to indicate the way for effective health promotion.**Methods:** A case-control study was conducted with 57 cases of obesity and 57 controls. Anthropometric measurements, the surveys of socio-economic status, behavioral status, nutrition status, dietary diversity, knowledge of NCDs, consciousness of health, and awareness of nutrition were conducted. Logistic regression analysis was conducted to identify factors significantly associated with obesity.**Result:** Significant odds ratio of dietary diversity, education level, and frequency of dark green leafy vegetables was 0.71, 0.31 and 0.29, respectively. Cases significantly had lower amount of protein, consumed less fish, meat, and dark green leafy vegetables than controls.**Conclusion:** The present study suggested that higher educated people take care of their health to keep healthy weight, and low diversity of food intake and low frequency of eating green leafy vegetables are the factors to increase rate of obesity. Strategies to improve education standards, give people nutrition and health education to have more diverse food are needed.

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1. Introduction

In September 2015, the 2030 Agenda for Sustainable Development with 17 Sustainable Development Goals (SDGs) was adopted at the United Nations General Assembly in New York (United Nation, 2015). Non Communicable Diseases (NCDs) such as cardio vascular diseases, diabetes, etc. were acknowledged as one of the major global development challenges of the next 15 years (WHO, 2015). According to the World Health Organization (WHO), more than 38 million out of 56 million deaths in the world in 2012 were caused by NCDs, and more than 72% of the mortality of NCDs in the world occur in low- and middle-income countries which suffer from the double burden of NCDs and communicable diseases

(WHO, 2012).

Obesity is one of the leading worldwide causes of death by NCDs. The highest prevalence of obesity and diabetes in the world is found in the Pacific Island countries (PICs) (Hawley and McGarvey, 2015). NCDs impose a heavy burden of cost on health and finances in PICs because NCDs require a long duration of treatment (Anderson, 2013). The Solomon Islands are one of the Melanesian countries located in the Pacific, northeast of Australia. It is the second least developed country in the group. According to the surveillance of these chronic disease risk factors by WHO, the prevalence of overweight (WHO, 2016) and obesity (WHO, 2016) among women in the Solomon Islands is 72.7% and 40.4%, respectively. Among men, 62.5% were overweight and 25.8% of these were obese. NCDs are estimated to cause 60% of the total deaths in the Solomon Islands (WHO Western Pacific region, 2006). Urbanization has had a dramatic impact on the economy as people moved from a traditional self-sufficient economy to a cash economy. Traditional food such as fresh fish, tubers, and local vegetables were replaced

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by processed food such as white rice, white flour, canned meats and canned fishes (Andersen et al., 2013). NCDs in the Solomon Islands are due to a number of factors. The immediate factors may be lifestyle behaviors such as lack of physical activity, drinking, and smoking. However, socio-environmental factors such as economic mood and politics, and social circumstances are the real underlying origins of NCDs (Hughes and Lawrence, 2005).

However, there is little information about the factors associated with NCDs. Therefore, the aims of this study are to evaluate the characteristics, nutrition status, consciousness of health of subjects, and to assess the factors that contribute to obesity, whether socio-environmental or behavioral to indicate the way for effective health promotion in order to improve both health and lifestyle in the Solomon Islands.

2. Material and method

2.1. Design and subjects

We conducted a case-control study with 57 cases of obesity and 57 controls. The subjects for this study were adults aged 20 or over, in two clinics, a general clinic and the NCD clinic in the capital city, Honiara located in the northern coast of Guadalcanal island, on one of the main islands of the Solomon Islands. The subjects of obese group were the all patients with a BMI over 30 kg/m (WHO, 2015) who came to the NCD clinic during July 2016. The control group was recruited by an opportunistic sampling of patients from the general clinic. All the subjects in the control group were either normal or overweight with a BMI less than 29.9.

The general clinic is an outpatient facility, which provides diagnosis, treatment, injections and counseling services. The NCD clinic is also an outpatient facility, which provides services to check blood sugar level, height, weight, waist circumference, and counseling about dietary intake, physical activity, tobacco and alcohol control for NCD patients suffering from obesity, diabetes, hypertension, heart diseases, gout, and so on. This study was conducted from July 1st to July 31st, 2016. The following items were investigated for all subjects: anthropometric measurements, socio-economic status, behavioral status, nutrition status, dietary diversity, knowledge of NCDs, consciousness of health, and attitude and awareness of nutrition, as details described below. The present surveys were implemented by conducting one to one interviews in Pidgin language.

2.2. Anthropometric measurements

Weight, height, and waist circumference were measured. Height was measured using Seca 213 Portable Stadiometer (model 213, SECA, Germany) with a precision of 0.1 cm. Weight was measured using a portable scale (BC-705N, Tanita, Japan) with a precision of 0.1 kg. The participants were asked to wear minimal clothes, no shoes and no socks. Blood pressure was measured using portable blood pressure machine (HEM-1010, OMRON, Japan). Waist circumference was measured over light clothes using a tape measure. The nutrition status was defined using Body Mass Index (BMI = kg/m (WHO, 2015)). In this study, normal weight was defined as BMI less than 25, overweight as BMI 25–29.9, and obesity was BMI more than 30.

2.3. Socio-economic status

A one to one interview was conducted with a questionnaire to obtain data consisting of gender, occupation, marriage status, household income level, education level, years of living in the capital, current number of household members, home province,

religion, possession of electricity at home. Education level was categorized into 4 groups; no formal education, primary school, secondary school, and high school or higher.

2.4. Behavioral status

A one to one interview was conducted with a questionnaire which consisted of the items regarding smoking and alcohol drinking behavior, main information media source, property of a garden, fishing behavior, frequency of eating out, and frequency of exercise. The Rapid Assessment of Physical Activity (RAPA) was used to assess exercise frequency (Patrick et al., 2006).

2.5. Nutrition status and dietary diversity

Twenty four-hour dietary recall method was conducted to obtain detailed information about all food and beverages consumed on the previous one day. The participants recalled the ingredients and the amount of food they ate the day before.

For the amount of intake each meal, the participants looked at photos of rice and potatoes with photos with three portion sizes; Large (300 g), Medium (200 g), and Small (100 g), and chose the one closest to their intake. The amounts of other foods were self-reported. Each participant's total energy intake, three major nutrients (protein, fat, and carbohydrate) intake, and PFC balance (the share of energy sources by Protein, Fat, and Carbohydrate) were estimated by "NutriSurvey 2007" software (Erhardt, 2005).

Then FAO's Individual Dietary Diversity Score (IDDS) (Swindale and Bilinsky, 2006) was calculated to investigate food adequacy and dietary quality using the checklist consisting of 14 food groups (Cereals; Vitamin A rich vegetables; White tubers and roots; Dark green leafy vegetables; Other vegetables; Vitamin A rich fruits; Other fruit; Organ meat; Flesh meats; Eggs; Fish; Legumes, nuts, and seeds; Milk and milk products; Oils and fats) with the result of 24-h dietary recall.

Dietary diversity was also investigated using the 11- item Food Diversity Score Kyoto (FDSK-11) questionnaire (Kimura et al., 2012). The FDSK questionnaire consists of 11 food items (Grains; Potatoes; Vegetables; Meat; Fish; Dairy products; Eggs; Beans; Seaweed; Fruits; Nuts) and asks the frequency of consumption of these foods in an average week over the previous 6 months. The questionnaire was created based on standard tables of food composition in Japan. After the data collection, for each group, participants who consumed the group more than once a week, a score of 1 was given, and a score of 0 was given for participants who consumed the group less than once a week. The highest FDSK score is 11, and a higher FDSK score indicates higher dietary diversity.

Learning experience about nutrition and learning location were also asked using the questionnaire.

2.6. Knowledge of NCDs, consciousness of health, and attitude and awareness of nutrition

To assess basic knowledge about NCDs, the questionnaire asking if they knew about the 8 factors of NCDs (Yes/No) based on Action Plan, WHO (2013).

To obtain information on consciousness of health, the questions about weight control, whether becoming fat was attractive or not, their preference for local food and processed food, and whether they thought vegetables and animal protein food were expensive or not were asked. The answers for those questions were one of the following candidates: agree, disagree, or neither.

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