BJMS
Borneo Journal of Medical Sciences

ORIGINAL ARTICLE

Overweight and Obesity Among Rural Community in Northern Borneo: Prevalence, Body Weight Perception and Its Associated Factors

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Received: 6 April 2021

Accepted: 15 November 2021

Published: 31 May 2022

DOI: https://doi.org/10.51200/bjms.v16i2.2953

Keywords: *body mass index, overweight, obesity, weight perception, rural population*

ABSTRACT

The World Health Organization (WHO) reported that Malaysia has the highest rate of obesity and overweight among Asian countries. There is an increasing trend in obesity from 11.9% (2015) to 14.8% (2019), according to the National Health and Morbidity Survey (NHMS). This study aimed to investigate the prevalence, bodyweight perception, and associated factors of overweight and obesity among rural communities in Northern Borneo. This cross-sectional study was conducted in one village in Northern Borneo. Adults from 18 to 69 years of age (n = 165) were included in the survey, and data were collected by interview or self-administered questionnaires. Measurements of weight and height were done for body-mass-index (BMI) calculation. The prevalence of overweight and obesity in the village was 71.5%. Kappa statistic indicated only a slight agreement between perceived and actual body weight status (k = 0.163, 95% CI = –0.156 to 0.482, p < 0.000). There were higher odds of being overweight and obese among the middle-aged group (35 – 55 years old) than the younger group (<35 years old) (OR = 3.575; 95% CI: 1.667, 7.667; p < 0.05) and among the married adults than the unmarried adults (OR = 2.196; 95% CI: 1.057, 4.565; p < 0.05). Although age and marital status are non-modifiable factors of overweight and obesity, this research indicated poor consistency between perceived and actual body weight with kappa statistics. The large magnitude of body weight misperception might contribute to overweight and obesity in the rural community.

INTRODUCTION

Overweight and obesity are excessive or abnormal fat accumulation that incurs health risks. WHO considered them a global burden as about 1.9 billion adults were overweight and 650 million were obese in 2016 (World Health Organization, 2020). The epidemic of overweight and obesity has led to a major challenge to chronic disease prevention and health worldwide (Gupta, 2014). NHMS 2019 showed that 50.1% of adults were overweight or obese in Malaysia. Besides, NHMS 2015 also showed an increasing trend of overweight or obesity from 44.5% in 2011 to 47.7% in 2015. In a health screening programme in the Inanam sub-district, Kota Kinabalu, Sabah, the prevalence of obesity based on BMI was 28% (Zarkasi et al., 2020). Another cross-sectional study in the rural community of Kudat also showed that 28.2% of respondents were found to be obese (Wong et al., 2017).

Obesity is strongly associated with chronic non-communicable diseases (NCDs), including diabetes and hypertension, leading to more severe complications. Nowadays, it is no longer being labelled as an urban-specific health issue about the high prevalence of overweight and obesity in rural areas compared to urban areas in a particular country (Shen et al., 2019).

Self-perceived body weight is an essential facilitator for people to maintain or lose weight (Park et al., 2016). It was suggested that body weight perception initiates one to attempt weight control. The attempt is less likely to be taken in overweight or obese people without accurate body perceptions (Rahman & Berenson, 2010). Thus, body weight perception was studied in this research to investigate the agreement between perceived and actual body weight status.

In this study, the associated factors of overweight and obesity were categorised into sociodemographic characteristics (age, gender, marital status, education level, and household income) and lifestyle factors (dietary habits and physical activity). This study aimed to investigate the prevalence, bodyweight perception, and associated factors of overweight and obesity among rural communities in Northern Borneo to target the ways to combat obesity and overweight effectively.

MATERIALS AND METHODS

Study Site Description

Kudat, a district located in the northern part of Borneo, Sabah, Malaysia, is about 190 kilometres from the state capital, Kota Kinabalu, with a total population of 101,683 (Department of Statistics Malaysia [DOSM], 2020). Rungus, a sub-ethnic group of the Kadazan-Dusun, makes up the majority of the people of Kudat.

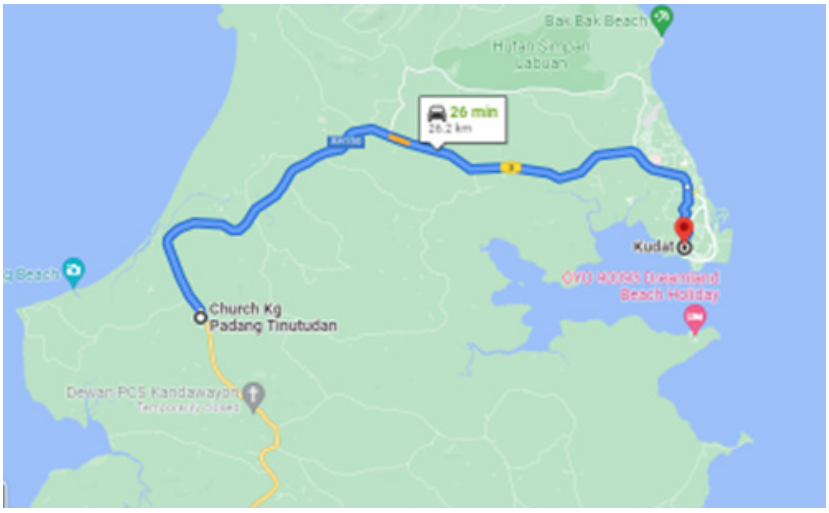

Figure 1 Kampung Tinutudan is 26.2 km away from Kudat, accessible via Jalan Kota Belud (Google, n.d.)

Data Collection

The study was conducted in Northern Borneo from November 2019 to December 2019. The inclusion criteria were male and female adults aged 18 to 69 years old for the International Physical Activity Questionnaire (IPAQ). Out of 297 people, 165 participants (56%) participated in our study by the universal sampling method. Pregnant ladies and those who were physically injured were excluded from our research. Data were collected through interviewing or self-administering questionnaires.

Research Tools

The questionnaire consisted of four components: (a) sociodemographic information, namely age, gender, date of birth, marital status, educational level, and household income; (b) body weight perception; (c) healthy eating assessment; and (d) IPAQ short form. Weight and height were measured with Seca weighing scale and measuring tape, respectively, for BMI calculation. BMI is defined as the ratio of a person's weight (kg) to the square of height (m^2). Based on the Malaysian Clinical Practice Guideline (CPG) Management of Obesity, a BMI greater than or equal to 23.0 kg/m^2 until 27.4 kg/m^2 is considered overweight, while a BMI over or equal to 27.5 kg/m^2 is considered obese.

Bodyweight perception is defined as how the participants describe their body images. It was classified into: (i) very underweight; (ii) underweight; (iii) normal; (iv) overweight; and (v) obese. Actual body weight status was categorised into underweight, normal, overweight, and obese. In contrast, body weight perception was then re-categorized into underweight (combination of very underweight and underweight), normal, overweight, and obese data analysis.

In Malaysia, marriage procedures consist of Islamic procedures for Muslim couples (Islamic Law) and civil systems for non-Muslims registered under the Marriage and Divorce Act 1976, Act 164 (National Registration Department of Malaysia, 2019). In this study, marital status was divided into two categories: (i) Married; and (ii) Unmarried (single, widow/ widower/ divorcee). Education status is the official confirmation in the form of a document certifying the successful completion of an educational programme or a stage of the programme (UNESCO Institute for Statistics, 2012). Education level was divided into four categories: (i) primary; (ii) secondary; (iii) tertiary; and (iv) others (no formal education). Household income is the monetary receipts, goods, and services received by the household members, excluding irregular, one-time receipts and windfall gains (Conference of European Statisticians, 2011). It was classified into: (i) less than RM800; (ii) RM801 – 2,000; (iii) more than RM2,000.

Dietary habit is defined as regarding individuals' or groups' food intake (Preedy & Watson, 2010). It was classified based on the Healthy Eating Assessment Score derived from the Northwest Territories government: (i) needs improvement: 10 – 19; (ii) fair: 20 – 29; (iii) good: 30 – 39; and (iv) excellent: 40 – 50. The scoring system was based on the questionnaire of Healthy Eating Assessment Score (Government of Northwest Territories, 2017)

Physical activity level was calculated with International Physical Activity Questionnaire (IPAQ) short form scoring protocol, namely: (i) high – a high-intensity activity for at least three days which achieves a minimum of 3,000 metabolic equivalents of task (MET) min/ week or around one hour of activity per day or more with at least a moderate intensity; (ii) moderate – five or more days of moderate-intensity activity or achieves 600 – 2,999 MET min/week; and (iii) low: MET of less than 600 min/week (IPAQ, 2008).

The interviewer assisted illiterate participants in further clarification of the in-depth questions: Healthy Eating Assessment and IPAQ short form. Weight was measured where the weighing scale was placed on a flat

surface and was calibrated before asking the participants to stand on it. The participants were also made sure not to carry extra belongings such as a wallet or handphone. Height was measured where the participants had to stand straight, leaning to a straight wall and facing forward. Three readings were taken, and their average was used for BMI calculation.

Statistical Data Analysis

IBM SPSS Statistics for Windows, Version 26.0 was used for data analysis. A p-value ≤ 0.05 was defined as statistically significant. The chi-square test of the association tested the presence of an association between the variables. If there was a significant association between the variables, the odds ratio and 95% confidence interval (CI) were estimated by multiple logistic regression analysis. Sociodemographic factors (age, gender, marital status, education level and household income) and lifestyle factors (dietary habit and physical activity) were the independent predictor variables, whereas BMI (overweight and obesity) were the dependent variable.

Ethical Clearance

This study was approved by the Ethics and Research Committee, Universiti Malaysia Sabah (UMS) (JKEtika 3/21(25)). The study protocol was explained to all participants before giving verbal and written informed consent. The participants had the right to withdraw from the study without penalty, and their data remained anonymous.

RESULTS

Sociodemographic Characteristics, Dietary Habit and Physical Activity of Adults Aged 18 – 69 Years

Out of 297 people, a total of 165 participants (56%), aged from 18 to 69 years, participated in the study, where most participants belonged to the age group of 35 to 55 years old (49%) (Figure 2). There were more female (54%) participants than male participants (46%) (Figure 3). More than two-thirds of the participants were married (73.3%). For educational status, most of the participants' highest education level was secondary education level (49.1%). Around one-third of the participants had a household income of RM800 – RM2,000 (38.2%) (Table 1).

Most of the participants fell in the good category of the Healthy Eating Assessment (89%) from this study. The data collected also showed that most participants engaged in a high physical activity (46.1%) (Table 2).

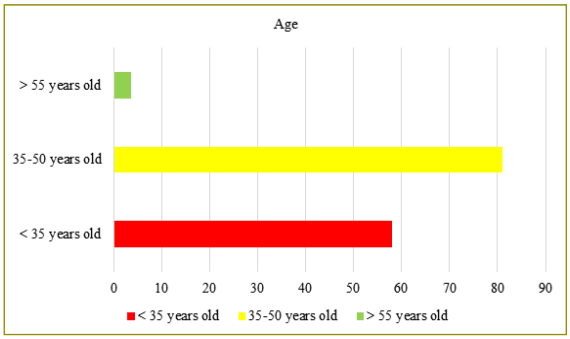

Figure 2 Age distribution of the participants

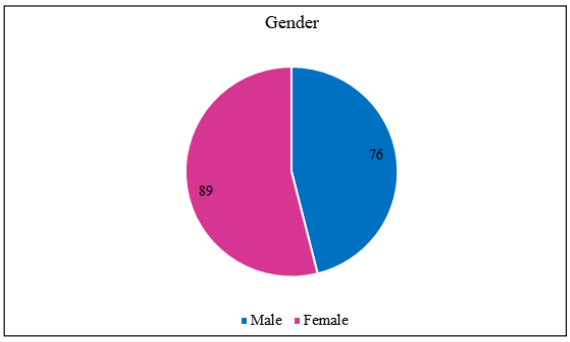

Figure 3 Gender of the participants

Table 1 Other demographic characteristics of the participants (n = 165)

Marital status		
Married	121	73.3
Unmarried	44	26.7
Educational level		
Less than primary school	22	13.3
Primary school	21	12.7
Secondary school	81	49.1
Tertiary	41	24.8
Household income		
< RM800	55	33.3
RM800 – RM2,000	63	38.2
> RM2,000	47	28.5

Table 2 Healthy eating assessment and international physical activity among the participants (n = 165)

Healthy eating assessment		
Needs improvement	0	0
Fair	9	5.5
Good	147	89
Excellent	9	5.5
International Physical Activity Questionnaire		
Low (< 600 MET min/week)	23	13.9
Moderate (600 – 2,999 MET min/week)	66	40
High (≥ 3,000 MET min/week)	76	46.1

Body Weight Perception

Table 3 shows an inconsistency between perceived and actual body weight status in rural communities. Kappa test was done to determine the degree of agreement between perceived and actual body weight status (Kappa statistic (k) = 0.163; 95% CI: –0.156 to 0.482; p < .0005). The strength of the agreement between perceived and actual body weight status was significantly slight.

Table 3 also shows that among those who were overweight or obese (n = 118), 41% of them misperceived themselves as normal or underweight.

Table 3 Bodyweight perception of adults aged 18 – 69 years (n = 165)

		Actual body weight status				Total
		Underweight	Normal	Overweight	Obese	
Perceived body weight status	Underweight	4	9	2	1	16
	Normal	3	24	36	9	75
	Overweight	0	4	24	33	61
	Obese	0	0	2	11	13
	Total	7	40	64	54	165

Association of Sociodemographic Factors, Dietary Habit and Physical Activity with Overweight and Obesity

Table 4 shows the odds ratio and 95% CI of sociodemographic factors associated with overweight and obesity. There were higher odds of being overweight and obese among the middle-aged group (35 – 55 years) compared to the younger group (< 35 years) (OR = 3.575; 95% CI: 1.667, 7.667; p < 0.05). There were also higher odds of being overweight and obese among the married group than the unmarried group (OR = 2.196; 95% CI: 1.057, 4.565; p <0.05). However, among gender, education level, and household income, the differences in the odds ratio of being overweight and obese were non-significant (p > 0.05).

There was no significant association of lifestyle factors, namely dietary habits and physical activity, with overweight and obesity (p > 0.05).

Table 4 Association of sociodemographic factors, dietary habits, and physical activity with overweight and obesity (n = 165)

		Overweight and Obesity		X^2	p-value (< .05)	OR [95% CI]
	Total (n = 165)	Yes n (%)	No n (%)			
Age group				11.927	**0.003***	
<35	58	32 (55.2%)	26 (44.8%)			1.00
35 – 55	81	66 (81.5%)	15 (18.5%)			3.575 [1.667, 7.667]
>55	26	20 (76.9%)	6 (23.1%)			2.708 [0.949, 7.731]
Gender				0.015	0.903	
Male	76	54 (71.1%)	22 (28.9%)			1.00
Female	89	64 (54.2%)	25 (28.1%)			1.043 [0.530, 2.054]
Marital status				4.547	**0.033***	
Unmarried	44	26 (59.1%)	18 (40.9%)			1.00
Married	121	92 (76%)	29 (24%)			2.196 [1.057, 4.565]
Educational level				3.267	0.352	
Primary	21	12 (57.1%)	9 (42.9%)			1.00
Secondary	81	62 (76.5%)	19 (23.5%)			0.622 [0.179, 2.163]
Tertiary	41	29 (70.7%)	12 (29.3%)			0.523 [0.542, 4.282]
Others	22	15 (68.2%)	7 (31.8%)			1.128 [0.367, 3.461]
Household income				1.936	0.380	
<800	55	39 (70.9%)	16 (29.1%)			1.00
801 – 2,000	63	42 (66.7%)	21 (33.3%)			0.659 [0.265, 1.635]
>2,000	47	37 (78.7%)	10 (21.3%)			0.541 [0.226, 1.294]
Healthy eating assessment				0.233	0.890	
Needs Improvement	0	0 (0%)	0 (0%)			
Fair	9	6 (66.7%)	3 (33.3%)			1.00
Good	147	106 (72.1%)	41 (27.9%)			1.293 [0.309, 5.413]
Excellent	9	6 (66.7%)	3 (33.3%)			1.00 [0.141, 7.099]
Physical activity				1.668	0.434	
Low	23	15 (62.5%)	8 (34.8%)			1.00
Moderate	66	45 (68.2%)	21 (31.8%)			1.143 [0.419, 3.114]
High	76	58 (76.3%)	18 (23.7%)			1.719 [0.627, 4.709]

DISCUSSION

The study indicated a high prevalence of overweight and obesity among the rural communities in Northern Borneo at 71.5%. The high prevalence of overweight and obesity in rural communities in Sabah was also indicated in a study in the Kiulu district of Sabah, where 42.9% of 42 participants were obese (Zarkasi et al., 2018). Moreover, according to a survey, approximately every one in two people in Malaysia was obese (Chan et al., 2017). This result was reflected more severely in our study finding in which more than half of our participants were overweight and obese.

Our study showed a significant inconsistency between perceived and actual body weight status in which 41% of overweight or obese adults misperceived themselves as normal or underweight. Kappa statistic showed that k = 0.163, indicating that the agreement strength was only slight. Underestimation of own body weight status found in this study correlates with another research done among Nigerian rural communities, which stated that 30% of participants underestimated their body weight (Akinpelu et al., 2015). Another study among children and adolescents in China also showed a mismatch between BMI and body weight perception. Kappa tests revealed poor BMI and body weight perception (Wang et al., 2018). Bodyweight misperception might be due to the high prevalence of overweight and obesity among rural communities. Some longitudinal studies supported this, which showed the increasing tendency of failure to identify adiposity with increasing population obesity prevalence. It is also stated that exposure to obesity leads to the normalization of larger body sizes, contributing to the failure among the population to recognise overweight and obesity according to a visual normalisation theory (Oldham & Robinson, 2016). On the contrary, based on three surveys of the Spanish adult population, it was reported that there was 26.9 to 28.4% over-perception of overweight or obesity, with the most significant percentage of misperceived overweight in the normal BMI (Gutiérrez-Fisac et al., 2002).

On the other hand, there was a significant association between age with overweight and obesity, especially among middle-aged adults (35 – 55 years old). The strong association is due to an increased amount of body fat in the body naturally with ageing, where men often gain weight until the age of 55 whereas females until the age of 65 (Starr & Bales, 2015).

Our study also exhibited a significant association between marital status with overweight and obesity. Married adults have a higher chance of being overweight and obese than unmarried (single, widow, widower or divorcee) adults. This outcome is supported by a study in 2009 that found that married respondents had a higher prevalence of generalized obesity (18.6%) than unmarried (6.9%) respondents (Sidik & Rampal, 2009). Another study also showed that marriage was associated with two-year weight gain, whereas divorce was associated with two-year weight loss (Jeffery & Rick, 2002). Among married women, the increase in BMI could be due to parity, as childbearing was suggested to contribute to the development of obesity.

In terms of gender, there was no association between gender with overweight and obesity. This contradicts a previous study stating that the gap between the prevalence of obesity between women and men had widened (Lim, 2016). Besides, our study found no association between educational level with overweight and obesity, which is inconsistent with the investigation in three countries of central and Eastern Europe, showing that the level of education was inversely associated with the prevalence of obesity (Pikhart et al., 2007).

Our study demonstrated no significant association between household income with overweight and obesity. Finding the association between household income

and BMI was difficult as other factors such as education level, household size, and socioeconomic status might influence this association (Ahmad et al., 2018).

Besides, our study showed no significant association between dietary habits with overweight and obesity due to recall bias. Response bias might also occur when the participants tended to answer the perceived correct answer.

Lastly, there was no significant association between physical activity with overweight and obesity. The physical activities performed by the participants included farming and doing house chores, which were done daily. A review concluded that the evidence of physical activity as a measure to control weight was inconclusive (Cook & Schoeller, 2011). On the other hand, a previous study is consistent with our study where the finding showed that there was no significant association observed between self-reported total physical activity and BMI as they were unable to determine if physical activity could directly affect BMI because it was a cross-sectional study with a limited duration (Lee et al., 2019). Moreover, there might be the presence of certain biases such as recall bias or social desirability bias while answering the IPAQ short form.

This study defined overweight and obesity based on BMI. However, higher BMI among rural communities does not always equal obesity. The participants might have large muscle mass due to their everyday engagement with increased physical activities such as farming, gardening, and other labour-intensive activities (Cheah & Poh, 2014). Therefore, proper waist circumference measurement is suggested in further studies to assess central obesity among rural communities. Still, the study's high percentage of body weight misperception may indicate the need to correct their perception as the first step to initiating weight control behaviour.

Our study showed that marital status was significantly associated with obesity or overweight. This can be due to married couples tending to have the same dietary habits and thus result in similar weight status. Our study shows that middle-aged adults were more likely to be overweight and obese. This is similar to the results shown in NHMS 2015, in which adults aged from 40 to 60 years old were reported to have the highest prevalence of overweight or obesity. This may be due to increased fat with increasing age.

CONCLUSION

The alarmingly high prevalence of overweight and obesity among rural communities in Sabah needs an urgent call for action. Prompt and effective intervention must be implemented to initiate adequate, profound, and sustainable weight control. Empowering the rural communities to recognise their actual body weight may be the first and foremost step in starting severe weight control behaviour and tackling the health issues of overweight and obesity among rural communities.

CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this article.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the Faculty of Medicine and Health Sciences (FMHS), Universiti Malaysia Sabah (UMS) for supporting this research.

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