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# Nutrition Knowledge, Attitude and Practice of Teachers in Rehabilitation Centres in Northern Malaysia

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## ABSTRACT

**Introduction:** Persons with disabilities (PWD) are susceptible to malnutrition. Caregivers or teachers in rehabilitation centres may not be adequately trained in nutrition management of PWD. The aims of this study were (i) to assess the nutrition knowledge, attitude and practice among teachers in community-based rehabilitation centres for PWD; and (ii) to evaluate changes in the nutrition knowledge and attitude of the teachers before and after exposure to a training workshop on nutrition management for PWD. **Methods:** A cross-sectional survey was conducted using a guided self-administered Nutrition Knowledge, Attitude and Practice Questionnaire on Persons with Disabilities (KAP-nOKU), among a convenience sample of 210 teachers. Forty-five of them further participated in a nutrition training workshop and completed the post-test evaluation on knowledge and attitude of the same measures. **Results:** At baseline, the teachers' average knowledge, attitude and practice scores were 13.80±3.73 for knowledge (below 50$^{th}$ percentile); 51.49±4.08 for attitude (above 75$^{th}$ percentile); and 48.08±3.61 for practice (between 50$^{th}$ and 75$^{th}$ percentile). There was significant positive correlations between knowledge and attitude ($r$=0.343, $p$<0.05), as well as between attitude and practice ($r$=0.147, $p$<0.05). After exposure to a 3-day nutrition workshop, significant improvements in the teachers' knowledge and attitude were observed, whereby teachers' knowledge score increased from 14.20±3.80 to 25.38±2.36 and from 51.16±3.97 to 55.20±4.41 for attitude ($p$<0.001). **Conclusion:** Nutrition intervention was associated with improvement in short term knowledge and attitude of the teachers. Sustainable interventional strategies are needed to enhance the nutrition knowledge and skills of teachers of PWD.

**Keywords**: Knowledge, attitude and practice (KAP), nutrition, persons with disabilities, teachers

## INTRODUCTION

The World Health Organization (WHO) recently reported that around 15% of the world population, or one billion people, live with disabilities (WHO, 2011). Government of Malaysia estimates indicate a figure of about 1.3 million people with various forms

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of disabilities in 2009 (Zulkiple, 2009). However, until 2010, only 21.5% had registered with the Malaysian Department of Social Welfare (Roslee, 2011). Among children, more than 850,000 under 15 years have a disability, with at least one-third being severe and requiring rehabilitation (Amar, 2008). This data is in agreement with Juanita's (2011) finding that a total of 900,000 children in Malaysia have been diagnosed with various form of disabilities. Community-based rehabilitation (CBR), initiated by WHO in the mid-1980s, is a multi-sectoral strategy that empowers persons with disabilities (PWD) to access and benefit from education, employment, health and social services. It aims to (i) enhance the quality of life for PWD and their families; (ii) develop local resources so as to expand facilities to them; and (iii) enable them to gain access to rehabilitation in their own communities using predominantly local resources (Malaysian Department of Social Welfare, 2011). It is a community-based public health programme which is usually managed in rural areas with the aim of ensuring that PWD in such areas are not neglected. CBR centres in Malaysia provide training for PWD who are either too young or too severely disabled to attend mainstream special education. CBR centre-based caregivers, or normally known as 'teachers' play the important role of teaching, training and preparing one meal which is the lunch for PWD.

PWD, being the most vulnerable population in society, are more likely to suffer from growth failure and poor health as a consequence of malnutrition, co-morbidities, dependence on caregivers, lack of specific health and rehabilitation facilities, socio-economic issues and other factors. International studies have been documented that undernutrition was found in almost 50% of children with cerebral palsy (Marchand & Motil, 2006; Sánchez-Lastres *et al.*, 2003). Nevertheless, studies also recognise obesity to be a major health threat among PWD (Lin *et al.*, 2005; Rimmer & Yamaki, 2006). A recent cross-sectional survey of nutritional assessment among 469 PWD in CBR centres in Kelantan, Malaysia demonstrated a remarkable prevalence of 22.6% underweight and 26.7% overweight and obese (Chen, pers.com., 2011). This double burden nutrition problem calls for immediate public health intervention efforts. Furthermore, to be enrolled as a CBR teacher, no qualification on special education or early intervention for PWD is needed; teachers only attend such courses periodically after recruitment. Teachers have low exposure especially to nutrition knowledge or information (Oeseburg *et al.*, 2010) and are not formally trained in nutrition management for PWD.

Understanding the relations between nutrition and health knowledge, skills, attitudes and behaviours in the general community raises the attention of public health nutrition to focus on promoting good health and well-being through healthy eating and lifestyles (Tan *et al.*, 2011; Khor, 2005). In addition, public health nutrition knowledge has been shown to result in nutritional improvements even among illiterate and socio-economically disadvantaged populations (Khor, 2005). Schools or learning centres are natural and logical places to promote healthful eating and physical activity (Tan *et al.*, 2011; Zaini *et al.*, 2005) as they provide a link to parents or caregivers who can reinforce health-promoting behaviours at home (Freedman & Alvarez, 2010; Hammerschmidt *et al.*, 2011). Thus, it is important to implement public health nutrition intervention among teachers in CBR centres so as to increase their knowledge, attitude and practice (KAP) on nutrition management for the PWD. However, to our knowledge, no study has been done to assess the aforementioned aspects among teachers in rehabilitation centres.

The present study was conducted with the two objectives: (1) to assess knowledge,

attitude and practice on nutrition for PWD among teachers in CBR centres; and (2) to evaluate the changes in nutrition knowledge and attitude by exposing them to a training workshop on nutrition management for PWD.

## METHODS

### Sampling method and data collection

A cross-sectional survey was conducted from May to September 2011 among teachers from 74 CBR centres in four states located at the northern region of Peninsular Malaysia: Perlis, Pulau Pinang, Perak and Kelantan. Permission to conduct the study was obtained from the Department of Social Welfare, Malaysia (Ref no. JKMM: 100 / 12 / 5 / 2 Jld 37[29]). Ethical approval was granted by the Research Ethics Committee (Human), Universiti Sains Malaysia (Ref. no. USMKK / PPP / JEPeM 218.4.[1.1]).

Based on a study conducted in year 2002 among middle-aged Malaysian women by Noor-Aini *et al.* (2006), the proportion of women who had poor nutrition knowledge score (less than 50$^{th}$ percentile of total score) was 19.9%. Thus, the sample size needed for this study based on the formula by Naing (2009) was 245 respondents.

$n$ = $(z / \Delta)^2 p(1-p)$, where
$n$ = estimated sample size
$z$ = standard value at confidence level at 95%
= 1.96
$\Delta$ = absolute precision set at 5%
= 0.05
$p$ = estimated proportion of Malaysian women who have poor nutrition knowledge score
= 19.9%
Thus, $n$ = $(1.96 / 0.05)^2$ x 0.199 x (1-0.199)
= 244.9
≈ 245

The respondents were recruited by convenience sampling method. This sampling method was adopted based on the feedback from the CBR centres and the availability of respondents in each centre. In addition, accessibility of the location of CBR centres was also taken into consideration. The respondents were defined as individuals aged between 18 to 60 years from both genders who taught more than six months in the respective centres. Data collection was carried out by researcher's visits to each CBR centre; the respondents who were eligible and agreed to participate in this study were informed of the purpose and procedure of survey before written informed consent was obtained. This study was able to recruit 210 CBR teachers, which only comprised 85.7% of the sample size needed.

### Questionnaire

Knowledge, attitude and practice on nutrition for PWD among CBR teachers were assessed using a guided self-administered questionnaire, Nutrition Knowledge, Attitude and Practice Questionnaire on Persons with Disabilities (KAP-nOKU). It was constructed in the Malay language and consisted of 57 items - 29 items for knowledge, 13 items for attitude; and 15 items for practice domain. The knowledge domain comprised of multiple choice items for the five components: nutrient and sources (8 items), nutrient and functions (4 items), food pyramid (6 items), healthy eating and food preparation (5 items), and nutrition management for PWD (6 items). Each item had four answer options and a 'Not Sure' option; only one option was the correct answer. One point was given for a correct answer and 0 point for an incorrect answer or 'Not Sure'. Possible total score ranged from 0 to 29. The attitude and practice domains consisted of three components: nutrition and health (3 items), nutrition teaching to PWD (6 items) and improving the health of PWD (4 items) for attitude; food preparation and modification (10 items), response to aversive behaviour (3 items) and training the PWD (2 items) for practice. For

attitude, the response options were organised into a 5-point Likert scale with 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree' and scored as 5, 4, 3, 2, 1 for attitude. For practice, it was 'everyday', 'always' (3-4 days in a week), 'sometimes' (1-2 days in a week), 'seldom' (1-2 days in a month) and 'never'; scored as 5, 4, 3, 2, 1. Possible total score ranged from 13 to 65 for attitude and 15 to 75 for the practice domain. Higher scores indicated good knowledge, positive attitude and good practice (Appendix). The validity and reliability of KAP-nOKU questionnaire was pre-tested. KAP-nOKU was developed based on the following steps: conceptualisation, construction, and pilot testing. Items formulation was done by review and adaptation of the published questionnaire, scientific literature and textbooks. Content validity of the instrument was established by a panel comprising seven experts in dietetics and nutrition, childhood psychology, paediatrics, community health and education. Face validity was administered to a group of nine teachers from rehabilitation training centre for spastic children. Content and face validity was done to determine the clarity, appropriateness and comprehensive of constructs of interest. The revised KAP-nOKU was further pilot tested among 165 CBR teachers. For test-retest, 51 teachers completed the same KAP-nOKU within three weeks. Internal consistency reliability was measured using KR20 and Cronbach's alpha, which yielded 0.63, 0.67 and 0.82 for knowledge, attitude and practice domains. Test-retest reliability reported 0.59, 0.73 and 0.91 for knowledge, attitude and practice domains respectively, revealing an acceptable reliability (Chen & Sakinah, 2011).

**Interventional study**

The preliminary interventional study was carried out in October 2011 among a subset sample (45 teachers from Kelantan) of the previous cross-sectional assessment of KAP, in Kelantan. This study location was selected due to easy access as the respondents needed to attend a 3-day training workshop on nutrition and management for PWD (approximately 6-hour training each day) in Health campus, Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan. Utilising one-group pre-post test design, knowledge and attitude items of the KAP-nOKU questionnaire was administered at the end of the workshop. Practice domain evaluation was excluded for this interventional study as it was an immediate post-test and their practice on nutritional management for PWD after training had not been carried out in their centres. We hypothesised that the nutrition knowledge and attitude could be improved after the respondents were trained with nutrition knowledge on care and management for PWD. The workshop was conducted in the Malay language and consisted of topics such as introduction to nutrients, food pyramid, healthy and well-balanced food preparation, overweight / obesity and nutrition management, nutrition needs and management for persons with autism, Down's syndrome and cerebral palsy, and ways to cope with aversive behaviours during mealtime. The components for this nutrition training workshop were also adopted from other studies (Burden *et al*., 2000; Humphries *et al.*, 2009). Theory and practical elements were included in the workshop and the nutrition topics were taught using power point presentation. The copies of slides were given to the respondents before each session so that they could have a better understanding of the information taught. In addition, an aerobic session by a sport professional from a sport science programme in USM was conducted on the second day to teach the teachers simple exercises which they could instruct to the PWD in CBR centres. Furthermore, a cooking competition with the theme "Healthy and Well-balanced Meal" was held on the third day. The respondents were divided into 12 groups and competed to prepare a healthy and well-balanced lunch with appropriate portion

size. Overall, the 3-day training workshop on nutrition for PWD was conceptualised and organised as simple, easily understood, practical and interactive.

### Statistical analysis

Data was analysed using Statistical Package for the Social Sciences (SPSS) version 18.0 for Windows (SPSS Inc, Chicago, IL). Descriptive statistics was used to demonstrate the socio-demographic characteristics of respondents; the respondents' knowledge, attitude and practice scores from respective states; and the mean response scores within each section of KAP-nOKU questionnaire for the cross-sectional survey. Parametric statistical tests were conducted to analyse normally distributed continuous data. Analysis of variance (ANOVA) was used to assess the mean difference in knowledge, attitude and practice scores among the states. Pearson correlation estimated the correlation between knowledge, attitude and practice. Paired-sample *t*-tests determined differences between pre- and post-test of respondents' knowledge and attitude scores. Non parametric McNemar's test was applied to analyse two dependent categorical variables; changes in respondent proportions for knowledge and attitude response before and after the interventional study. P value <0.05 was considered statistically significant.

## RESULTS

In the cross-sectional survey, the recruitment of respondents from each state was as follows: 7.6% from Perlis, 31.0% from Pulau Pinang, 40.0% from Perak and 21.4% from Kelantan. Of a total of 210 respondents, 97.1% were women (n=204). The majority were Malays (98.1%). The age of respondents ranged from 20 to 60 years, with a mean age of 34.9±9.2 years. A total of 159 teachers were married, followed by 17.6% who were single. The highest level of education reached by the majority (84.3%) was upper secondary school. Most of the teachers were quite new to CBR teaching and training as 65.7% had had been engaged as CBR teachers for less than five years (mean working duration was 5.5±5.0 years). The respondents reported an average income of RM1049.52 (USD333.29). Most of the teachers originated from the area where the CBR centre was located. Around 85% of the teachers reported that they had not participated in any nutrition course before.

Table 1 shows the respondent's average knowledge, attitude and practice scores based on state. There was no significant difference in mean knowledge, attitude and practice scores among the four states ($p$>0.05). Overall, more than half (55.2%) of the respondents scored less than the 50$^{th}$ percentile of total knowledge score; 78.1% scored more than the 75$^{th}$ percentile of total attitude score; and almost all (99.5%) scored between 50$^{th}$ and 75$^{th}$ percentile for practice score.

Of the total of 210 respondents, their mean knowledge, attitude and practice score were as follows: 13.80±3.73 for knowledge (below 50$^{th}$ percentile); 51.49±4.08 for

**Table 1.** Teachers' knowledge, attitude and practice on nutrition for persons with disabilities for each state (n=210; expressed in mean±sd)

| *State* | *No. of respondents (%)* | *Score (Mean±SD)* | | |
|---|---|---|---|---|
| | | *Knowledge** | *Attitude** | *Practice** |
| Perlis | 16 (7.6) | 13.69±2.94 | 50.63±3.07 | 49.25±3.66 |
| Pulau Pinang | 65 (31.0) | 14.26±3.98 | 52.52±4.18 | 47.83±3.19 |
| Perak | 84 (40.0) | 13.25±3.60 | 51.04±4.14 | 48.11±4.12 |
| Kelantan | 45 (21.4) | 14.20±3.80 | 51.16±3.97 | 47.96±3.16 |

*$p$>0.05

attitude (above 75th percentile); and 48.08±3.61 for practice (between 50th and 75th percentile). Table 2 illustrates the mean score for individual components within knowledge, attitude and practice domains. For knowledge, two components named 'nutrient and functions' and 'nutrition management for PWD' recorded scores of respondents (1.79±0.98 and 1.71±0.96) below the 50th percentile of its respective total score. For 'nutrition management for PWD', almost 95% of the teachers responded wrongly for items, "The following foods can easily cause food allergy among children with disabilities, EXCEPT…" (92.9% responded wrongly); "Persons with cerebral palsy who have drooling problem should…" (94.3% responded wrongly); and "The following foods are suitable to be added into the diet of an underweight PWD, such as children with cerebral palsy, EXCEPT…" (96.2% responded wrongly). Other items that were scored correctly by only 25% of teachers included items: "In the list below, which option is the group of nutrients?" (20.5% responded correctly); "In the list below, which has the highest calorie content?" and "Recommended salt intake for an individual per day is…" (25.7% responded correctly for both items). The majority had a favorable positive attitude for all components assessed except for the 'improving the health of PWD' which recorded below the 75th percentile of its total score; 48.6% of the teachers thought that they did not have the knowledge to teach nutrition to the PWD. Most teachers scored above the 50th percentile for total practice score and for individual components within it. Nevertheless, around 50% of the teachers reported that they always or everyday perform the following practice which is not encouraged, in their centre. For example, "I add a large amount of soup into rice for PWD"; "I insist on the PWD finishing the nutritious food even though they do not like it"; and "I restrict the food quantity given to an overweight disabled child". Only 21.4% of teachers reported that they always introduced new food to PWD (which is a good practice). There was a weak but significant positive correlation between knowledge and attitude ($r=0.343$, $p<0.05$) and between attitude and practice ($r=0.147$, $p<0.05$). No significant correlation was found between knowledge and practice.

Forty-five teachers (21.4%) from the cross-sectional survey participated in the interventional study. After the training

**Table 2.** Teachers' knowledge, attitude and practice on nutrition for persons with disabilities by domain and its components (n=210; expressed in mean±sd)

| *DOMAIN*<br>*Components* | *No. of items* | *Total score* | *Mean±SD* |
|---|---|---|---|
| KNOWLEDGE | 29 | 29 | 13.80±3.73 |
| Nutrient and sources | 8 | 8 | 4.35±1.64 |
| Nutrient and functions | 4 | 4 | 1.79±0.98 |
| Food pyramid | 6 | 6 | 3.22±1.51 |
| Healthy eating and food preparation | 5 | 5 | 2.72±1.10 |
| Nutrition management for PWD | 6 | 6 | 1.71±0.96 |
| ATTITUDE | 13 | 65 | 51.49±4.08 |
| Nutrition and health | 3 | 15 | 11.47±1.04 |
| Nutrition teaching to PWD | 6 | 30 | 26.00±2.66 |
| Improving the health of PWD | 4 | 20 | 14.03±2.15 |
| PRACTICE | 15 | 75 | 48.08±3.61 |
| Food preparation and modification | 10 | 50 | 30.90±3.14 |
| Response to aversive behaviour | 3 | 15 | 11.16±1.94 |
| Training the PWD | 2 | 10 | 6.01±0.93 |

workshop on nutrition for PWD, the teachers' knowledge score improved significantly from 14.20±3.80 to 25.38±2.36 ($p<0.001$). Similarly, the teachers' attitude score also increased significantly from 51.16±3.97 to 55.20±4.41 ($p<0.001$). All teachers (100%) could correctly answer at least 50% of questions at post-test compared to only 48.9% at pre-test. The proportion of respondents who responded correctly on individual knowledge items for pre- and post-test is shown in Table 3. There were 18 out of 29 knowledge items which showed a significant increment in correct responses

**Table 3.** Teachers' knowledge on nutrition for persons with disabilities before and after Nutrition Training Workshop (n=45)

| | | *Correct Response* | |
|---|---|---|---|
| *Knowledge Items* | | *Pre-test, n(%)* | *Post-test, n(%)* |
| K1 | In the list below, which option is the group of nutrients? | 5(11.1) | 19(42.2)[b] |
| K2 | The following are foods rich in carbohydrate, except | 15(33.3) | 28(62.2)[b] |
| K3 | The following are foods rich in protein, except | 32(71.1) | 40(88.9)[b] |
| K4 | In the list below, the food with the highest fat content is... | 30(66.7) | 45(100.0) |
| K5 | What are the two main nutrients contributed by fruits and vegetables? | 33(73.3) | 40(88.9) |
| K6 | In the list below, the food with the highest calcium content is... | 42(93.3) | 40(88.9) |
| K7 | In the list below, the foods with the highest iron content are... | 12(26.7) | 41(91.1)[a] |
| K8 | In the list below, the foods with the highest fibre content are... | 18(40.0) | 41(91.1)[a] |
| K9 | What is the main function of carbohydrate? | 37(82.2) | 43(95.6) |
| K10 | The following statements are the functions of protein, except | 16(35.6) | 39(86.7)[a] |
| K11 | The following statements are the functions of vitamin C, except | 14(31.1) | 31(68.9)[a] |
| K12 | In the list below, which has the highest calorie (energy) content? | 11(24.4) | 18(40.0) |
| K13 | What is a well-balanced diet? | 32(71.1) | 43(95.6)[b] |
| K14 | You can get all the required nutrients by... | 36(80.0) | 45(100.0) |
| K15 | Do you know about the food pyramid? | 30(66.7) | 45(100.0) |
| K16 | According to the food pyramid, the foods you are advised to take adequately are... | (37.8) 17 | 40(88.9)[a] |
| K17 | According to the food pyramid, the foods you are advised to take plenty are... | 26(57.8) | 40(88.9)[a] |
| K18 | According to the food pyramid, the foods you are advised to take in moderation are... | 8(17.8) | 39(86.7)[a] |
| K19 | Recommended salt intake for an individual per day is... | 7(15.6) | 44(97.8)[a] |
| K20 | Fruit juice is better than whole fruit because fruit juice has higher vitamin content | 24(53.3) | 43(95.6)[a] |
| K21 | Exclusive breastfeeding should be given to a baby until 6 months old | 27(60.0) | 45(100.0) |
| K22 | The most suitable food transition from liquid to solid for a child is... | 37(82.2) | 45(100.0) |
| K23 | Choose the food combination that is most suitable for a 6-year-old child | 40(88.9) | 43(95.6) |
| K24 | The following foods can easily cause choking among children with disabilities, except | 25(55.6) | 41(91.1)[a] |
| K25 | The correct method for eating management of a child with Down's syndrome is... | 25(55.6) | 45(100.0) |
| K26 | The following foods can easily cause food allergy among children with disabilities, except | 10(22.2) | 40(88.9)[a] |
| K27 | Persons with cerebral palsy (CP) who has drooling problem should… | 5(11.1) | 42(93.3)[a] |
| K28 | The following foods are suitable to be added into diet of an underweight person with disabilities (such as children with cerebral palsy CP), except | 5(11.1) | 44(97.8)[a] |
| K29 | The effective method to lose weight among obese children with Down's syndrome is… | 20(44.4) | 33(73.3)[b] |

[a]$p<0.001$, McNemar Test
[b]$p<0.05$, McNemar Test

**Table 4.** Teachers' attitude on nutrition for persons with disabilities before and after Nutrition Training Workshop (n=45)

| *Attitude items* | *Response* | *Pre-test n(%)* | *Post-test n(%)* |
|---|---|---|---|
| A30 Good eating habit is important for maintaning overall health. | Strongly agree | 31(68.9) | 35(77.8) |
| | Agree | 14(31.1) | 10(22.2) |
| | Neutral | - | - |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A31 Nutrition knowledge is beneficial for maintaning overall health.[a] | Strongly agree | 26(57.8) | 37(82.2) |
| | Agree | 19(42.2) | 8(17.8) |
| | Neutral | - | - |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A32 I am not worried about the food choices for children because they are still young. | Strongly disagree | 13(28.9) | 18(40.0) |
| | Disagree | 30(66.7) | 25(55.6) |
| | Neutral | 1(2.2) | - |
| | Agree | - | 1(2.2) |
| | Strongly agree | 1(2.2) | 1(2.2) |
| A33 In my opinion, vitamin supplementation should be given to all PWD. | Strongly disagree | 1(2.2) | 4(8.9) |
| | Disagree | 4(8.9) | 33(73.3) |
| | Neutral | 14(31.1) | 1(2.2) |
| | Agree | 23(51.1) | 7(15.6) |
| | Strongly agree | 3(6.7) | - |
| A34 I am interested in teaching nutrition among PWD. | Strongly agree | 11(24.4) | 14(31.1) |
| | Agree | 32(71.1) | 30(66.7) |
| | Neutral | 2(4.4) | 1(2.2) |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A35 I am responsible for teaching nutrition among PWD in CBR centre. | Strongly agree | 15(33.3) | 18(40.0) |
| | Agree | 30(66.7) | 27(60.0) |
| | Neutral | - | - |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A36 I am confident that I manage to convey nutrition knowledge and information to PWD. | Strongly agree | 5(11.1) | 13(28.9) |
| | Agree | 37(82.2) | 29(64.4) |
| | Neutral | 3(6.7) | 3(6.7) |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A37 My efforts in nutrition teaching to PWD will be more effective if there is cooperation from their parents or caregivers. | Strongly agree | 22(48.9) | 26(57.8) |
| | Agree | 23(51.1) | 19(42.2) |
| | Neutral | - | - |
| | Disagree | - | - |
| | Strongly disagree | - | - |

**Table 4.** Continued

| | | | |
|---|---|---|---|
| A38 In my opinion, nutrition teaching among PWD will be more effective if reference sources such as teaching module are available. | Strongly agree | 16(35.6) | 19(42.2) |
| | Agree | 28(62.2) | 26(57.8) |
| | Neutral | 1(2.2) | - |
| | Disagree | - | - |
| | Strongly disagree | - | - |
| A39 I would voice out my comment or advice if the food prepared for PWD is unhealthy. | Strongly agree | 6(13.3) | 12(26.7) |
| | Agree | 28(62.2) | 25(55.6) |
| | Neutral | 6(13.3) | 6(13.3) |
| | Disagree | 5(11.1) | 2(4.4) |
| | Strongly disagree | - | - |
| A40 I do not have knowledge to teach nutrition to the PWD. | Strongly disagree | 1(2.2) | 3(6.7) |
| | Disagree | 8(17.8) | 32(71.1) |
| | Neutral | 11(24.4) | 5(11.1) |
| | Agree | 23(51.1) | 5(11.1) |
| | Strongly agree | 2(4.4) | - |
| A41 In my opinion, food behaviour among PWD could not be improved as they do not understand my advice. | Strongly disagree | 2(4.4) | 6(13.3) |
| | Disagree | 28(62.2) | 29(64.4) |
| | Neutral | 11(24.4) | 8(17.8) |
| | Agree | 4(8.9) | 1(2.2) |
| | Strongly agree | - | 1(2.2) |
| A42 In my opinion, physical activity should be limited in the daily lifestyle of PWD in order to reduce their burden. | Strongly disagree | 5(11.1) | 10(22.2) |
| | Disagree | 29(64.4) | 30(66.7) |
| | Neutral | 7(15.6) | 2(4.4) |
| | Agree | 4(8.9) | 2(4.4) |
| | Strongly agree | - | 1(2.2) |

[a] $p<0.05$, McNemar Test

during the post-test ($p<0.05$). There was general improvement in responses on attitude questions, indicating a more positive attitude but only the item "Nutrition knowledge is beneficial for maintaining overall health" showed a significant increment (Table 4).

## DISCUSSION

The majority of the teachers were women, Malay, married, with a mean age of 34.9±9.2 years and could be considered as young teachers. The highest educational level attained by most was until secondary school and they had not participated in any prior nutrition course. Recruitment as a CBR teacher did not require any qualifications in special education. Therefore, all these observations may be linked to the finding that more than half of the teachers' nutrition knowledge on management of PWD was below average. This is also reflected in the response of 48.6% of the teachers who reported that they did not have knowledge to teach nutrition to the PWD. This low level of nutrition knowledge was also observed in studies among unlicensed or informal child caregivers (Burden *et al*., 2000) and home-based or centre-based child care providers (Freedman & Alvarez, 2010). The responses of the teachers were not satisfactory especially in the aspect of 'nutrition and function', where the mean score in this component was 1.79±0.98 of the total score of 4. This finding was similar to a qualitative study among caregivers on child health and nutrition in rural areas in

Malaysia that reported none of the focus group was able to relate nutrients to their specific functions (Ng *et al*., 2005). Furthermore, another aspect of concern was 'nutrition management for PWD' where almost all teachers responded incorrectly for items regarding food allergy, drooling and food management for underweight PWD. In addition, Burden *et al.* (2000) also reported that the caregivers lacked nutrition knowledge; and they mentioned that they were interested in obtaining nutrition information on nutrition needs and feeding of children, food allergies and choking prevention, areas that were targeted in the respective components (Appendix K24-K29). Though nutrition requirements and management for disability is disease-specific and intervention be individual-tailored, teachers are encouraged to be equipped with knowledge and skills to cope with such problems especially for those centres that accommodate a wide range of PWD with various disabilities. Thus, it is recommended that community-based public health educational programmes on general community nutrition as well as disability-specific nutrition be conducted at community level particularly in rural areas periodically by public health professionals such as dieticians or nutritionists.

Generally, the teachers had positive attitudes towards importance of nutrition on health; nutrition teaching to PWD; and improving the health of PWD. More than 90% of the teachers reported that they were interested (97.6%), were responsible (97.1%), and were confident (90.4%) of teaching nutrition to PWD. At the same time, 54.3% of them were confident that the PWD would understand their advice and the food behaviour of PWD could be improved. Some studies suggest that higher nutrition-teaching self-efficacy is correlated with spending more time teaching nutrition (Brenowitz & Tuttle, 2003; Britten & Lai, 1998). Though the teachers in the current survey failed to recall average time spent on simple nutrition teaching such as healthy vs. unhealthy food to PWD, the strong nutrition-teaching self-efficacy had exhibited their readiness to implement nutrition teaching to PWD. However, lack of nutrition knowledge might be the major barrier (Burden *et al*., 2000) as around 50% of the teachers reported that they did not have nutrition knowledge to teach the PWD in this survey. In addition, 97.1% of them stated that nutrition teaching to PWD would be more effective if reference sources were available. From the public health perspective, nutrition promotion programme need to focus on increased nutrition training for CBR teachers; they should be provided with nutrition teaching materials which are perceived to facilitate nutrition education (Hammerschmidt *et al*., 2011). Also, teacher training should be designed to increase nutrition-teaching self-efficacy rather than just simply providing nutrition information (Brenowitz & Tuttle, 2003). Such an approach should enable teachers to effectively disseminate nutrition information to PWD and their families.

Our study findings demonstrate that more than 50% of the teachers prepared lunch that included rice, *mi, mihun* or *kuetiau*, chicken or beef and vegetables in the centre at least three days per week but did not provide for fruits. The reason given was that the food budget was limited and that they were dependent on the sponsors from the community to get such sources. Although there is an allocation from the authorities, generally it is still insufficient to maintain all facilities. Most teachers stated that they added large amounts of soup into the rice for the PWD as they perceived it to facilitate swallowing by PWD who had eating difficulties. On the contrary, this can cause early satiety and prevent intake of other nutrients. The observation that more than 70% of teachers insisted on the PWD finishing the nutritious food even though they did not like it was consistent with the findings of Freedman & Alvarez (2010). Exerting a greater degree of control over children's food intake might lead to their

reduced ability to regulate energy intake, and further contributing to overweight (Scaglioni, Salvioni & Galimberti, 2008). Furthermore, they could develop a hatred towards such healthful food. Restricting food quantity given to an overweight disabled child is not encouraged but most teachers (54.7%) always did so. The children are still growing up and their disability causes them to be physically and physiologically stressed. Physical activity is recommended while practising healthy eating. Besides, teachers rarely (21.4%) introduced new food to PWD as reported by other studies (Freedman & Alvarez, 2010; Carruth *et al.*, 2004). Frequent exposure to a new food is necessary to enhance its acceptance (Williams *et al*., 2008; Wardle *et al*., 2003). Teachers need to be more patient in introducing new food especially among PWD.

In contrast to the study of Siti Sabariah *et al*. (2006), there was no correlation between knowledge and practice in our study. Our findings indicate that teachers who gain nutrition knowledge will have positive changes in attitude which may not eventually result in a significant impact on their practice in food preparation and modification for the PWD. Possible reasons could be that the teacher was not able to apply her knowledge due to facilities or financial constraints or personal unwillingness to change.

The interventional study was aimed at evaluating the changes in nutrition knowledge and attitude by exposing a group of self-selected respondents to a training workshop on nutrition for PWD. After intervention, a significant 78.7% improvement for knowledge score and 7.9% for attitude score were observed during post-test. Nutrition knowledge showed obvious and great improvements as it was previously poorly responded due to lack of such knowledge. All 6 items in 'nutrition management for PWD' individually showed a significant increment in the proportion of teachers who responded correctly as compared to the pre-test except for item K25 (Table 3). Improvement in attitude score was also noted but only an increment of 8% due to the high initial pre-test score on the measure. Most of the findings were not statistically significant despite positive improvements in nutrition knowledge and attitude due to the 'ceiling effect', which resulted in an increase of 100% (Table 3 & 4). Nutrition education and intervention had been found to be effective in improving nutrition knowledge and attitude among different populations (Freedman & Alvarez, 2010; Burden *et al*., 2000; Lee, McDonnell & Probart, 1998); and 'teachers receiving professional development on nutrition education' have been described as a facilitator in expanding nutrition education into the community (Hammerschmidt *et al*., 2011).

This study has several limitations. The number of respondents in the cross-sectional survey only comprised 85.7% of the sample size needed. This was because some teachers refused to take part in the study or were absent during data collection. The respondents were only selected from the CBR centres in the northern region of Peninsular Malaysia which are relatively homogenous (all Malays). Thus, this limits generalisability. For the intervention study, the teachers who had taken part in the initial cross-sectional survey were self-selected to participate in the workshop; they might be a group of motivated teachers. Furthermore, the post-intervention evaluation was an immediate assessment right after intervention; this might overestimate the improvement in knowledge and attitude as they was strong retention of nutrition knowledge taught. Further evaluation can be done after 1 and 3 months to assess the sustainability of their knowledge gained in the nutrition education. Moreover, a qualitative survey can be initiated to observe changes in 'practice' of the teachers in CBR centres, with the aim of not only increasing their knowledge on nutritional management for PWD, but also translating this knowledge

into appropriate behaviours and implementation in the CBR centres. Besides, it is recommended that research funding be sought to conduct the intervention studies in the state of Perlis, Pulau Pinang and Perak as the nutrition knowledge scores of the CBR teachers in the respective states were also not satisfactory. A proper sampling method should be adopted in such studies instead of convenient sampling in order to reduce selection bias.

In conclusion, nutrition knowledge among teachers in community-based rehabilitation centres in the Northern region of Peninsular Malaysia on management for persons with disabilities was below average; however, they had a positive attitude and reported fairly good practice in the centres. Nutrition education and intervention are associated with an improvement in knowledge and attitude of the teachers. Hence, multidisciplinary healthcare teams can target more specific interventional strategies to this group which can further improve the overall quality of life of the unfortunate.

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**APPENDIX**

Knowledge, Attitude and Practice Questionnaire on Nutrition for Persons with Disabilities KAP-nOKU

| | **PART A: PERSONAL INFORMATION**<br>**Please fill in your information and circle the most accurate option** | **Code** |
|---|---|---|
| 01 | Gender:<br>1 Male 2 Female | |
| 02 | Ethnic group / Race:<br>1 Malay 2 Chinese 3 Indian 4 Others, please state…… | |
| 03 | Age:……..years | |
| 04 | Marital Status:<br>1 Single 2 Married 3 Divorced 4 Widowed | |
| 05 | Job title:<br>1 Supervisor in community-based rehabilitation centre<br>2 Teacher in community-based rehabilitation centre<br>3 Assistant in community-based rehabilitation centre<br>4 Others, please state…….. | |
| 06 | Number of years working in community-based rehabilitation centre : .....years | |
| 07 | Your highest educational level:<br>1 None<br>2 Primary school (UPSR)<br>3 Lower secondary school (SRP / PMR)<br>4 Upper secondary school (SPM)<br>5 Certificate / Diploma course:.....<br>6 University | |
| 08 | Have you participated in any nutrition course before?<br>1 Yes, ……time(s)<br>2 No | |

**PART B: Knowledge, Attitude and Practice Questionnaire on Nutrition for Persons with Disabilities (PWD) among Teachers in Community-based Rehabilitation (CBR) Centres**

| **I** | **Please shade the MOST ACCURATE ANSWER for the following questions** | **Code** |
|---|---|---|
| K1 | In the list below, which option is the group of nutrients?<br>O Rice, fried chicken, and mustard<br>O Biscuit, low fat milk, and protein<br>O Cheese, calcium and egg<br>O Fat, vitamin and mineral<br>O Not sure | |
| K2 | The following are the foods rich in **carbohydrate, EXCEPT**<br>O French fries<br>O Oat<br>O Egg<br>O Chocolate drinks<br>O Not sure | |
| K3 | The following are the foods rich in **protein, EXCEPT**<br>O Soy bean<br>O Mustard<br>O Chicken<br>O Egg<br>O Not sure | |
| K4 | In the list below, the food with the **highest fat content** is...<br>O Spring roll<br>O Chappati<br>O *Roti canai*<br>O *Kuih apam*<br>O Not sure | |
| K5 | What are the **two MAIN nutrients** contributed by fruits and vegetables?<br>O Protein and calcium<br>O Vitamin B and iron<br>O Vitamin A and vitamin C<br>O Vitamin D and Vitamin E<br>O Not sure | |
| K6 | In the list below, the food with the **highest calcium content** is…<br>O Yogurt<br>O Wholemeal bread<br>O Papaya<br>O Chicken<br>O Not sure | |

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| | |
|---|---|
| K7 In the list below, the foods with the **highest iron content** are...<br>O White bread and butter<br>O Beef and internal organs<br>O Cabbage and banana<br>O Low fat milk and potato<br>O Not sure | |
| K8 In the list below, the foods with the **highest fibre** content are...<br>O Guava and red bean<br>O Wholemeal bread and fish<br>O Milk and cheese<br>O Beef and chicken<br>O Not sure | |
| K9 What is the main function of **carbohydrate**?<br>O To build muscle<br>O To provide energy<br>O To improve immune system<br>O To produce blood<br>O Not sure | |
| K10 The following statements are the functions of **protein, EXCEPT**<br>O Body growth and development<br>O Tissue generation<br>O Muscle building<br>O Bone generation<br>O Not sure | |
| K11 The following statements are the functions of **vitamin C, EXCEPT**<br>O To prevent infections<br>O To improve healing from injury<br>O For healthy gums<br>O For healthy eyesight<br>O Not sure | |
| K12 In the list below, which has the **highest calorie (energy)** content?<br>O Water<br>O Carbohydrate<br>O Fat<br>O Protein<br>O Not sure | |
| K13 What is **a well-balanced diet**?<br>O Eat more rice and meat which are important for body growth<br>O Restrict oil and high fat cooking<br>O Eat food that contains carbohydrate, protein, vitamin and fiber<br>O Eat food that contains all nutrients with recommended quantity<br>O Not sure | |

Continued

| | |
|---|---|
| K14 You can get **all** the required nutrients by...<br>O Eating a lot of food<br>O Eating a lot of meat<br>O Eating a variety of food<br>O Eating expensive food<br>O Not sure | |
| K15 Do you know about the food pyramid?<br>O Yes<br>O No<br>If "yes", continue to question K16<br>If "no", go directly to question K19 | |
| K16 According to the food pyramid, the foods you are advised to take **ADEQUATELY** are...<br>O Beef, fish, chicken<br>O Milk and dairy products<br>O Rice, bread, cereal, and tubers<br>O Vegetables and fruits<br>O Not sure | |
| K17 According to the food pyramid, the foods you are advised to take **PLENTY** are...<br>O Beef, fish, chicken<br>O Milk and dairy products<br>O Rice, bread, cereal, and tubers<br>O Vegetables and fruits<br>O Not sure | |
| K18 According to the food pyramid, the foods you are advised to take **IN MODERATION** are...<br>O Beef, fish, chicken<br>O Fat, oil and sugar<br>O Rice, bread, cereal, and tubers<br>O Vegetables and fruits<br>O Not sure | |
| K19 Recommended salt intake for an individual per day is...<br>O 1 teaspoon<br>O ½ teaspoon<br>O 1 tablespoon<br>O ½ tablespoon<br>O Not Sure | |
| K20 Fruit juice is better than whole fruit because fruit juice has higher vitamin content<br>O Agree<br>O Disagree<br>O Not sure | |

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K21 Exclusive breastfeeding should be given to baby until 6 months old
- O Agree
- O Disagree
- O Not sure

K22 The **MOST SUITABLE** food transition from liquid to solid for a child is...
- O Milk→biscuit→rice→*kuih*
- O Milk→baby cereal→rice porridge→*kuih*
- O Milk→fruit juice→chopped meat→biscuit
- O Milk→chicken soup→rice→vegetable
- O Not sure

K23 Choose the food combination that is **MOST SUITABLE** for a 6-year-old child
- O Breakfast: 1 cup of tea + 1 piece of *roti canai*
- O Breakfast: 1 cup of coffee + 1 packet of *nasi lemak* + 2 pieces of *kuih lapis*
- O Breakfast: 1 cup of milk + ½ bowl of fried mihun + 1 banana
- O Breakfast: 1 cup of milk + 2 pieces of curry puffs
- O Not sure

K24 The following foods can easily cause choking among children with disabilities, **EXCEPT**
- O Hard textured food (such as hotdog)
- O Sticky food (such as *kuih muih*)
- O Cold food (such as ice cream)
- O Sweet food (such as chocolate)
- O Not sure

K25 The **CORRECT** method for eating management of a child with Down's syndrome is...
- O Feed the child in lying position so that he is not tired
- O Feed the child with large quantity of food to train chewing skills
- O Try one type of new food at one time
- O Stop giving milk to child when he can take solid food
- O Not sure

K26 The following foods can easily cause food allergy among children with disabilities, **EXCEPT**
- O Cow's milk
- O Seafood
- O Nuts
- O Chicken
- O Not sure

K27 Persons with cerebral palsy (CP) who have a drooling problem should…
- O Reduce fluid intake
- O Increase fluid intake
- O Be given sweets
- O Be given dried foods like biscuits
- O Not sure

Continued

| | |
|---|---|
| K28 The following foods are suitable to be added into diet of an underweight person with disabilities (such as children with cerebral palsy CP), **EXCEPT**<br>O Butter<br>O Soup<br>O Full cream milk<br>O Curry gravy<br>O Not sure | |
| K29 The effective method to lose weight among obese children with Down's syndrome is…<br>O To give 3 main meals without snacks<br>O To replace rice with bread in daily menu<br>O Do not eat dinner<br>O To increase exercise<br>O Not sure | |

| II | **Questions A30-A42 do not give right or wrong answers. Please circle THE MOST ACCURATE option based on your opinion for the following statements** | | | | | |
|---|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Neutral | Agree | Strongly agree |
| A30 | Good eating habits are important for maintaning overall health | 1 | 2 | 3 | 4 | 5 |
| A31 | Nutrition knowledge is beneficial for maintaning overall health | 1 | 2 | 3 | 4 | 5 |
| A32 | I am not worried about the food choices for children because they are still young | 1 | 2 | 3 | 4 | 5 |
| A33 | In my opinion, vitamin supplementation should be given to all PWD | 1 | 2 | 3 | 4 | 5 |
| A34 | I am interested in teaching nutrition among PWD | 1 | 2 | 3 | 4 | 5 |
| A35 | I am responsible for teaching nutrition among PWD in CBR centre | 1 | 2 | 3 | 4 | 5 |
| A36 | I am confident that I manage to convey nutrition knowledge and information to PWD | 1 | 2 | 3 | 4 | 5 |
| A37 | My effort in nutrition teaching to PWD will be more effective if there is cooperation from their parents or caregivers | 1 | 2 | 3 | 4 | 5 |
| A38 | In my opinion, nutrition teaching among PWD will be more effective if reference sources such as teaching module are available | 1 | 2 | 3 | 4 | 5 |
| A39 | I would voice out my comment or advice if the food prepared for PWD is unhealthy | 1 | 2 | 3 | 4 | 5 |
| A40 | I do not have knowledge to teach nutrition to the PWD | 1 | 2 | 3 | 4 | 5 |
| A41 | In my opinion, food behaviour among PWD could not be improved as they do not understand my advice | 1 | 2 | 3 | 4 | 5 |
| A42 | In my opinion, physical activity should be limited in the daily lifestyle of PWD in order to reduce their burden | 1 | 2 | 3 | 4 | 5 |

| III | **Questions P43-P57 do not give right or wrong answers Please circle THE MOST ACCURATE option reflecting the frequency of your action in the following situations** |
|---|---|

***Never
Seldom -1-2 days in a month
Sometimes -1-2 days in a week
Always -3-4 days in a week
Everyday

| | | Never | Seldom | Sometimes | Always | Everyday |
|---|---|---|---|---|---|---|
| P43 | I prepare food like rice, meat, vegetables and fruits for PWD in CBR centre | 1 | 2 | 3 | 4 | 5 |
| P44 | I prepare vegetables in the menu of PWD in CBR centre | 1 | 2 | 3 | 4 | 5 |
| P45 | I prepare fruits in the menu of PWD in CBR centre | 1 | 2 | 3 | 4 | 5 |
| P46 | I try to modify hard-textured food to soft texture for those with eating difficulties | 1 | 2 | 3 | 4 | 5 |
| P47 | I add large amounts of soup into rice for PWD | 1 | 2 | 3 | 4 | 5 |
| P48 | I try to introduce new food to PWD | 1 | 2 | 3 | 4 | 5 |
| P49 | I only cook food that I know the children will like | 1 | 2 | 3 | 4 | 5 |
| P50 | I insist on the PWD finishing the nutritious food even though they do not like it | 1 | 2 | 3 | 4 | 5 |
| P51 | I always prepare fried food to PWD because they like it most | 1 | 2 | 3 | 4 | 5 |
| P52 | I restrict the food quantity given to an overweight disabled child | 1 | 2 | 3 | 4 | 5 |
| P53 | I add more vegetables in the daily diet of an underweight PWD | 1 | 2 | 3 | 4 | 5 |
| P54 | I inform the rules on good and bad eating behaviours to PWD who have behaviour problems during mealtime | 1 | 2 | 3 | 4 | 5 |
| P55 | I ignore autistic children who are irritable and refuse to eat at CBR centre | 1 | 2 | 3 | 4 | 5 |
| P56 | I scold the PWD if they eat in a dirty and messy condition | 1 | 2 | 3 | 4 | 5 |
| P57 | I help the PWD to do physical activity in CBR centre | 1 | 2 | 3 | 4 | 5 |