Nutritional status of women and children in Malaysian rural populations

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This study was conducted to investigate the nutritional status of the rural population in Malaysia, especially women and children. A total of 262 women aged 18 and over and 183 children aged 2-6 years were selected using multistage cluster sampling from four locations in rural areas. It was found that the prevalence of malnutrition among children 2-6 years old ranged between 25.5% in the Malays Felda settlement scheme to 80% in the Orang Asli settlement. Malnutrition was associated with worm infestations, bottle feeding and early weaning. More than 30% of Orang Asli women were malnourished compared to less than 15% of Malay Felda settlement women. On the other hand, Malay women in the land settlement scheme had a higher risk of developing overweight and diabetes. Goitre was found among 11.5% of children; however, no cretinism was found. Breast feeding was still a common practice among rural mothers, but inadequate health education tended to reduce the duration of breast feeding and increased early weaning. Upgrading women's status in the rural areas will ultimately improve the nutritional and health status of the children and community as a whole.

Introduction

Women and children are still considered to be dependent groups in most developing countries. The status of women varies enormously between countries. Some countries offer women equal rights and status with men, while in the least developed countries, discrimination on the basis of gender still exists. Most of these women are economically dependent and vulnerable, politically and legally powerless. They work longer hours and sometimes work harder than men, but their work is typically unpaid and undervalued[1]. As mothers, they take care of the children, so the fate of the children in terms of physical growth, mental growth, behaviour and education largely depend on their capability. However, educational attainment among women is too poor in most underdeveloped countries to enable women to carry full responsibilities in child upbringing.

Malaysia, a developing nation of tropical climate has morbidity and mortality statistics indicating a trend towards improvements in the health status of the population[2]. Maternal and child health programs have been upgraded to consolidate the existing services. However, certain areas are still under-served due to distance from towns or cities. Efforts to reduce infant and maternal mortality have been intensified through a risk-approach, and priority given to improve the health and nutrition of "the very poor" through community education and nutrition rehabilitation. This study investigates the nutritional and health status of rural women and child populations in Malaysia against this background.

Methods

The study was approved by the University ethics committee. A total of 262 women aged 18 years and over and 183 children aged 2-6 years were selected using multistage cluster sampling from four locations in rural areas (Table 1). The locations range from very traditional Aboriginal settlements (Lanai Post and Betau Post) deep in the jungle to modern Malay settlements (Hulu Sungai village and Sungai Koyan Federal Land settlement). All subjects invited attended our clinic.

Table 1. Study subjects according to age group and ethnic settlement.

Ethnic/settlement	Male		Female	
Age(year)	2-6	>18	2-6	>18
Orang Asli	**48**	**146**	**46**	**103**
Lanai Post	19	65	20	47
Betau Post	29	81	26	56
Malays	**46**	**128**	**43**	**159**
Hulu Sungai village	18	64	16	90
Sungai Koyan Federal Land settlement (FELDA)	28	64	27	69
Total	**94**	**274**	**89**	**262**

Physical examination, anthropometric assessment, an oral glucose tolerance test (OGTT) and biochemical analysis were performed. Dietary intake and sociodemographic questionnaires were administered. Stool was collected for ova and cyst examination to determine helmint and protozoa infection. Body weight was measured using a Seca spring balance and height was measured by the Microtoise tool. Questionnaires were used to obtain information about socioeconomical aspect and nutrition (24-hour dietary recall and food frequency). Three interviewers and one research assistant were

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selected and trained in the required techniques, the process of social contact and anthropometric measurement.

For determination of nutritional status among children, a NCHS (National Centre of Health Statistics, USA) reference was used, and for adults, body mass index (BMI), was used where PEM is defined as less than 18.5 and overweight is 25 kg/ m^2 or greater. Children between 7-17 years and adults had 15 ml and 20 ml of blood taken, respectively. Serum albumin was measured by enzyme calorimetric method using Technicon SMA II autoanalyser (ICI, America Inc.). Seru cholesterol was measured using the CHOD-PAP method (Boehringer Manheim). Thyroid gland enlargement was classified by palpation according to criteria recommended by WHO[3]. The criteria for diagnosis of diabetes mellitus was based on the recommendations of the World Health Organization[4]. Glucose tolerance was measured using Reflotron glucose analysing tool (Boehringer Mannheim). A fasting venous whole blood glucose level of 8 mmol/L and a two hour venous whole blood glucose level of 11 mmol/L or more was diagnostic for diabetes.

Statistical analysis was with SAS statistical software release 6.3 (SAS Institute Inc)[5].

Results

In general, Orang Asli in rural areas suffered from malnutrition. Stunting was found to be higher in Orang Asli than in the Malays ($p<0.0001$, Table 2). The prevalence was 66.7% in Lanai Post and 80% in Betau Post compared to 41.2% and 25.5% in Hulu Sungai village and Felda Koyan settlements respectively. However, wasting was more common among Malays in rural area.

Table 2. Prevalence of malnutrition (PEM) among children.

Nutritional index		Weight for age		Height for age		*Waterlow's classification[7]			
Ethnic/ settlement	n	normal	PEM	normal	PEM	N	S	W	S/W
Lanai Post	39	71.8	28.2	33.3	66.7	30.8	66.7	2.7	0.0
Betau Post	55	38.2	61.8	18.2	18.8	18.2	80.0	0.0	1.8
Hulu Sungai	34	47.1	52.9	52.9	47.1	44.1	41.2	8.8	5.9
Felda Koyan	55	74.1	25.9	72.7	27.3	65.5	25.5	7.3	1.8

N = Normal W = Wasting S = Stunting S/W = Stunting/ Wasting *Chi-square; x2 = 42.333 p = 0.000 (p is significant at 0.05)

Table 3. Infant feeding.

Settlement	Breast Feeding (%)	Bottle feeding (%)	Breast + bottle feeding (%)
Lanai Post	92.0	5.2	2.8
Betau Post	96.2	0.0	3.8
Hulu Sungai	50.0	0.0	50.0
Felda Koyan	9.6	0.0	90.3

Breast feeding was still a common practice among Orang Asli women in rural area (more than 90%) compared to Malays (less 50%)[6]. Surprisingly, 5.2% of Orang Asli children in Lanai Post were only bottle fed, which was not the practice in other locations[6] (Table 3). In terms of duration of breast feeding, there was no difference between locations[6]. However, solid food was given late to Orang Asli children (Table 4). Protozoa were common organisms which infested children in all locations especially Orang Asli (Table 5). One third of children in Betau were infested with round worm (ascaris lumbricoides) and thread worm (trichuris trichiura). Surprisingly, hookworm (ancylostoma duodenale) was not found among children in the interior location (Lanai Post).

Table 4. Duration of breast feeding and age of introducing solid food.

Location	Duration of breast feeding (months)		Age of introducing solid food (months)	
	n	mean	n	mean
Lanai Post	39	18.2	38	9.4*[a,b,c]
Betau Post	50	17.6	43	7.0
Hulu Sungai	29	19.3	33	6.0
Felda Koyan	51	16.6	54	5.6
Analysis of variance	F	3.32		4.41
(ANOVA)	P	0.0065		0.0007

* significant ($p<0.05$) a = compared to Felda Koyan; b = compared to Hulu Sungai; c = compared to Betau Post

Table 5. Prevalence of worm and protozoal infestation by settlement.

Settlement	Protozoa (blood & intestine)	Round worm (ascaris)	Thread worm (trichuris)	Hook worm (ancylostoma)
Lanai Post	68.4	7.9	15.8	0.0
Betau Post	80.2	30.2	30.2	9.4
Hulu Sungai	66.5	14.2	11.8	3.5
Felda Koyan	41.7	13.6	16.7	1.8

Malnutrition and overweight among women

Overweight among Orang Asli women was significantly lower than the Malays in rural areas (Table 6). The Orang Asli women were 2-4 times more likely to be overweight than the men but there was almost no difference in Malays. On the other hand, Malay women in rural areas had higher risk of becoming overweight compared to Orang Asli women and men (Table 6)[6].

Table 6. Prevalence of PEM (malnutrition) and overweight (OW) among adults.

Ethnic/ settlements	Men			Women		
	n	PEM	OW	n	PEM	OW
Lanai Post	65	15.4	0.0	46	34.0	0.0
Betau Post	81	8.6	2.5	56	35.7	1.8
Hulu Sungai	64	10.9	14.1	91	13.3	15.5
Felda Koyan	64	1.6	18.7	69	0.0	33.3
Total	**274**	**9.3**	**8.4**	**262**	**15.5**	**17.1**

Albumin and cholesterol levels

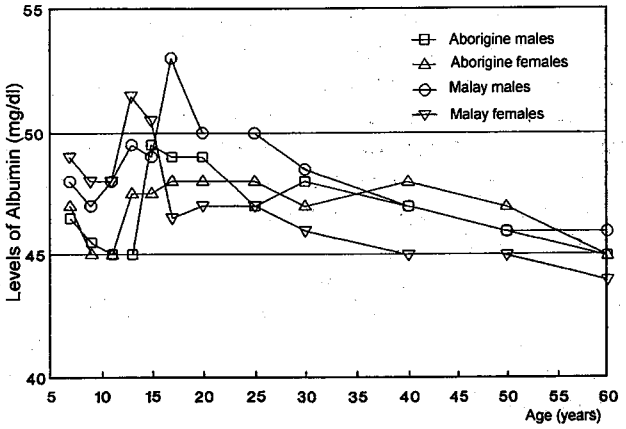
The levels of albumin were within normal values (3.7-5.1 g/100 ml)[6] in both ethnic groups at all stages (Fig. 1). However, median cholesterol levels were higher in Malays than in the Orang Asli. The women had higher cholesterol than men at nearly all stages (Fig. 2).

Goitre

Goitre was found among 11.5% of children; no cretinism was found. The prevalence was higher among the Orang

Asli children compared to the Malays. Goitre was twice as common among Orang Asli women than among Orang Asli men and 3-10 times more common as among Malays in both sexes (Table 7).

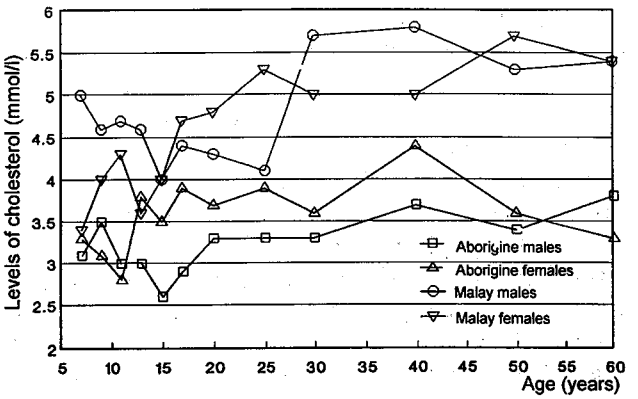
Figure 1. Median level of serum albumin by ethnic group



Diabetes

Prevalence of diabetes was higher in women compared to men especially among Malay women over 40. The prevalence of diabetes among Malay women in Hulu Sungai village was 1.1% whereas in Felda Sungai Koyan land settlement it was 9.5%. Diabetes was not common among Orang Asli women (Table 8).

Figure 2. Median level of serum cholesterol among women by ethnic group



Discussion

Malnutrition is widespread in developing countries especially among young children[8]. It reduces resistance to infectious diseases and inhibits growth and development. Malnutrition plays a key role in maternal and infant mortality. It was shown in this study that stunting was common among the rural population especially in the Orang Asli. The high prevalence of malnutrition in Orang

Table 7. Prevalence of goitre according to age, ethnicity and sex.

Age		Overall subjects			Orang Asli			Malays		
(year)	Sex	sample	goitre	(%)	sample	goitre	(%)	sample	goitre	(%)
2-7	male	94	10	11.0	48	8	16.7	46	2	4.4
	female	88	11	12.5	45	9	20.0	43	2	4.7
7-12	male	157	23	14.6	71	21	29.6	86	1	1.2
	female	146	17	11.6	62	14	10.5	84	3	1.8
13-17	male	60	9	15.0	27	8	29.6	86	1	1.2
	female	71	33	46.5	37	25	67.6	34	8	23.5
18-29	male	89	20	22.5	60	18	30.0	29	2	6.9
	female	127	63	49.6	74	50	67.6	53	13	24.5
30-49	male	147	28	19.1	65	25	38.5	82	3	3.7
	female	174	61	35.1	54	33	61.1	120	28	23.3
50and	male	96	20	20.8	43	16	37.2	53	4	7.6
above	female	74	27	36.5	30	18	60.0	44	9	20.5

Table 8. The prevalence of diabetes mellitus (DM), impaired glucose tolerance(IGT) and glucose tolerance abnormality (GTA) among subjects and the Malays.

Age		Overall subjects			Orang Asli			Malays		
(year)	Sex	DM	IGT	GTA	DM	IGT	GTA	DM	IGT	GTA
<40	male	0.6	0.6	1.3	0	1.0	1.0	1.6	0	1.6
	female	0.5	10.1	10.6	0	3.5	3.5	1.0	17.3	18.3
40-49	male	1.4	4.0	5.5	0	7.4	7.4	2.2	2.2	4.4
	female	11.3	19.7	31.0	0	11.1	11.1	12.9	21.0	33.9
50-59	male	3.7	3.7	7.4	4.0	8.0	12.0	3.5	0	3.5
	female	2.1	10.6	12.8	0	5.9	5.9	3.3	13.3	16.6
>60	male	5.6	16.7	22.2	0	11.8	11.8	10.5	21.1	31.6
	female	8.0	8.0	16.0	0	8.3	8.3	15.4	7.7	23.1
Chi-square	male	4.86	27.6	21.04	-	13.3	7.42	2.78	11.7	13.39
(trend)		(S)	(S)	(S)		(S)	(S)	(NS)	(S)	(S)
	female	6.16	0.06	2.12	-	0.88	0.88	4.8	0.56	0.29
		(S)	(NS)	(NS)		(NS)	(NS)	(S)	(NS)	(NS)

Asli children was associated with feeding (especially late introduction of solid food) and infection. However, protein energy malnutrition (PEM) was not only a problem in children, but also among women (PEM is defined as BMI<18.5 kg/m^2). Malnutrition among mothers in rural areas, particularly the Orang Asli, is a common phenomenon. The most common types are underweight, anaemia due to malaria and nutritional deficiencies; and iodine deficiency disorders[6].

Children born to healthy mothers normally have higher birth weights than children of malnourished mothers. There is strong epidemiological evidence of an association between maternal nutritional status, both during and prior to pregnancy (prepregnancy weight and weight gain during pregnancy), and birth weight and intrauterine growth retardation[9]. Stunting, which was common among the Orang Asli children, may result from impaired growth in utero when the foetus is deprived of essential substances[6]. Mothers with high parity are often more affected by malnutrition; as too many pregnancies or pregnancies too close together deplete the mother's stores and result in low birth weight babies[10]. Low birth weight babies have high morbidity and mortality rates especially in the first year of life[10]. Malnourished mothers often fail to breast-feed their children successfully and hence there is a higher chance for the child to become malnourished due to early introduction of solid food[11]. Malnutrition problems among the adult Orang Asli were high among the females in which their weight, height and body mass index were found to be low[6]. This indirectly pictures unequal distribution of food in a family due to family size[12]. Children and mothers usually consumed less than others of the family's food[13,14].

Despite the protein energy malnutrition that affects the Orang Asli in all of the studied areas, overweight (BMI≥25) is a problem among the Malay adult population, particularly among the females. The prevalence of overweight is associated health outcomes, such as diabetes mellitus and cardiovascular diseases. It is caused by excess energye and decreased energy output[15]. In this study, it was found that Malay women in rural areas had a higher risk of developing overweight compared to Orang Asli women and men. Data from NHANES (National Health and Nutrition Examination Study, USA) showed that the prevalence of overweight was more frequent among women[16]. In general, there are more women who are overweight than men; and this increases with age[16].

Education and income have a significant association with the prevalence of overweight, with moderate education and income related to an increment. Aside from that, the factor that contributes most is the intake of an energy dense, high fat diet (especially of animal source) and lack of activity (especially among women in the Felda settlement). The high levels of serum cholesterol among Malays are consistent with high fat diets[17,18,19] and a high risk of developing coronary disease and other cardiovascular diseases[20]. Overweight is not a problem among the Orang Asli but, if modernisation and changes of lifestyle continue, it is probable that the prevalence of overweight will increase then in urban areas.

Goitre was common among Orang Asli women compared to Orang Asli men and to Malays of both genders. It is believed that the high prevalence of goitre among the Orang Asli community, especially among women, reflects iodine deficiency and malnutrition. Among traditional communities, malnutrition among women was associated with cultural discrimination and paternal dominance. The high prevalence of goitre is associated with the remoteness of an area-- the more remote the area, the higher the prevalence of goitre, particularly the large obvious goitres[21,22,23]. There were low levels of iodine intake amongst the villagers, exacerbated by low levels of iodine in drinking water in that area[24]. The urban community generally had no sign of endemic goitre, although the levels of iodine in drinking water were quite low. Besides lack of iodine in drinking water and food (such as eggs and chicken), remote communities were also threatened by goitrogens in their daily food such as in tapioca and millet.

This study showed a higher prevalence of diabetes in women compared to men. Diabetes was common, especially among Malay women aged over 40, compared with women from other countries. Diabetes, however was not common among Orang Asli women. The prevalence of diabetes in Malay women was most likely related to declining physical activity and increased energy density[6].

In developing countries, protein energy malnutrition is common among children admitted to hospital and is associated with high morbidity and mortality[25]. The circulating concentration of the transport protein albumin, has been used to define protein deficiency in clinical practice. A study done in central Africa observed on average, serum albumin concentrations to be high among young children of less than 1 year old and low in children between 2 to 5 years of age corresponding to weaning and the development of kwarshiorkor[26]. However, the values of albumin in this study were acceptable in both ethnic groups at all ages and the pattern according to age was similar in both ethnic and gender. Thus, visceral protein deficiency is not apparent in Malaysia.

Malnutrition will not only cause death if severe, but it can retard growth, impair mental ability and change behaviour[27,28,29]. Even if malnutrition is mild, it can be sufficient to reduce working capacity, increase the costs of health care and shorten working life. Children who have suffered malnutrition through early life may give less attention to education and social skills irrespective of intelligence quotient (IQ)[30]. The nutritional status of young children influences educational achievement[31].

Generally, median cholesterol levels were higher in the Malays compared to the Orang Asli. Among the Malays, cholesterol levels were high in women at all ages. The high median cholesterol levels in Malay women may relate in part to the high prevalence of diabetes and overweight among them.

In women, pregnancy outcome depends on nutritional status. Women need nutritious food from birth to maturity, adequate medical care, sufficient rest, more educational opportunities and less sexual discrimination[32].

Poverty eradication can prevent malnutrition and goitre. However, malnutrition can be reduced by

supplementation of nutrients. Prevention of diseases such as non-insulin dependent diabetes mellitus (NIDDM) and impaired glucose tolerance (IGT) will require appropriate intake of food in the context of upgrading the status of women in rural areas.

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馬來西亞農村婦女及兒童的營養狀況

摘要

本文研究了馬來西亞農村居民，特別是婦女及兒童的營養狀況，作者從 4 個農村地區選擇了 262 位 18 歲以上的婦女和 183 位 2-6 歲的兒童爲對象，分階段進行了研究，結果發現，馬來西亞 Felda 村居的 2-6 歲兒童營養不良患病率爲 25.5%、Orang Asli 村居爲 80%。營養不良與蠕虫感染、人工喂養和早期斷奶有關。Orang Asli 婦女患營養不良者超過 30%，而 Felda 婦女卻少於 15%。另一方面，內陸的馬來西亞婦女易患肥胖症及糖尿病。雖然兒童沒有克汀病，但患甲狀腺腫爲 11.5%。農村婦女通常用母乳喂養，但由於健康教育不足，往往縮短哺乳期和增加早期斷奶，從長遠計，增加農村婦女的營養狀況將最終改善兒童及整個社會的營養和健康狀況。

Kajian ini dilakukan untuk melihat status pemakanan (gizi) populasi luar bandar di Malaysia terutamanya di kalangan wanita dan kanak-kanak. Sejumlah 262 orang wanita yang berumur 18 tahun ke atas dan 183 orang kanak-kanak di antara 2-6 tahun dipilih menggunakan persampelan gugusan berbilang peringkat di 4 lokasi di kawasan luar bandar. Didapati bahawa prevalens malnutrisi di kalangan kanak-kanak yang berumur di antara 2-6 tahun menunjukkan julat di antara 25.5% di skim penempatan FELDA Orang Melayu sehingga 80% di penempatan Orang Asli. Malnutrisi adalah dikaitkan dengan infestasi cacing, penyusuan botol dan waktu cerai susu yang awal. Lebih daripada 30% wanita Orang Asli mengalami kekurangan zat makanan berbanding dengan kurang daripada 15% di kalangan wanita di penempatan Felda Orang Melayu. Sebaliknya, wanita Melayu & kawasan skim penempatan mempunyai risiko yang lebih tinggi untuk mengalami obesiti dan diabetes. Sebanyak 11.5% kanak-kanak mengalami goiter, walau bagaimanapun, tiada kretinisma dijumpai. Pemberian susu ibu masih lagi merupakan suatu kebiasaan di kalangan ibu-ibu di luar bandar tetapi kurangnya pendidikan kesihatan mempunyai kecenderungan untuk mengurangkan jangkamasa penyusuan dan meningkatkan kadar cerai susu yang awal. Untuk jangkamasa panjang, peningkatan status wanita & kawasan luar bandar akan dapat memperbaiki status pemakanan dan kesihatan kanak-kanak dan masyarakat secara keseluruhan.

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