

## RESEARCH ARTICLE

# Diet quality and weight status of adult women at Tuba Island, Langkawi, Malaysia

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## Abstract:

The prevalence of overweight and obesity in rural regions is high due to low income and limited access to nutritious foods. It is contributed by the geographical factor, which limits access to the availability of nutritious foods. Thus, this study aimed to determine the prevalence of weight status, diet quality, and its association among adult women in Tuba Island. This cross-sectional study was administered thru a structured questionnaire consisting of sociodemographic characteristics, 24-hour diet recall, and the Malaysian Healthy Eating Index (HEI). Weight and height were measured. HEI was used to identify the level of diet quality in the population. A total of 114 respondents aged between 18 to 45 years old were involved. 43% (n=49) and 26.3% (n=30) of them were overweight and obese respectively. While 28.1% (n=32) had normal weight status. The mean score of HEI was  $42.44 \pm 7.49$ , indicating poor diet quality. Further investigation showed they had poor compliance to meet dietary guidelines for vegetables, fruits, legumes, and milk and milk products. Nonetheless, diet quality was not associated with weight status in this population. The present study showed that more than half of the adult women at Tuba Island were overweight and obese, and their diet quality was poor.

**Keywords:** Diet quality, weight status, adult women, rural, healthy eating index (HEI)

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## 1. INTRODUCTION

The burden of worldwide malnutrition remains a serious issue and crisis in all ages, especially among low-middle-income countries. Recently, a recognized paradox has been identified that relates poverty, food insecurity, and malnutrition to obesity or the state of overnutrition (Tanumihardjo et al., 2007). About 1.9 billion adults and one in three people worldwide are obese or overweight (World Health Organization, Global Nutrition Report), and women are the primary of it. Recent surveys indicate that the ratio of overweight or obese women among low- and middle-income countries is rising alarmingly due to ongoing demographic changes (Al Kibria et al., 2019). The higher prevalence of overweight and obesity in rural regions is due to low income and limited access to nutritious foods. Nevertheless, in many poor and rural areas, these geographical localities with limited access to the availability of healthy foods are the main problem (Canto et al., 2014). In several poor-rural areas in Malaysia, the prevalence of overweight and obesity among women was 35% and 17% in Bachok (Ihab et al., 2013), 39.6% and 11.9% in Sarawak (Chang et al., 2012),

and 52.1% overweight in Sabak Bernam (Khor & Sharif, 2003).

This paradoxical circumstance occurred when the diets of people who live in poverty had enough calories to meet or exceed their energy needs but lacked the essential quality of diet that required them to have good health status and prevent chronic disease (Tanumihardjo et al., 2007). A diet high in saturated fat, added sugars, and sodium but low in fruits, vegetables, legumes, and whole grains contribute to chronic diseases (Reedy et al., 2014). Data analysis by GBD 2017 Diet Collaborators (2019) for the Global Burden of Diseases in 2017 showed that about 22% of deaths and 15% of all disability-adjusted life-years (DALYs) were caused by poor-diet quality. Diet quality is the measurement of both the quality and diversity of the whole diet, allowing the link between whole foods and health status to be explored instead of just nutrients (Preedy et al., 2013).

Tuba Island is considered a rural area where it is a traditional fishing village, and the villagers live in long-established ways. Most previous studies found that low socio-economic status and food insecurity contribute to unhealthy dietary

intake and a high prevalence of overnutrition in rural communities. In the National Plan of Action for Nutrition of Malaysia (NPANM III) 2016-2025, two additional supporting strategies were implemented which are to minimize obesity and diet-related NCDs, as well as to improve food systems for a good diet (National Coordinating Committee on Food and Nutrition, 2016). However, the extent to which women's weight status can be affected by diet quality and sociodemographic factors is still uncertain, and limited data were available from a study found in Malaysia. Thus, this study aims to assess the prevalence of weight status and diet quality among women in Tuba Island and to identify the association between sociodemographic factors and diet quality with weight status among them.

## 2. MATERIALS AND METHODS

### 2.1 Study Design and Participants

A cross-sectional study was carried out at Tuba Island, located 5km southwest of Kuah Jetty, Langkawi. There are three main villages: Kampung Tuba, Selat Bagan Nyior, and Teluk Cempedak. Convenience sampling was employed for potential respondents available to participate in this study in August 2020. Cochran's formula was used to calculate the minimum sample size. The calculation was based on the estimated prevalence of diet quality of 45.3% from a previous study in Mah Meri (Chong et al., 2019), a 95% confidence level, and 0.1 desired precision. The sample size derived was 95, but to accommodate a lower response rate of more than 35%, the sample size was increased to 129. The participants were selected by inclusion (women aged 18-45 years old, not pregnant, and not breastfeeding) and exclusion (vegetarian, developed any diseases, and changed dietary intake in the past six months). A total of 114 women were eligible to participate in this study, and data collection was conducted through a face-to-face interview which required approximately 30 minutes to complete. This study obtained ethical clearance from the Research Ethics Committee (REC) Universiti Teknologi MARA with reference number REC 05/2021 (UG/MR/421).

### 2.2 Research Instruments.

A structured questionnaire consisting of three sections which were demographic characteristics, anthropometry measurement, and dietary intake assessment, was used in this study. Demographic characteristics comprised four items: age, marital status, education level, and employment status. The anthropometry measurement was assessed to determine the weight and height of the respondent. The weight and height were translated to body mass index (BMI) based on WHO guidelines. Dietary intake assessment was evaluated via 24-hour diet recall (one day each from weekday and weekend) by using household measurements (teaspoons, tablespoons, rice ladles, cups, and bowls) and Atlas of Food Exchanges and Portion Sizes (Shahar et al., 2015) was used to achieve a more precise estimation of serving sizes. The

Nutritionist Pro Software Version 4.0 (Axxya Systems, Stafford, Texas, USA) was used to analyze the dietary intake that was transformed into energy and nutrient intake.

The Malaysian Healthy Eating Index (HEI), established by Lee et al. (2011) and validated by Goh et al. (2012), was used to evaluate respondents' diet quality. The Malaysian HEI contained nine components, divided into seven food groups (Grains and cereals, vegetables, fruits, meat, poultry and egg, fish and seafood, legumes, milk, and dairy products) and two nutrients (percentage of energy from total dietary fat and sodium). The scoring for all components measured originated from recommended serving size and nutrient intake in the Malaysian Dietary Guidelines (MDG) (National Coordinating Committee on Food and Nutrition, 2010). The score from each food group in HEI components was computed by using the formula:

$$\frac{\text{total score accumulated from nine components}}{\text{maximum score of 90}} \times 100\%$$

The score ranges from zero to ten for each component and then was summed up to determine the total HEI score.

While the formula for composite score:

$$\frac{\text{actual serving consumed based on respondent's diet recall}}{\text{recommended serving size based on MDG}} \times 10$$

A composite score of less than 51% indicated a poor diet, a score between 51-80% stated a diet requiring improvement, and a score of more than 80% showed a good diet (Chong et al., 2019; Pei et al., 2018).

### 2.3 Statistical analysis

The data were analyzed using Statistical Package of Social Science (SPSS) version 23. Descriptive statistics were conducted for all variable demographic characteristics, weight status, and diet quality of the respondents, which were presented in mean, standard deviation, frequency, or percentage. Fisher's exact test was used to identify the association between sociodemographic factors and diet quality on weight status. The significant level of the statistics was set at P<0.05.

## 3. RESULTS

### 3.1 Sociodemographic characteristics, diet quality, and weight status

A total of 114 women participated in this study. Table 1 shows the respondent demographic characteristics, food

security status, anthropometry measurement, and diet quality status. Most were between 36-45 years old (45.6%) and were married (71.7%). Approximately half of the respondents completed secondary education (55.3%). About 66.7% were homemakers, while 21.9% and 11.4% were self-employed and worked in either the government or private sector. In terms of diet quality status, 86% of the respondents had a poor diet, while another 14% fell under a diet requiring improvement classification. None of the respondents achieved a good diet category under the Malaysian HEI classification. A high prevalence of overweight with 43.0% was seen among the respondents, followed by normal, obese, and underweight, with 28.1%, 26.3%, and 2.6%, respectively.

Table 1: Sociodemographic characteristics, diet quality status, and anthropometry measurement of respondents (n=114)

Variables	n	%	Mean ± SD
<b>Sociodemographic characteristics</b>			
<b>Age, years</b>			
18-26	33	28.9	
27-35	29	25.4	
36-45	52	45.6	
<b>Marital Status</b>			
Single	27	23.7	
Married	81	71.1	
Widowed/divorced	6	5.3	
<b>Education Level</b>			
No formal education	3	2.6	
Primary education	37	32.5	
Secondary education	63	55.3	
Tertiary education	11	9.6	
<b>Employment Status</b>			
Government/private sector	13	11.4	
Self-employed	25	21.9	
Housewife	76	66.7	
<b>Diet quality status</b>			
<sup>a</sup> HEI classification			
< 51% (poor diet)	98	86.0	
51-80% (diet requiring improvement)	16	14.0	
> 80% (good diet)	0	0.0	
<b>Anthropometry measurement</b>			
Weight, kg			67.89 ± 14.89
Height, cm			157.39 ± 5.54
Body mass index, kg/m <sup>2</sup>			27.36 ± 5.55
< 18.5 (underweight)	3	2.6	
18.5-24.9 (normal)	32	28.1	
25-29.9 (overweight)	49	43.0	
> 30 (obese)	30	26.3	

<sup>a</sup>Healthy Eating Index

### 3.2 Malaysian Healthy Eating Index (HEI)

Table 2 presents the mean serving size consumed in a day and the mean score for each component of Malaysian HEI of the respondents in this study. The total mean score of Malaysian HEI was 42.44 ± 7.49 indicating poor diet among women on Tuba Island. The majority of them were not able to meet the recommended serving size of vegetables (0.76 ± 1.09), fruits (0.15 ± 0.49), legumes (0.14 ± 0.07), and milk

and milk products (0.0575 ± 0.21). Only cereals and grains (6.75 ± 3.14) and poultry, meat, and egg (0.83 ± 0.69) fulfilled the recommended serving size for one day. The mean percentage of energy from total dietary fat (33.10 ± 4.95) and sodium intake (2383.46 ± 886.25) exceeded the recommendation. We found out that fish and seafood intake (1.43 ± 0.89) were more than the dietary guidelines due to sustainable foods among island people.

Table 2: Serving size per day, the score for each component, and total HEI (n=114)

HEI component	<sup>a</sup> Recommended serving size/day	Serving size/day (Mean ± SD)	Possible Range of Score	HEI Score (Mean ± SD)
<b>Food groups</b>				
Cereals and grains	4 – 8	6.75 ± 3.14	0 to 10	8.20 ± 2.79
Vegetables	3	0.76 ± 1.09	0 to 10	2.13 ± 2.57
Fruits	2	0.15 ± 0.49	0 to 10	0.68 ± 2.09
Poultry, meat and egg	0.5 – 2	0.83 ± 0.69	0 to 10	6.59 ± 3.84
Fish and seafood	1	1.43 ± 0.89	0 to 10	8.66 ± 2.86
Legumes	0.5 – 1	0.143 ± 0.07	0 to 10	0.19 ± 1.07
Milk and dairy products	1 – 3	0.0575 ± 0.21	0 to 10	0.28 ± 1.25
<b>Nutrients</b>				
Percentage of energy from dietary fat, %	≤30	33.10 ± 4.96	0 to 100	4.07 ± 4.07
Sodium, mg	≤2000	2383.46 ± 886.25	0 to 100	7.33 ± 2.89
<b>Total <sup>b</sup>HEI, %</b>			0 to 100	42.44 ± 7.49

<sup>a</sup>Based on Malaysian Dietary Guidelines (National Coordinating Committee on Food and Nutrition, 2010)

<sup>b</sup>Healthy Eating Index

### 3.3 Association between sociodemographic characteristics and diet quality status with weight status

Table 3 depicts the association between education level, employment status, and diet quality with weight status. Education level (p=0.010) and employment status (p=0.002) were significantly associated with weight status. However, a non-significant association was found between diet quality and weight status among adult women on Tuba Island (p=0.390).

Table 3: Association between sociodemographic characteristics and diet quality with weight status (n=114)

Variables	<18.5 kg/m <sup>2</sup> (Underweight), n=3		18.5-24.9 kg/m <sup>2</sup> (Normal), n=32		25-29.9 kg/m <sup>2</sup> (Overweight), n=49		>30 kg/m <sup>2</sup> (Obese), n=30		p-value
	n	%	n	%	n	%	n	%	
<b>Education level</b>									
No formal education	0	0.0	1	33.3	2	66.7	0	0.0	*0.010*
Primary education	0	0.0	5	13.5	19	51.4	13	35.1	
Secondary education	1	1.6	25	39.7	24	38.1	13	20.6	
Tertiary education	2	18.2	1	9.1	4	36.4	4	36.4	

<b>Employment status</b>									
Government/private sector	1	7.7	4	30.8	8	61.5	0	0.0	*0.002*
Self-employed	0	0.0	12	48.0	4	16.0	9	36.0	
Housewife	2	2.6	16	21.1	37	48.7	21	27.6	
<b>Diet quality status</b>									
Poor diet	2	66.7	26	81.3	45	91.8	25	83.3	
Diet need improvement	1	33.3	6	18.8	4	8.2	5	16.7	*0.390

\*Fisher's Exact Test

\*Significant value (p<0.05)

#### 4. DISCUSSION

Findings in this study showed that women on Tuba Island had a high prevalence of weight status (overweight and obese). Surprisingly, it was consistent with data from World Health Organization (WHO) which is 40% overweight and 15% obese, respectively (World Health Organization). Along with economic development and income growth among developing countries, the number of overweight and obese people is rising. This relationship occurs when processed foods' availability and low cost comprise 'empty calories and no nutritional value. A similar study by Befort et al. in 2012 indicated that in developing countries, rural women were affected by higher rates of weight gain and obesity. This finding is related to woman's lifestyle availability of fast and processed food, sedentary or less physically active lifestyle, and consumption of an energy-rich but nutrient-poor diet, which result in a high number of obesities among them.

Overall, women on Tuba Island had a poor diet with a higher Malaysian HEI mean score, and it was similarly reported in the previous study conducted among Mah Meri ethnic women (Chong et al., 2019). Poor diet in this study was contributed by low scores on the consumption of vegetables, fruits, legumes, and milk. These results were consistent with studies conducted by Badari et al. (2013) and Chong et al. (2019), particularly those unable to comply with recommended dietary intake. Respondents reported low consumption of these food groups due to lack of availability and high food prices on this island. A possible reason, as the area is geographically isolated from others, is that a boat is needed to obtain an adequate food supply for the island community. In contrast, HEI scores in other Malaysian urban areas fell into the 'need improvement' category (Karupaiah et al., 2012; Pondor et al., 2017) that, were attributed to high income and stable financial status that will affect food choices available in these areas. Concerning low economic status, high food costs seemed to have a particular effect on the affordability of households to spend a large proportion of their income on food (Brinkman et al., 2009; Gustafson, 2013).

Despite poor diet quality, the respondents had a substantially higher consumption of fish and seafood, probably due to easy access to adequate protein sources as they lived on the

island and most of their family members worked as fishermen. The findings were in line with previous studies where most islanders had a high proportion of consuming fish or/and seafood due to engaging in traditional fishing activity (Farmery et al., 2020; Haynes et al., 2020; Horsey et al., 2019). The average consumption of poultry, meat, and eggs is associated with an agricultural activity that emphasizes the availability of these products. As for nutrient components, excessive amounts of fat and sodium from recommendations were due to high consumption of cooking or purchasing more fried foods, coconut milk, and soy sauce dishes. From the dietary assessment, most of them were frequently consumed like nasi lemak, fried chicken/fish, chicken/fish curry, chicken/fish cooked in soy sauce/sambal, fried noodles, fried rice, traditional rice *kuih*, and salted fish. Thus, it is unsurprising that the lowest-cost diets significantly cause the least healthy (Darmon & Drewnowski, 2008).

The present study found a significant association between education and employment status with weight status. A total of 86.5% of respondents who completed primary education were overweight and obese. Education is related to increasing knowledge related to nutrition; therefore, those who have a higher education have better exposure to nutrition knowledge which will result in engaging in healthy dietary habits. Chong et al. (2019) mentioned that women with lower education usually had poor nutrition knowledge and low awareness and comprehension of nutrition information. In contrast, 76.3% of unemployed women in Tuba Island contribute to numbers overweight/obesity. Employment showed varying impacts on obesity by age and gender and unemployment among women and is associated with increased BMI (Noh et al., 2016). It could be explained by low physical activity and unhealthy dietary intake.

Overall, women who are overweight/obese were associated with diet quality (Wolongevicz et al., 2009). However, this study identified no association between diet quality and weight status. A systematic review by Asghari et al. (2017) found that 24-hour diet recall cannot obtain estimated dietary patterns and usual intake. It is consistent with our study that used 24-hour diet recall to assess respondents' dietary intake. Besides, the number of respondents engaged in this study was low compared to other reviewed studies.

The findings from this study can represent the primary data on diet quality and weight status for women on Tuba Island. However, due to the small sample size, it cannot conclude a causal inference. A multicentre approach may be applied in future research to represent Malaysian rural and island populations from other areas. The longitudinal research design may be adopted, and qualitative analysis could further explore diet quality and weight status by using in-depth interviews utilizing open-ended questions that could allow for a deeper exploration of these measures.

## 5. CONCLUSION

The finding highlights poor diet quality and a high prevalence of overweight and obesity among adult women at Tuba Island, Langkawi. Two sociodemographic variables, education and employment, were associated with weight status, but no association was found between diet quality and weight status. This research emphasized diet quality and weight status from women's viewpoint in the Malaysian rural area. These findings could help health-related agencies, government ministries, and other stakeholders develop educational, promotion, prevention, and treatment programs to improve diet quality and reduce overweight and obesity incidence among women in Malaysia, especially in rural areas. However, more research needs to be conducted to identify other causes of poor diet quality and the high prevalence of overweight and obesity. Improved diet quality and weight status will enhance health and improve quality of life.

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