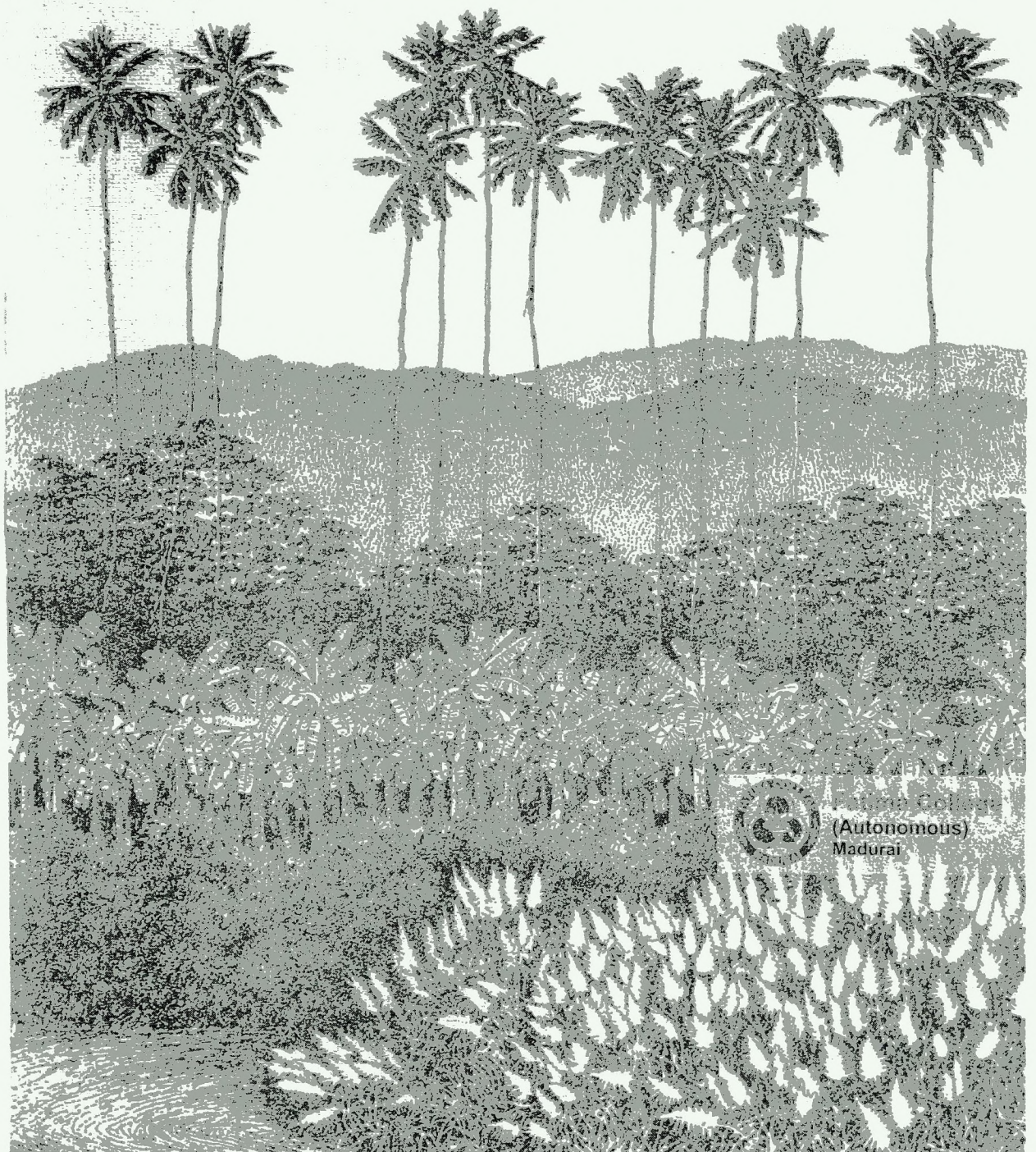


Solutions to Ecological Challenges: Multidimensional Perspectives



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Arto Cordelia Vijanth

Solutions to Ecological Challenges: Multidimensional Perspectives

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Ecology of Household Food Insecurity and its Association with Obesity among Aborigines in Perak Region of Peninsular Malaysia

T.A. Anto Cordelia, M. Sylvia Subapriya, Hnin Pwint Aung

Abstract

Background: Food insecurity rates and its associated burden of obesity have increased over the past two decades in Malaysia. This study examines the household food insecurity and its related nutritional outcomes among the aboriginal mothers of Peninsular Malaysia.

Study Settings: Tribal villages in Perak region of Peninsular Malaysia.

Materials and Methods: A cross sectional survey in the households of indigenous population was conducted from mothers of 218 households aged between 18 to 65 years who were non-lactating, non-pregnant and had at least one child aged between 2 to 12 years. A pre-tested and validated questionnaire which included socio-demographic characteristics, Radimer /Cornell food insecurity scale and anthropometric measurements were used to collect baseline information. Descriptive analysis was done to assess prevalence of food insecurity and correlation was established between food insecurity and associated ecological factors.

Results: Around 90% of the study population faces a kind of food insecurity with 69.72% facing child hunger. BMI corresponds to 22.94% and 56.42% of the maternal households to be overweight and obese. Abdominal obesity as measured by waist circumference showed a prevalence rate of 59.63%. Overweight and obesity ratios were higher among women of food insecure households which exhibited a positive association.

Conclusion: Adopting ecological approaches can help build resilient food systems in achieving food security among the indigenous community.

Keywords: Food insecurity, obesity, ecology, indigenous community, Malaysia.

Introduction

Food insecurity redefined in Food and Agriculture Organization (FAO) report “The State of Food Insecurity 2001” which states that “Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. Food insecurity exists when people do not have access to food as defined above. According to FAO’s most recent estimates (2011-2013) 842 million people globally representing 12 percent of the global population could not meet their dietary energy requirements. These alarms us that, around one in eight people in the world were likely to have suffered from chronic hunger, not having enough food to sustain daily an active and healthy life. Majority of hungry people around 827 million live in developing regions, where the estimated prevalence of under nutrition is at 14.3 percent¹.

Food insecurity at household level reflects poor socio-economic status, poor income levels, poor per capita income, inadequate dietary intake and poor nutritional and health status. The poor income levels are associated with only single earning from the head of the family, family or household size with more children, unemployed adults at home, single or widowed mother, poor educational levels of family head and female not working. Poor socio economic factor also contribute to poor purchasing capacity of food, poor food choices and inadequate intake of nutritious food². Food insecurity among children is visible in the form of stunting and wasting as a result of under nutrition³, whereas adults suffer from non-communicable diseases like obesity, hypertension and diabetes mellitus and also show signs for various nutritional deficiencies like vitamin A, vitamin B, vitamin D, iron and iodine deficiencies⁴.

An estimated 370 million indigenous people globally are spread through 70 countries worldwide⁵. Almost all indigenous people have retained their native customs that are unique and different from other segments of their national population. Orang Asli, term used which refers to tribal people of Malaysia, are the oldest inhabitants of Peninsular Malaysia ever since 5,000 years ago. They mostly inhabited from China and Tibet enroute migration to mainland of Southeast Asia before foothold in the Peninsular Maloriginal people” or “first people”. It is a collective term for the 18 sub-ethnic groups generally classified under three main subgroups termed as Semang (Negrito), Senoi and Aboriginal Malay (Proto Malay)⁶. The Orang Asli are a heterogeneous group with its own language and culture, and are distinct from the others.

The lifestyle and means of subsistence of the indigenous peoples varies with different ethnic groups. Fishing is the chief occupation of coastal communities, such as the Orang Laut, Orang Seletar and Mahmeri in Peninsular Malaysia whereas other groups like the Temuan, Jakun and Semai communities practice permanent agriculture and manage their own rubber, oil palm or cocoa farms. Approximately 40% of other indigenous community are tied mostly to the rainforests. These include the Semai, Temiar, Che Wong, Jahut, Semelai and Semoq Beri

communities whose major occupation is swiddening (hill rice cultivation) hunting as well as gathering forest produce. They trade in petai, durian, rattan resins and honey to earn cash incomes⁷.

The Department of Statistics Malaysia (DOSM)⁸ reported that there was a steep increase in the Orang Asli population in Peninsular Malaysia between 1947 and 2010. The Orang Asli population was the highest in 2010 with 160,993 still representing a meager 0.6 percent of the total population. As of 2010, Pahang was the state thickly populated with Orang Asli (63,174), followed by Perak (51,585), Kelantan (13,123), Selangor (10,399), Johor (10,257), Negeri Sembilan (9,502), Melaka (1,502), Terengganu (619), Kedah (338), Kuala Lumpur (316), Pulau Pinang (156) and Perlis (22).

Worldwide, the indigenous populations are the economically poor and marginalized community. In Malaysia, the Orang Asli are still marginalized socio-economically and culturally. The Malaysian Government has embarked on developmental programs to streamline the Orang Asli with the mainstream population. The Orang Asli villages are now more opened and easily accessible. The services provided by the government sector include general healthcare, maternity and infant care, dental care, police security, communication and education.

Despite these developments, the Orang Asli are in a state of nutrition transition from hunter gatherer practices to westernization of foods. They now have more access to processed foods. The development path pursued by the government has had an intense impact on all aspects of Orang Asli lives, their livelihood, the way of life and their cultural values. They are increasingly pushed from a subsistence economy into the prevailing cash economy as labourers in the timber industry, workers in town or settlers in land schemes⁹.

Malaysia is experiencing an alarmingly increasing prevalence rates of obesity in the recent past among all age groups¹⁰. This situation has not spared the aboriginal populations which also share the same problem. Though studies have reported food insecurity among low-income groups in Malaysia, the association between food insecurity and obesity has been contradicted by some and accepted by few studies^{11,12,13,14}. Yet detailed study on this regard has not been established. Hence it was thought of interest to assess food insecurity among Orang Asli households and see if it has any possible association to obesity.

Materials and Methods

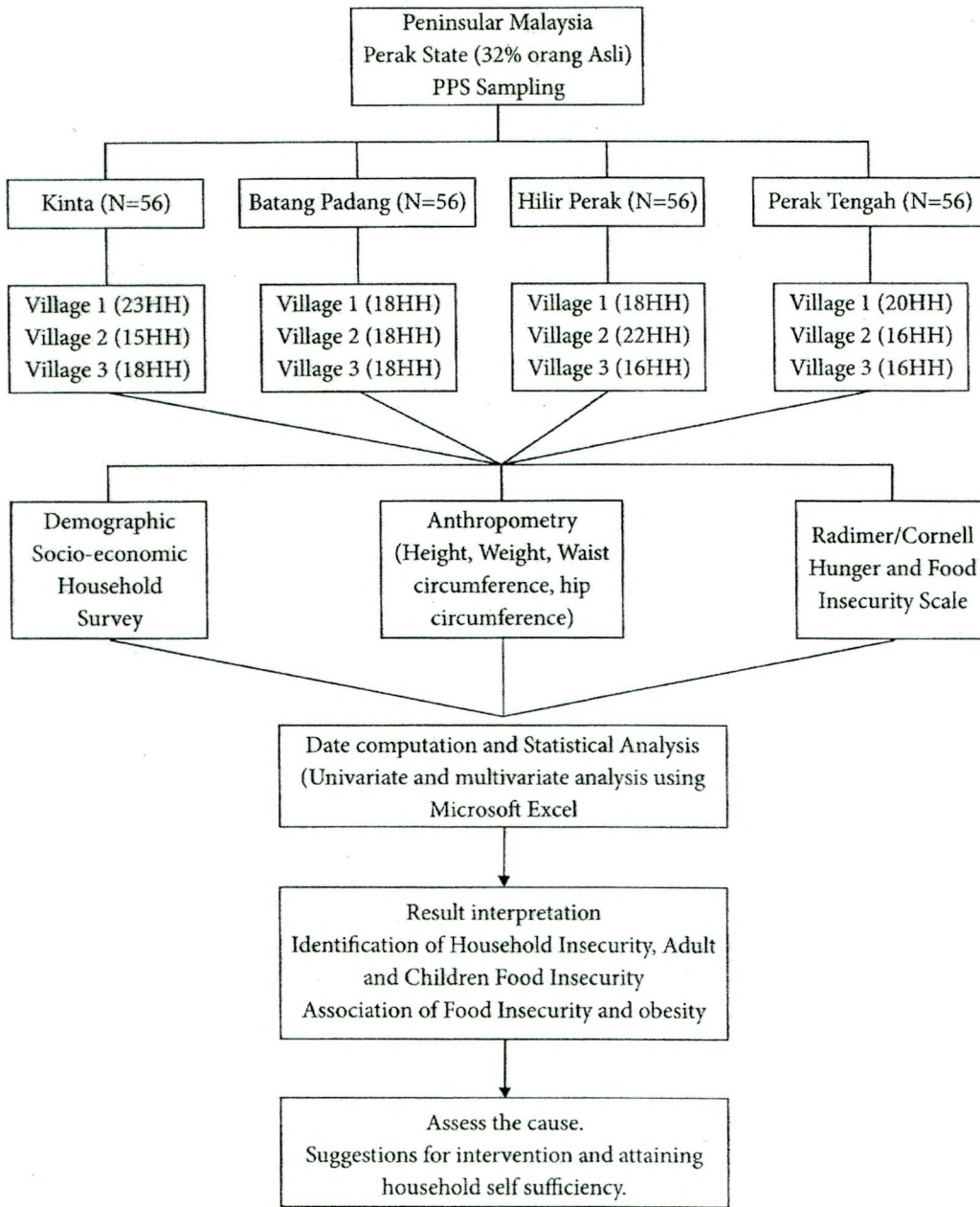


Figure 1: Flow Chart Depicting the Study Design

Data Collection

Prior to data collection permission to carry out study was obtained from JAKOA (Department of Orang Asli Affairs), Perak, Malaysia. The research protocol was approved by the Ethical Research Committee of University Tunku Abdul Rahman. Informed consent was obtained from the mothers of the households involved in the study. The following tools were used in data collection:

Questionnaire

All pertinent information regarding the study was collected from the field through face-to-face interviews with the mothers individually. A pre-tested and validated questionnaire was used to obtain information on the demographic, socio-economic and education background of the indigenous mothers. The mothers were interviewed about the household income and expenditure pattern, household size, number of children, number of children attending school, parental age, marital status, education and employment status of mothers. In cases where the needed information were incomplete, the father was interviewed to collect the necessary information. Radimer /Cornell hunger and Food insecurity instrument^{15,16} was used to evaluate the household food security, household food insecurity, adult food security and children food security. Food quantity, food quality, food acceptability and certainty of obtaining food were the four main elements in the Radimer /Cornell food insecurity construct. This construct is based on the fact that the severity of food problem starts at the household level (mild food insecurity) followed by adult food insecurity (moderate food insecurity) which portrays the quality and quantity of food consumed by the adults and child hunger which depicts severe food insecurity wherein the children are deprived of quality and quantity of food. This is characterized based on the idea that children in a household are the last ones to go hungry in household food insufficiency. The data collected from the mothers and children were classified into the following four categories: food-secure, household food insecure, adult food insecure and child hunger. The Radimer and Cornell food insecurity instrument has been widely accepted as a valid instrument in the direct assessment of household food insecurity in Malaysia and has been used in earlier studies^{14, 17, 18}.

Anthropometric Measurements

Anthropometric measurements were taken to assess the degree of malnutrition for the mothers and children of the households. The mothers of the selected households were subjected to anthropometric measurements following the World Health Organization's (WHO) standard procedures. Height was measured using a portable stadiometer with a horizontal head- board attachment. The subjects removed their shoes and stood erect with their heads, shoulders and upper arms relaxed. The length between the standing surface and the top of the head

was measured at maximum point of exhalation. The measurement was done in duplicate to a precision of and 0.1cm and mean value calculated. The body weight we was measured using OMRON digital weighing scale to nearest 0.1kg. The subjects were measured with light clothes and shoes removed. The measurement was repeated twice and the average was used. Body Mass Index was calculated using the formula: Weight (kg) /height (m ²). Waist circumference (WC) was measured using a flexible tape. The superior border of the iliac crest and the inferior border of the last rib were marked on both the lateral sides of the abdomen. A measuring tape graduated to 1mm was looped around the waist at the midpoint between the two marks and recording at the point of normal expiration. Two consecutive measurements were recorded and the mean value was used in the analyses.

Data Analysis

The data was computed and analysed in Microsoft excel 2010. Student T- test, mean and standard deviation was calculated to establish positive association between different parameters.

Results and Discussion

Table 1 envisages the prevalence of household food insecurity status in the study population. Approximately 89% of the indigenous population had experienced food insecurity for a period over the past 12 months prior to the interview. Among them, 3.67% (n=8) reported household food insecurity, 16.05% (n=35) reported individual food insecurity and a vast majority of 69.72% (n=152) experienced child hunger. The same kind of result has been reported in earlier studies among the aborigines of other nations^{20, 21,22,23,24,25} which shows a similar trend in acquiring food. Most of the Orang Asli community have less access to the main road connecting them to the mainstream population and do not possess proper transport facilities to procure food. The observations ensured that availability of nutritious food in terms of quality and quantity is not constant throughout the year with inconsistent periods of abundance and deprivation. This statement has been supported by earlier studies on low household income in Peninsular Malaysia^{26,27}.

Table 1: Household food secure and insecure (n = 218)

| Food Security Status | n(%) |
|---------------------------|-------------|
| Food –secure household | 23 (10.55) |
| Food – insecure household | 8 (3.67) |
| Food –insecure individual | 35 (16.05) |
| Child hunger | 152 (69.72) |

The mean age of the mothers in the household were 37.77 ± 10.41 years ranging 18 – 65 years

Where majority of them (54.59%) fell under the age group of 31- 50 years (n=119). The study population consists of more number of young mothers who had children attending schools and below the age of 59 months. Hence, most of the families rely on single income whereby their mean income per capita was less. More than 80% of the mothers had attained less than lower secondary education and most women did not have any formal education. Only a few villages had schools within the vicinity. Majority of the villages had to go to other villages or towns to attend schools. This is one main cause for the poor educational status among the Orang Asli mothers. The percentage of mothers who had attended secondary schools and above are higher among the food secure group (34.78%) compared to the food insecure group (15.89%). therefore educational status of mother have a significant association with food insecurity. The average household size was 5.11 ± 1.28 and the mean number of children per household was 2.95 ± 1.88 with 1.94 ± 0.95 children attending school. Only a meager 5.02% of the respondents were single mothers whereas the vast majority of the households were double headed (94.98%). One third of the mothers in the household (35.78%) went for odd jobs in oil palm estates or rattan factories and the rest of the (64.22%) participants were house wives and did not have any income. The average household income was RM 656.97 \pm 257.66 with a per capita income of RM123.57 \pm 39.37. The food secure group had less number of children attending schools and more number of earning members. Hence the mean income of the household food secure group was much higher than the food insecure group with RM 1062.61 \pm 469.64 and 609.13 \pm 165.638 respectively.

Table 2: Household Demographic Characteristics for Food Secure and Insecure (n = 218)

| Parameters | In Total(n=218) | Food Secure | Food Insecure | p < 0.05 |
|----------------------------------|---------------------|--------------------------------|---------------------------------|------------|
| | | (n=23) n (%) Mean \pm STD | (n=195) n (%) Mean \pm STD | |
| Age of Mothers (Years) | 37.77 \pm 10.41 | 48.087 \pm 7.920 | 36.549 \pm 10.005 | 0.00000039 |
| Education of Mothers | | | | |
| Lower than secondary | 180 (82.20%) | 15 (65.22%) | 164 (84.11%) | |
| Secondary and Above | 39 (17.81%) | 8 (34.78%) | 31 (15.89%) | |
| Household size | 5.11 \pm 1.28 | 4.913 \pm 1.041 | 5.139 \pm 1.330 | 0.02154 |
| No. of children per household | 2.950 \pm 1.188 | 2.870 \pm 1.058 | 2.959 \pm 1.205 | |
| No. of children going to school | 1.940 \pm 0.956 | 1.522 \pm 0.665 | 1.990 \pm 0.974 | |
| Type of Household | | | | |
| Single headed | 11 (5.02%) | 0 | 11(5.64%) | |
| Double headed (Ref) | 208 (94.98%) | 23 (100%) | 184 (94.36%) | |
| Employment status | | | | |
| Employed | 78 (35.78%) | 10 (43.49%) | 68(34.87%) | |
| House wife | 140 (64.22%) | 13 (56.52%) | 127 (65.13%) | |
| Household Income (RM) | 656.97 \pm 257.66 | 1062.609 \pm 469.644 | 609.128 \pm 165.638 | 0.0000011 |
| Household Income per capita (RM) | | 219.203 \pm 79.288 | 124.965 \pm 42.951 | |

As reported in previous studies^{28, 29, 30, 31, 32}, the higher the income, the increase in accessibility to foods in terms of quality and quantity. Poor socio-economic group tends to buy calorie-dense, low cost foods which would end up in added weight gain among the food insecure families. The per capita income and household income levels are often the major contributors of household food insecurity.

The results of anthropometric measurements have been tabulated in Table 3. The mean weight of the indigenous women in the selected households were 61.93 ± 13.7 which was higher than the mean weight of the women in household food secure group (52.06 ± 12.247) while a slight increment was seen among women of food insecure household (63.247 ± 12.96). When the mean weight was compared with the national data of adult weight among non-indigenous female, an increase of 7.33kg was observed which highlights the fact that Orang Asli women were heavier than their non-indigenous counterparts. The average height of the participant aborigines were 149.12 ± 5.93 which was more than the food secure group (145.74 ± 4.67) and almost same with the food insecure group (151.9 ± 5.95). The non-indigenous counterpart of Malaysian population were approximately 3cm taller than the aboriginal women^{33, 34}. The Body Mass Index (BMI) of the selected subjects showed that the indigenous adults fall under the category of obesity according to WHO classification for Asian population with a mean BMI of 27.79 ± 5.2 . The mean BMI was higher in food insecure women (28.26 ± 5.09) compared to women of food secure household (24.34 ± 4.90). These results threaten the fact that ne out of two women in the Orang Asli community are either obese or overweight. The non-indigenous population of females showed a BMI of 23.1 ± 2.7 which is overweight. The mean waist circumference of the female aborigines was 82.73 ± 11.23 which underlines the fact that central adiposity or abdominal obesity is more prevalent among the semai tribes. The mothers from the food insecure group did not exhibit central obesity whereas the mothers from food insecure households possessed abdominal adiposity (83.32 ± 11.08) as revealed by their waist circumference. The data collected and observed highlights the escalating rates of overweight and obesity among the food insecure households in the Orang Asli communities and calls for serious and immediate intervention to curb this serious threat.

A nutrition paradox, introduced a decade ago stated that those living in poverty could experience high levels of food insecurity (a condition of food insufficiency and under nutrition) and high levels of obesity (a condition of overnutrition) simultaneously. Townsend et al. reported that the prevalence of overweight in women increased as the level of food insecurity increased²³. The convergence of under- and over-nutrition creates a "double burden" on the health of the poor^{35, 36}.

Previous studies^{37, 38, 39, 40} have reported both positive and negative associations of food insecurity with obesity. The implications from current study portrays that maternal obesity has positive association with food insecurity. This is because the mothers tend to eat all the left overs when there is abundance availability of food through donations or food stamps and experience

a period of deficit wherein they do not consume food and keep starving. This inconsistent form of dietary practices could be the leading cause of overweight and obesity among the food insecure mothers⁴¹. Selection of food from one single group and very less intake from fruits and vegetable group has also been observed.

Most of the women stay at home and do very little physical activity which also lead to obesity. Physical inactivity, uncertainty over food availability, increased food prices, poor educational status, low socio-economic status, poor choice of food with less consumption of fruits and vegetables, inadequate intake of fluids could be attributed to the leading cause of overweight and obesity among the indigenous women. In spite of the Malaysian government's earnest measures to streamline the indigenous community with the main population, the benefits have not reached the Orang Asli community all alike. The shift in nutritional status from under nutrition to obesity has posed a serious threat of acquiring non-communicable diseases like hypertension and diabetes mellitus.

Nutrition education and empowering women to raise their economic status and providing education is the need of the hour. Helping the indigenous women to raise kitchen garden as every house has a space to grow plants, this might help them grow more nutritious fruits and vegetables and keep them self sustained rather than providing them with one time incentives^{42,43,44}.

Agricultural ecosystems can be taught and implemented in the indigenous communities whereby it significantly benefits various aspects of human well-being, such as adequate livelihoods, self sustainment in providing sufficient and safe nutritious food, health, secure resource access and security from natural disasters⁴⁵. Reorienting natural ecosystem to means of livelihood would be imperative in bringing a change in the household food security. Since agriculture and fishing are the main livelihood of the Orang Asli, fishing and crab farming along with nutrition gardening can be implemented whereby the members of the household would be employed to do the labor.

Table 3: Household Maternal Anthropometric Indices for Food Secure and Insecure (n = 218)

| Parameters | In Total(n=218) | Food Secure (n=23) n(%) Mean±STD | Food Insecure (n=195) n (%) Mean ±STD | p<0.05 |
|--------------------------|-----------------|-------------------------------------|---------------------------------------------|---------|
| Weight (kg) | 61.93±13.7 | 52.061±12.247 | 63.247±12.959 | |
| Height (cm) | 149.12±5.93 | 145.740±4.673 | 149.523± 5.950 | |
| BMI (kg/m ²) | 27.79±5.20 | 24.34±4.896 | 28.20±5.093 | 0.00192 |
| BMI Category I* | | | | |
| <18.5 | 13(5.96%) | 2 (8.70%) | 11 (5.64%) | |

| | | | |
|------------------------------------|--------------|-------------|--------------|
| 18.5-<25 | 43 (19.72%) | 9 (39.13%) | 34 (17.44%) |
| 25-<30 | 78 (35.78%) | 9 (39.13%) | 69 (35.38%) |
| ≥30 | 84 (38.53%) | 3 (13.04%) | 81 (41.54%) |
| BMI Category II** | | | |
| <18.5 | 13 (5.96%) | 2 (8.70%) | 11 (5.64%) |
| 18.5.0 – 22.9 | 32 (14.68%) | 7 (30.43%) | 25 (12.82%) |
| 23.0 – 27.5 | 50 (22.94%) | 3 (13.04%) | 47 (24.10%) |
| ≥27.5 | 123 (56.42%) | 11 (47.83%) | 112 (57.44%) |
| Waist | 82.73±11.23 | 75.74±10.40 | 83.32±11.08 |
| Circumference (cm) | | | |
| Waist circumference classification | | | |
| <80 cm | 88 (40.37%) | 16 (69.57%) | 72 (36.92%) |
| ≥80cm | 130 (59.63%) | 7 (30.43%) | 123 (63.08%) |

* WHO Classification

** WHO Consultative group for Asian Population

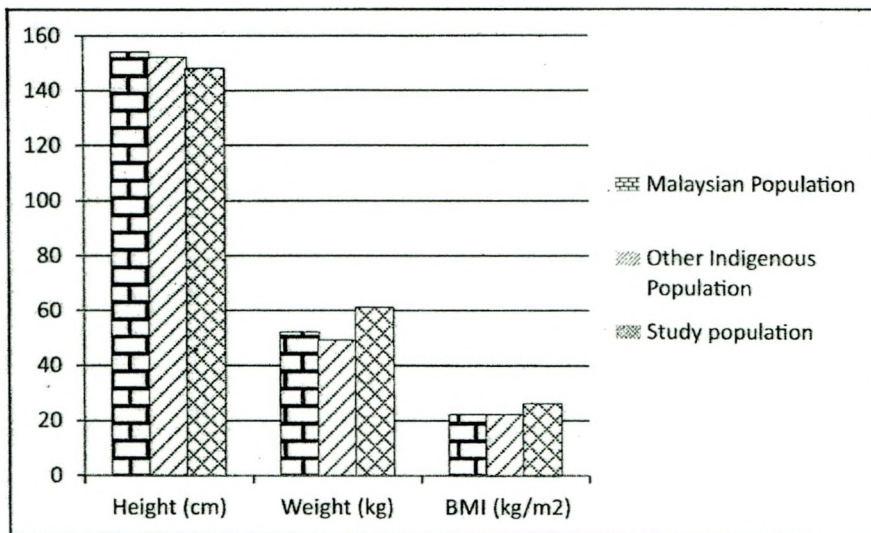


Figure 3: Comparison of Results based on National Benchmark

Food security of the nation and household food security are inextricably linked, and innovative initiatives are needed to create opportunities to face challenges regarding future food security requirements. Intervention in terms of nutrition education to the maternal heads

of the Orang Asli households should be implemented to prevent the dual burden of obesity and non-communicable diseases.

Limitation

In this study, the sample size was small and restricted to Orang Asli women. Despite the government effort to tackle this situation, household food insecurity still represent an appreciable problem in indigenous and the marginalized communities. One time measurement cannot be considered as an effective method of assessing food security and therefore multiple measurements in a longitudinal study would allow more space for the investigators to probe the nutrition transitions and concluding the various associations.

Conclusion

In this study, the alarming rise of overweight and obesity among the Orang Asli women and its association with household food insecurity has been identified and requires further investigations over a long period for further recommendations. Poor dietary practice, poor education and economic status among the mothers of Orang Asli households, unpredictable availability of food abundance and deprivation, physical inactivity may be the developing cause for overweight and obesity. Changing the agricultural ecosystems into effective farming involving the Orang Asli household members can empower the aboriginal women in both nutritionally and financially. Nutrition education is vital to the maternal heads to improve their nutritional and health status.

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