Knowledge of diabetes and lifestyle behaviour amongst indigenous population in Peninsular Malaysia

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INTRODUCTION

Malaysia is a multiethnic country with a population of 29.5 million people [1]. The indigenous Orang Asli, also known as the original peoples of the Malay Peninsular consist of various aboriginal tribes and make up about 1% of the Malaysian population. The Orang Asli can be grouped into three major ethno-linguistic groups namely Negrito, Senoi and Proto-Malays. Within these major groups are smaller subgroups, distinguished by language and geographical location [2].

The primary aim of this study was to determine the level of knowledge amongst members of the Orang Asli populations with regards to aetiology, clinical symptoms and associated risk factors related to diabetes mellitus of 3 different tribes living in 3 different socioeconomic settings; urban, semi-urban and very remote in the deep jungles.

We hypothesized that there will be a difference in the knowledge amongst indigenous populations living in three different socioeconomic conditions and most likely knowledge will be better in the semi-urbanized indigenous population.

MATERIALS & METHODS

Preliminary Visit

The welfare of the Orang Asli and matters relating to their communities falls under the purview of the Department of Aborigine Advancement (JKOA) Malaysia. Prior to the study, several preliminary visits were arranged with the approval from and collaboration with JKOA to establish contact with the headman or Tok Batin of each settlement and details of the study were discussed and confirmed. Participation amongst the Orang Asli population was voluntary and a small token were given to all participants and their family on the day of the study. Ethics approval was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia.

Study design and Recruitment phase

This was a cross-sectional study involving seven Orang Asli settlements located in three different states in Peninsular Malaysia; Johor, Selangor and Perak. The settlements were selected by convenience sampling as the number of villages are limited and the indigenous population were small. The recruitment phase was from June 2009 till December 2010. In total three separate visits were organized for recruitment and interview.

The settlements were categorized to three different types according to distance from the nearest township. In Johor, the settlements were Kampung Bakar Batu, Kampung Simpang Arang and Kampung Kuala Masai. These settlements were considered urban as they were situated less than 10 kilometres from Johor Bahru. The Carey Island settlement was considered intermediate as it was situated approximately 30 kilometres from small town, Banting, in Selangor. In Northern Perak, the settlements were Kampung Bukit Asu and Kampung Sungai Tiang, situated in a conserved rainforest area near the Thai border. These villages were remote and situated more than 50 kilometres from nearest town, Gerik, and accessible only with four-wheel drive vehicles and motorized boats.

Subjects

The total number of respondents was 385 (299 Proto-Malays, 48 Mah Meri, (subgroup of Senoi) and 57 Negritos). The Proto-Malays in Johor are semi-urbanised and mainly Christians. They live within close proximity to Singapore and have access to the modern mass media, some go on to receive secondary education in nearby schools. The Mah Meri are mainly animists; they have settled in an island and live further distance from Kuala Lumpur and less influenced by urbanization. They have a strong wood carving culture within their community and some make their living by carving and selling their handicrafts, consequently they are regularly exposed to tourists and outsiders. The Negritos (Kintak and Jehai subgroups) are semi-nomadic hunter gatherers and are very few in number. They live in the remote jungle, close to the Southern Thai border. Access is difficult, modern amenities are scarce and influence of urbanization is unlikely. All the indigenous groups received financial assistance from the government. The numbers of respondents in our study are few because the indigenous population are very small and only constitute 1% of the general population. Nevertheless, more than 75% were represented from each settlement. The age range was between 15 and 82 and the mean age was 36.4 ± 14.0 SD years old.

Interview Tool (Orang Asli-Diabetes Knowledge Questionnaire – OA-DKQ) and Procedure

Validation of OA-DKQ

OA-DKQ was developed in Bahasa Malaysia as respondents

This article was accepted: 9 April 2013

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were more likely to be conversant in this language. The validation of OA-DKQ tool used has been described in a previous paper [3]. Briefly, a panel of expert consisting of bilingual (English and Bahasa Malaysia) researchers with specific content expertise was established. Following a panel discussion, 3 categories were identified as important in constructing the OA-DKQ. The OA-DKQ consisted of eight knowledge-related (57 sub-items) and three behaviour-related (25 sub-items) questions. The questionnaire has a good internal consistency of 0.806 with the indigenous population (case) group and 0.759 when tested with control group. The intraclass correlation (ICC) coefficients of the items were in the acceptable range (> 0.60), indicating reasonable intraclass reliability.

Interview procedure
Interviews took the form of standardized pretested questionnaire administered in a face-to-face interview. The interviewers received standardized training prior to the survey and familiarised themselves with the OA-DKQ. The ratio of interviewer to respondent was kept at 1:5. The interview was conducted in Bahasa Malaysia and took twenty five minutes to conduct in cases where there was no language barrier. In general, majority of the participants had no problem answering the questions during the interview as the Bahasa Malaysia language spoken was simple and straight forward with no medical jargon. In some situation, where participants had some difficulty understanding, the headman or Tok batin would assist in asking the questions.

Statistical analysis
Data was analysed using PASW Statistics Version 18 (SPSS Inc., Chicago, Ill., USA). The statistical tests employed in the study were Chi-Square Test and Fisher's Exact Test. A p value less than 0.05 was taken as significant.

RESULTS

Subjects
Table I illustrates the demographic characteristics of the study participants and the location of the settlements.

Male and female
Table II illustrates the distribution of male and female from the different settlements.

Knowledge
Regarding aetiology of diabetes, the majority of respondents were not able to identify the correct responses or answers. From the 12 sub-items that were given as options, five were correct; drinking excess sweet beverages, eating excess rice, lack of exercise, hereditary disease and increase in age. Only one sub-item on drinking excess sweet beverages was identified correctly by majority (56%) as a cause for diabetes ($p < 0.001$). The remaining questions regarding diabetes were scored poorly (all score < 50%) with p value < 0.05 for all sub-items.

Regarding signs and symptoms of diabetes; the majority of respondents were not able to identify the correct responses. From the 18 sub-items given, 7 sub-items described hypoglycaemia and 6 sub-items described hyperglycaemia symptoms. The remaining 5 sub-items with wrong options were all scored poorly (all score < 50%) with p value < 0.05 for all sub-items. (Refer to Table III).

Regarding cure for diabetes; the majority (58%) of respondents thought that diabetes is a curable disease ($p < 0.001$). (Refer to table III).

Regarding vulnerable group at risk; half (50%) of respondents correctly identified elderly people as a vulnerable group prone to diabetes (p=0.000). The remaining sub-items with wrong options scored poorly (all score < 50%) with p value < 0.05 for all sub-items except for KQ5.9 with p = 0.049 (NS). (Refer to Table III).

Table III illustrates overweight as a risk factor for non-communicable disease (KQ6 and KQ7) and preventive measures against diabetes (KQ9).

Performance of knowledge-related questions (KQs)
In total, 7% (4 of 57 sub-items) of knowledge-related questions were answered correctly (≥ 50%) by the entire cohort. 56% answered excess sweet beverages as a cause of diabetes (p=0.000), 50% answered old age as risk factor for diabetes (p=0.000), 62% answered reducing sugar consumption (p=0.014) and 53% answered regular exercise (p=0.000) as prevention against diabetes.

Comparison of knowledge between different indigenous settlements
The Mah Meri population of Carey Island (n=46) had higher knowledge scores compared to urban Proto-Malays (Orang Laut and Orang Seletar) of Johor (n=282) and the Negritos (Kintak and Jehai) in remote Perak (n=57) settlements. For KQ1, KQ2, KQ5, KQ7 and KQ9, the Mah Meri had the highest score of 100%, 75%, 67%, 100% and 100% respectively and did better than all the other indigenous groups (with p value < 0.05 for all sub-items except KQ4.4 p=0.074). (Refer to Table IV). Thus, there are highly significant differences in knowledge between the 3 settlements.

Behaviour and Preference
Behaviour-related questions (BQ) showed that when asked regarding choice of treatment if they had diabetes (BQ3); 30% chose to self-treat (p=0.000), 88.1% chose modern treatment (p=0.009) and 5.5% chose traditional healer (p=0.000). The Mah Meri of Carey Island had highest percentage (91.3%) seeking modern treatment and the Negritos of Gerik had highest percentage seeking to self-treat (61.4%) and to see traditional healers (21.1%) (p value for each sub-item is < 0.05).

Table V illustrate dietary pattern of the respondents.

DISCUSSION

Knowledge
The level of knowledge regarding diabetes is poor amongst the indigenous people in Peninsular Malaysia. Of the 8 knowledge questions (57 sub-items), only 4 sub-items (7%) were identified correctly by ≥ 50% of the entire cohort (n=385). The four sub-items that were identified correctly

Table I: Demographic characteristics of the study population

Demographic characteristics		Sample Population n (%) Total n = 385
Gender	• Male	139 (36)
	• Female	246 (64)
Age group (years)	• < 20	30 (8)
	• 20-29	118 (31)
	• 30-39	93 (24)
	• 40-49	70 (18)
	• 50-59	43 (11)
Mean age 36.38, Median age 33, SD	• 60-69	23 (6)
14.02 * 1 data missing with regards to age information	• ≥ 70	7 (2)
Tribes	• Orang Seletar (Proto-Malays)	298 (51)
	• Orang Laut (Proto-Malays)	84 (22)
	• Mah Meri	46 (12)
	• Kintak (Negrito)	21 (6)
	• Jehai (Negrito)	36 (9)
Urban (Johor)	• Kg Bakar Batu, Danga Bay, Johor Bahru	35 (9)
	• Kg Simpang Arang, Gelang Patah, Johor Bahru	163 (42)
	• Kg Kuala Masai, Johor Bahru	84 (22)
Intermediate (Selangor)	• Carey Island	46 (12)
Remote (Northern Perak)	• Kg Bukit Asu, Gerik	21 (6)
	• Kg Sungai Tiang, Belom	36 (9)

Table II: Male and female participants from different settlements

Distance from township (State in Peninsular Malaysia)	Settlements	Male = 139 (100%)	Female = 246 (100%)
Urban (< 10 km) (Johor)	Kg Bakar Batu, Danga Bay	15 (10.8)	20 (8.1)
	Kg Simpang Arang, Gelang Patah	59 (42.4)	104 (42.3)
	Kg Kuala Masai	26 (18.7)	58 (23.6)
Intermediate (30 km) (Selangor)	Carey Island	19 (13.7)	27 (11)
Remote (50 km) (Northern Perak)	Kg Bukit Asu, Gerik	0 (0)	21 (8.5)
	Kg Sungai Tiang, Belom	20 (14.4)	16 (6.5)

were; drinking sweet beverages in excess can cause diabetes, elderly people are more vulnerable to get diabetes, reducing sugar intake and doing regular exercise can prevent diabetes. The majority of respondents failed to identify other correct options such as eating excess rice, lack of exercise, hereditary condition and increase age as a cause of diabetes. In another study exploring the knowledge and beliefs in a group of Aborigines in Northern Territory, most respondents considered worry about family and social problems to be the primary cause of diabetes, while others recognized that diabetes runs in families either as a contributing or causative factor [4].

When asked about groups of people who were vulnerable to diabetes, half (50%) of the respondents identified age increase (elderly people) as a risk factor for diabetes. Less than half (44%) of respondents did not identify children as a vulnerable group to diabetes. Although, respondents were able to identify that elderly people had higher risk to diabetes, they did not think that increasing age was a causative factor. Perhaps the reason for this disparity is because in first knowledge question (KQ1 – see Table III) the question was posed in an academically inclined manner, whereas the second question (KQ5 – see Table III) was posed in an experiential manner and this allowed the respondents to use their background experience and knowledge to answer the question better. This finding indicated that they displayed some knowledge of diabetes. However, only 40% of cohort identified diabetes patients as a vulnerable group. This sub-item was included as a baseline to gauge respondents understanding of the question and the results revealed a conceptual understanding deficiency.

Regarding obesity as a risk factor for non-communicable diseases; less than half of the respondents correctly identified the options such as heart disease (41%), diabetes (40%) and hypertension (48%). The majority of respondents correctly identified reducing sugar intake (62%), regular exercise (53%) and weight reduction (48%) as preventive measures against diabetes. Our result differed from another study in a group of Aborigines in Northern Territory who did not mention exercise, weight loss or medication as part of prevention or treatment of diabetes [4].

Table III: Results of knowledge-related questions (KQs)

Item (No. of Sub item)	Question	% cohort answered correctly (n=385)	P value*
KQ1(11)	**Cause of diabetes**		
KQ1.3	drink excess sweet beverage	56*	p < 0.001
KQ1.4	eat excess rice	23	p < 0.001
KQ1.6	lack of exercise	24	p < 0.001
KQ1.7	hereditary condition	25	p < 0.001
KQ1.9	increase age	25	p < 0.001
KQ2 (18)	**Signs and symptoms of diabetes Hypoglycaemia**		
KQ2.1	headache	24	p < 0.001
KQ2.4	sweating	19	p < 0.001
KQ2.11	shivering	15	p < 0.001
KQ2.12	hunger	19	p < 0.001
KQ2.14	heart palpitations	21	p < 0.001
KQ2.15	confuse	16	p < 0.001
KQ2.16	angry	21	p < 0.001
	Signs and symptoms of diabetes Hyperglycaemia		
KQ2.3	frequency	26	p < 0.001
KQ2.6	weight loss	24	p < 0.001
KQ2.7	tired	33	p = 0.002
KQ2.8	blur vision	26	p < 0.001
KQ2.9	pruritus vulva	15	p < 0.001
KQ2.10	thirst	25	p < 0.001
KQ4 (1)	**Cure for diabetes**	58	p < 0.001
KQ5 (12)	**Which group is vulnerable to get diabetes?**		
KQ5.1	children	8	p = 0.016
KQ5.2	elderly	50*	p < 0.001
KQ5.7	diabetes patients	40	p < 0.001
KQ6 (1)	**Do you know your weight?**	49	p < 0.001
KQ7 (6)	**Overweight is a risk factor for which disease?**		
KQ7.2	heart disease	41	p < 0.001
KQ7.4	diabetes	40	p < 0.001
KQ7.5	high blood pressure	48	p = 0.002
KQ9 (4)	**Which are preventive measures against diabetes?**		
KQ9.1	lose excess weight	46	p < 0.001
KQ9.2	reduce sugar intake	62*	p = 0.014
KQ9.3	regular exercise	53*	p < 0.001

(*) p value was obtained by cross-tabulating location (1 = urban, 2 = remote, 3 = intermediate) with responses (0 = yes, 1 = no, 3 = don't know)

Table IV: Knowledge-related questions (KQs) scores from different settlements.

Knowledge Item (number of sub-items)	Frequency of highest score sub-item/total sub-item (%)			P value*
	Urban (n=282)	Remote (n=57)	Intermediate (n=46)	
KQ1 Cause of diabetes (11 sub-items)	0	0	11/11 (100)	< 0.05
KQ2 Sign and symptom of diabetes (18 sub-items)	0	6/18 (25)	12/18 (75)	< 0.05
KQ5 Vulnerable group (12 sub-items)	0	4/12 (33)	8/12 (67)	< 0.05
KQ7 Obesity as risk factor for chronic disease (6 sub-items)	0	0	6/6 (100)	< 0.05
KQ9 Preventive measures against diabetes (4 sub-items)	0	0	4/4 (100)	< 0.05

(*) p value was obtained by cross-tabulating location (1 = urban, 2 = remote, 3 = intermediate) with responses (0 = yes, 1 = no, 2 = don't know). Each sub-item from KQ1, KQ2, KQ5, KQ7 and KQ9 has p value < 0.05.

Table V: Results of behaviour-related questions (BQ11 sub-items)

Item/Subitem	Question	% cohort (n = 385)			P value*
		Never	Occasionally	Frequent	
BQ11.1	Eat breakfast	7	30	63	0.031
BQ11.2	Eat lunch	6	29	65	0.000
BQ11.4	Snack between meals	34	52	14	0.005
BQ11.5	Drink carbonated drinks	24	56	20	0.000
BQ11.7	Eat food with coconut milk	28	65	8	0.024
BQ11.8	Eat vegetables	3	45	53	0.001
BQ11.9	Eat fruits	7	58	36	0.000
BQ11.10	Consume alcohol drinks	89	9	1	0.000

(*) p value was obtained by cross-tabulating location (1 = urban, 2 = remote, 3 = intermediate) with responses (3-point Likert scale 0 = never, 1 = occasionally 2 = frequent)

The knowledge score also differed significantly for each settlement, with the Mah Meri people of Carey Island scoring highest compared to Negritos in Gerik or the Proto-Malays in Johor Bahru settlements. Firstly, it should be acknowledged that the Mah Meri was the smallest in number (n=46) amongst our sample group. However, this intermediate group achieved the best score with regards to cause of diabetes, hyperglycaemia and hypoglycaemia symptoms and signs, at risk group for diabetes, preventive measures for diabetes and obesity as a risk factor for chronic disease. This group is financially viable with carving industry as their mainstay of income. In addition, they are regularly in contact with other people and tourists that come to visit and buy their handicrafts. This regular contact might partially explain their level of knowledge.

Secondly, the semi-urbanised Proto-Malays in Johor Bahru also showed poor knowledge despite access to the city and modern mass media and amenities. This finding is of concern, given the alarming increase in diabetes prevalence rates in Malaysia. Further effort should be made to educate indigenous population in Peninsular Malaysia with regards to diabetes prevention. However, these efforts must now take into account the peculiarities of the tribes and their locations or accessability. Studies done in Pacific Islands, has shown that culturally relevant educational diabetes 'packages' were effective in delivering diabetes education to high risk indigenous groups [5,6]. A similar approach can be adopted in further attempts to educate our indigenous populations using 'tailored packages' based on the findings in this study.

The result of our knowledge study differed from the knowledge of diabetes found by Ding et al. Their results showed that knowledge of diabetes amongst diabetes and non-diabetes patients attending a public outpatient setting in Peninsular Malaysia was acceptable, although the knowledge in diabetes patients were significantly higher than the non-diabetes patients [7].

It is important to note that our attempt to assess the indigenous population's knowledge is focused from the bio-medical point of view only. Hence, the answers in our questionnaire were limited to bio-medical science issues. Our survey was not designed to take into consideration other cultural and informal knowledge that the indigenous groups may have.

Behaviour

The majority of respondents (88%) preferred to seek modern medical treatment compared to seeing a faith healer (bomoh) (5.5%) or to self-treat with traditional medicine (30%). In addition, the Mah Meri of Carey Island which showed the best level of knowledge pertaining diabetes also has the highest preference to seek for modern treatment if they had diabetes. This preference should be optimized to further educate indigenous population in diabetes and health. With regards to preferred ways to lose weight, the indigenous groups chose healthy ways to reduce their weight by taking regular exercise and reducing their sugar intake.

The findings showed that having three meals per day is a norm rather than an exception amongst the indigenous groups in our study. In addition, more than half admitted to snacking between meals, eating fast food, drinking carbonated drinks and preparing their food with coconut milk (santan). From our findings, it seems that the indigenous groups are displaying some unhealthy eating habits. A qualitative study by Ng et al on indigenous mothers from the Mah Meri and Temuan settlements in Peninsular Malaysia showed that all groups considered fruits, vegetables, meat, eggs, milk and fish as 'good' foods while sugar and snacks were 'bad' foods [8].

It is worth mentioning that although urbanization have not made a positive impact in improving knowledge amongst indigenous population, unfortunately negative impact such as westernization of diet have begun to make its way in. This trend is worrying as the diabetes scenario in the local indigenous tribe may mirror their counterparts in United States and Australia [9-12].

As for alcohol consumption, the majority (89%) responded never to have consumed alcohol. Our findings suggested that alcohol consumption was not a prominent issue amongst the indigenous population in Peninsular Malaysia. Although there was a higher consumption of alcohol amongst indigenous males the difference was not statistically significant. Historically, uncontrolled alcohol consumption has led to both health and social deterioration in some indigenous settlements [13, 14]. Another aspect to consider in our cohort is that approximately a third (36%) was males. This may to a certain extent downplay the figures for alcohol consumption. Previous studies have reported Australian Aborigine males as having a higher risk of being involved in alcoholism at a younger age [15, 16].

Strengths and limitations

There are some limitations to our study. Firstly, the nature of convenience sampling must be acknowledged. This is because we wanted to determine if different socioeconomic conditions such as urbanization and accessability would influence the indigenous groups' knowledge pertaining diabetes. Although, convenience sampling is a non-probability sampling method, we believe that our study samples and findings represent the tribal groups within Peninsular Malaysia since our study comprises of the three main indigenous groups in Peninsular Malaysia.

Secondly, regarding the context of the questionnaire itself, our questionnaire attempted to look only at the bio-medical sciences component. Our questionnaires did not take into consideration cultural and familial component of the Orang Asli's knowledge and experience. Had these parameters been assessed, there may have been a better outcome. On the other hand, our study represents comprehensive attempts to assess various aspects of diabetes in terms of aetiology, pathophysiology and complications of diabetes to determine the level of knowledge amongst the indigenous population with a tailor-made questionnaire.

Finally, there were more female than male respondents. However, the distribution of males and females respondent were almost equal in all settlements except for one where no males responded during the day of the study. Despite agreed prior arrangements, the men in Kg Bukit Asu, Gerik were not available to participate in the study. It was likely that they were the sole breadwinner's for their households. In addition, the numbers of respondents amongst the Mah Meri and Negritos were low (ie. 27%) compared to Orang Seletar and Orang Laut cohort. The low numbers are representative of their small populations in Peninsular Malaysia.

To our knowledge, our study is the first large study to determine the level of knowledge amongst different types of indigenous population in Malaysia. Although the findings are mainly descriptive, it remains important to highlight the issue that knowledge pertaining diabetes is still very low among indigenous group of people in Malaysia. Our results clearly showed the deficiency in knowledge about diabetes mellitus in all socioeconomic levels in the indigenous groups studied. Despite the Proto-Malays being close to the city of Johor Bahru and Singapore, with access to television and other mass media facilities, their knowledge on diabetes mellitus is no different from those indigenous group living in the rainforest of Northern Perak.

Future Study

A similar study using the same knowledge tool (OA-DKQ) will be carried out to assess the level of diabetes knowledge amongst the general population from lower socioeconomic class living in urban areas. It will be useful to compare the results of these two studies and determine if there are any differences between the indigenous and general Malaysian population.

CONCLUSION

The level of knowledge of diabetes is poor amongst indigenous population in Peninsular Malaysia. There were some significant differences in the level of knowledge between each settlement. Respondents from the Mah Meri had higher level of knowledge compared to Proto-Malays or Negritos. Although it was unsurprising for the Negritos from remote settlement to score poorly, the Proto-Malays from urban settlements also had poor knowledge despite close accessibility to the city. The dietary intake revealed some unhealthy eating habits and alcohol consumption was very low in all the settlements.

ACKNOWLEDGEMENT

The authors would like to thank all the people involved in the study in particular the staff of the Department of Aborigine Advancement (JKOA) Malaysia and the village heads (Tok Batin). The authors would also like to thank some of the Monash faculty members who helped in developing the questionnaire used in this study.

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