ORIGINAL ARTICLE

Knowledge, Attitude and Practice on Vegetables Intake among Adolescents in Rural Terengganu, Malaysia

Mohd Adzim Khalili Rohin, Norhayati Abd Hadi, Sahirah Sariff, Siti Syarma Mohd Shariff, Norhaslinda Ridzwan, Mimie Noratiqah Jumli

School of Nutrition & Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Gong Badak Campus, Maimunah Block, 21300 Kuala Nerus, Terengganu Darul Iman, Malaysia

ABSTRACT

Introduction: The objective of this study was to examine the levels of knowledge, attitudes, and practices of adolescent's vegetable intake in rural Terengganu, Malaysia. **Methods:** This study is a cross-sectional study conducted at selected secondary schools in the districts of Marang and Hulu Terengganu from January 2019 until May 2019. By using multistage random sampling in schools and based on inclusion criteria, a total of 160 students was recruited. A self-administered questionnaire consisting of demographic information, knowledge, attitude and practice of vegetable intake was developed by the researchers. The reliability test showed that the validity and internal consistency of the questionnaire were acceptable with a Cronbach Alpha value of 0.701, 0.702 and 0.708 for knowledge, attitudes and practices, respectively. **Results:** The findings showed that respondents had 'good' knowledge (41%), 'good' attitudes (41%) and 'fair' practices (52%) towards the vegetable intake. There were a significant difference in the mean knowledge scores between male and female respondents (p=0.041) based on the Independent T-test. A positive correlation was observed between attitude and knowledge (r=0.38), attitude and practices (r=0.25) (p<0.05). The result also showed that respondent's intake of vegetables was significantly correlated with knowledge (p=0.014) and attitudes (p=0.006). **Conclusion:** The findings showed that only 9% adolescents achieved adequate intake of vegetables per day based on recommendation by Malaysian Dietary Guideline. Therefore, if these population did not change their food behavioural intake, the incidence of chronic diseases was expected to rise during their adulthood.

Keywords: Vegetables intake, knowledge, attitudes, practices, Malaysia

Corresponding Author:
Mohd Adzim Khalili Rohin, PhD
Email: mohdadzim@unisza.edu.my
Tel: +609-6688522

INTRODUCTION

According to the World Health Organization (WHO) (1, 2), an adolescent is suggested to have at least five servings of fruit and vegetable varieties a day (about 400g or 80 g per serving). However, in Malaysia, the prevalence of adequate vegetable intake among adolescents between the ages of 10 and 17 was only 7.9%; implying that most adolescents did not comply with the recommendation (3). Nonetheless, Peltzer & Pengpid (4) reported that 76.3% of adolescents in Asian countries was not met the recommended intake of vegetable, with an average of 1.9 servings of vegetables consumed daily. Meanwhile, only 41.5% of respondents consumed vegetable at least three times a day in Terengganu state reported the latest NHMS (3) in 2017.

Promoting sufficient intake of vegetables per day is one of the key components of a healthy diet; which plays a major role in both prevention of malnutrition and non-communicable diseases during adulthood (1, 5). Some main factors, however, including urbanization, industrialization, technological growth, economic development and market globalization, have led to rapid changes in diet and lifestyle in the last decade (6). As an adolescent, through shifts in societal norms, habits or parenting, the transitional process of dependency and preparation of legal adulthood is a transitional phase (7); eating trends or habits will continue into adulthood throughout the adolescent cycle (3).

In previous studies, Othman et al. (8) observed that attitude, habit, social influences and availability were important factors in fruit and vegetable consumption behaviour. Daud et al. (9) explained in depth that rural and urban adolescents have moderate knowledge, positive attitude and good practice scores for dietary intake of fibers. Consequently, these studies showed that domain mediators of knowledge, attitude and practices (KAP) have an impact on behavioural respondents. These KAP domains related to the intake of vegetables among rural adolescents are also needed as they can be treated in intervention programmes as mediating variables. Therefore, the purpose of this study is to evaluate the levels of KAP on vegetable intakes of adolescents in

rural Terengganu, Malaysia.

MATERIALS AND METHODS

Study design and study population

The study area included in Marang and Hulu Terengganu rural districts, in Terengganu state. This was a cross-sectional study conducted from January 2019 to May 2019, with a total duration of the study was 5 months. The sample size used for this study was determined using Single Proportion Formula (10). Based on National Health Morbidity Survey (3), the proportion of the population with adequate vegetable intake among adolescent's ages 10 – 17 years old in Malaysia was 8%. The level of significance was set at 0.05 and z-score of the study was 1.96. By considering 20% of dropout rate, the final sample size selected in this study was 160. Follows, the inclusion criteria of the respondents were both males and females Malaysians who aged 14 and 16 years old, studying and living in rural Terengganu of Marang and Hulu Terengganu districts and have parental consent to participate in this study. Non-Malaysian respondents and respondents having physical or medical conditions that influence normal dietary intake were excluded.

In this study, multistage random sampling was used as follows:
Stage 1: Two out of eight districts were selected using a simple random sampling technique of balloting, which is Marang and Hulu Terengganu. In Marang district, 12 schools met the inclusion criteria, while in Hulu Terengganu district, 11 schools met the criteria.
Stage 2: By using a probability sampling technique, the sampling frame involve students of form II and form IV at two rural secondary schools selected in Marang and Hulu Terengganu.
Stage 3: From the enrolment, 10 males and 10 female students were selected by simple random sampling from each form II and form IV at two rural secondary schools in districts selected.

A total of four schools from two selected districts provided a sample of 160 respondents. Ethics approval was obtained from the Research Ethics Committee of Faculty of Health Sciences, Universiti Sultan Zainal Abidin (UniSZA) with reference number UniSZA.C/2/UHREC/628-2 (45). The study was also being approved by the Ministry of Education Malaysia with registration number, KPM.600-3/2/3-eras (2677).

Data collection

Prior to data collection, a consent letter was distributed to all respondents to obtain their agreement. The total number of respondents was acceptable based on minimum requirement from the sample size calculation with 20% dropout rate by 160. After consent from parents were obtained, the respondents attended anthropometric measurement session and interview session conducted by the researcher for Food Frequency Questionnaire regarding dietary vegetable intake and KAP questionnaire design.

Part 1: Anthropometric assessments

Anthropometric assessments consisted of measuring weight and height was applied according to Mohd Adzim Khalili Rohin et al. (11, 12). Body weight of respondents was measured in a light clothing with their shoes removed by using SECA 813 digital flat scale (Hamburg, Germany) to the nearest 0.1 kg. On the other hands, the height of respondents was measured with their shoes removed by using Seca 217 Model Portable Stadiometer (Hamburg, Germany) to the nearest 0.1 cm. BMI of the respondents were calculated and analysed by using WHO Anthro Plus Version 3.2.2 (13). The Z-score or standard deviation obtained from the software were used to classify the BMI of the respondents based on WHO BMI classification for adolescent (13).

Part 2: Food Frequency Questionnaire (FFQ)

A validated MyUM Adolescent Food Frequency Questionnaire (FFQ) (14) was used to measure the frequency of vegetable intake of the respondents, constructed from the MyHeARTs population-based study conducted in 2012 (15). The questionnaire consisted of 24 vegetable items which classified into 6 groups; green, legumatous, cruciferous, fruits, root and tuberous vegetables. The method used by Khalili et al. (16) was done accordingly in a face-to-face interview by asked respondents' specifically on vegetables intake portions and the frequency recorded in nine categories as "never", "less than once per month", "one to three times per month", "once a week", "two to four times a week", "five to six times a week", "once a day", "two to three times a day", "four to five times a day" and "six times a day or more". A flip chart with colour illustrations of household measurement utensils and the portions of vegetable items was prepared based on the Malaysian Atlas of Food Exchanges and Portion Sizes (14). For recommended guidelines, MDG for Children and Adolescents (17) had specifically recommends adolescents aged 10-18 years old to consume at least 3 servings of vegetable daily for adequate intake.

Part 3: Questionnaire design and reliability test

A self-administered questionnaire in this study was developed by the researchers through combining several validated questionnaires regarding vegetables intake details (8, 9, 18, 19, 20, 21). The researcher had adapted the questionnaire on similar factors towards vegetable intake and translated into Malay languages. The reliability test and internal consistency of the questionnaire were tested in a pilot study involving 30 students. These respondents were not involved in the final survey. By using Cronbach Alpha test, the reliability coefficient obtained from knowledge, attitudes and practices were 0.701, 0.702 and 0.708 respectively, acceptable internal consistency (22). Following that, several items in the questionnaire were modified to improve clarity.

This questionnaire consisted of four sections, namely socio-demographic background, knowledge, attitudes and practices regarding vegetable intake.

Section 1: Socio-demographic background
This section included six questions regarding socio-demographic information such as age (years), gender, religion, height, weight and body mass index (BMI).

Section 2: Knowledge of dietary vegetable intake
This section consisted of 11 closed-end questions regarding the general knowledge about consumption of vegetables and benefits of vegetable intakes. The answer choices were divided into three categories; 'yes', 'no', and 'not sure'. Each correct answer carried one mark while the wrong answer carried zero marks. The total score ranged from 0 to 11 for the knowledge domain. The total scores of knowledge were categorised either poor (≤50%), fair (51% - 69%) or good (>70%). The collected scores were reported as mean (SD) and were then correlated with the other domains, attitudes and practices.

Section 3: Attitudes of dietary vegetable intake
This section consisted of 11 questions on attitudes towards vegetable consumption. A 4-point Likert scales answers was used as follows: Neutral – 0; Strongly disagree – 1; Disagree – 2; Agree – 3; Strongly agree – 4. 'Strongly agree' gives the highest score, hence gives the total score ranged from 0 to 44. The total scores of attitude scores were categorised either poor (≤50%), fair (51% - 69%) or good (>70%). The collected scores were reported as mean (SD) and were then correlated with the other domains, knowledge and practices.

Section 4: Practices of dietary vegetable intake
This section consisted of 8 multiple choice questions regarding serving size and frequency of vegetable intake. The total score in this section ranged from 0 to 8. The total scores of practices scores were categorised either poor (≤50%), fair (51% - 69%) or good (>70%). The collected scores were reported as mean (SD) and were then correlated with the other domains, attitudes and knowledge.

Statistical analysis
Descriptive statistic for socio-demographic information and prevalence of vegetable intake were presented as frequencies and percentages. The statistical analysis was computed by using the IBM Statistical Package for the Social Sciences (SPSS), version 22.0 software (IBM Corp. Armonk, NY, US). Results were expressed as mean and standard deviation for domains of knowledge, attitudes and practices towards vegetable intakes. Pearson correlation test was used to assess the correlation between the KAP variables and the outcomes. Independent T-test and One-way ANOVA test were used to compare levels of KAP to the selected test parameters. A p-value of less than 0.05 ($p<0.05$) was considered to be statistically significant.

RESULTS

Demographic characteristics of respondents
Based on Table I, the demographic information were available for 160 respondents. In this study, 52% of the respondents were males and the females with 48%. Meanwhile, there were 77 respondents (48%) of form two students and 83 (52%) respondents of form four students. All of the respondents involved were Malay race (100%).

Anthropometric assessment of respondents
The results of the respondents' anthropometric assessment; weight (kg), height (cm) and BMI status (kg/m2) are tabulated in Table I. The mean weight and height of the respondents were 52.80 (15.18) kg and 153.78 (8.11) cm, respectively. On the other hand, mean of the respondents were 22.20 (5.96) kg/m2, normal weight status based on the WHO classification (13). The BMI of the respondents were calculated using WHO Anthro Plus and the classification of the BMI was based on BMI for adolescent age Z-score (13). The results showed the majority of the respondents were normal with 74 (45%), following obese by 20%, overweight with 15%, thin with 13% and lastly severely thin with 6%.

Table I: Socio-demographic data of the respondents (n=160)

Variables	N (%)	Mean (SD)
Gender		
Male	83 (52)	
Female	77 (48)	
Age (years)		
14	77 (48)	
16	83 (52)	
Height (cm)		153.78 (8.11)
Weight (kg)		52.80 (15.18)
BMI status (kg/m2)		22.20 (5.96)
Severely thin	10 (6)	
Thin	21 (13)	
Normal	74 (46)	
Overweight	24 (15)	
Obese	31 (20)	

Prevalence of vegetable intake among respondents by gender, age and BMI
In this study, Table II shows that the majority of the respondents did not consume adequate intake of vegetables, in which less than three servings per day (< 3 servings of vegetable/day). Only 9% of the respondents who meet the recommendation of adequate intake of 3 or more servings of vegetables per day (≥ 3 servings of vegetable/day). Even though the overall consumption of vegetables was lower among respondents, males (59%) were more likely to consume more servings of vegetables

Table II: Prevalence of vegetables intake among respondents by gender, age and BMI (n=160).

	Vegetable intake (< 3 servings/day) N (%)	Vegetable intake (≥ 3 servings/day) N (%)
Overall	146 (91)	14 (9)
Gender		
Male	79 (54)	8 (59)
Female	67 (46)	6 (41)
Age (Years)		
14	69 (47)	5 (35)
16	77 (53)	9 (65)
BMI status		
Severely thin	10 (7)	0 (0)
Thin	19 (13)	0.8 (6)
Normal	64 (44)	9.1 (65)
Overweight	23 (16)	1.7 (12)
Obese	30 (20)	2.4 (17)

per day as compared to females (41%). Moreover, older respondents (16 years old) (65%) tend to consume 3 or more servings of vegetables per day compared to 14 years old respondents (35%). On the other hand, differences in vegetable consumption were also observed among respondents with different BMI status. Respondents with normal BMI (65%) had been observed to more likely having an adequate intake of vegetable consumption as compared with thin respondents (6%).

Level scores of KAP questionnaire

a) Knowledge towards vegetable intake

Overall, the knowledge on vegetable intake among the respondents were 'fair', with mean scores of 66.84 (14.98). However, 42% of the respondents displayed 'good' and 'fair' knowledge towards vegetables intake, respectively. Based on the question, the majority of the respondents agreed that frequent consumption of vegetables aids in reducing risk of developing chronic disease (60%), promotes optimal functioning of gastrointestinal tract (63%) and preventing constipation (62%). Thoroughly, a good knowledge regarding health benefits of vegetable consumption was mostly observed among respondents.

b) Attitudes towards vegetable intake

The overall attitude score towards vegetable intake among respondents were within fair range, 65.07 (16.62). However, this study showed that the majority of the respondents had 'good' (41%) and 'fair' (40%) attitudes towards vegetable intake. A positive attitude had been shown by the majority of respondents who strongly believed frequent consumption of vegetables would make them healthier (77%) and only 4% of the respondents answered strongly disagree (data not attached). Another question regarding attitudes towards vegetable intake reported that most of the respondents in this study agree that they eat vegetable because they want to set a good example to others (31%). On the other hands, most of respondents also claimed that they eat vegetables because someone else advices them to consume it (43%).

c) Practices towards vegetable intake

In this study, the mean score of practices towards vegetable intake among respondents was 55.54 (9.74), in the fair range. The majority of the respondents obtained 'poor' (42%) and 'fair' (52%), while only 11 respondents were having good range. In practice section, survey observed that 66% of respondents answered 'sometimes' in the questions regarding whether they eat vegetables when they eat away from home, while the remaining answered 'never' (12%) and 'most of the time' (22%). A similar result showed that the majority of the respondent's rarely practicing intake of vegetables at both home (58%) and school (51%). The percentage of respondents who practicing vegetable intake most of the time was higher when they at home (38%) as compared to school (18%) and away from home (22%).

Association between KAP levels and gender, age and BMI status

The difference in the mean scores of KAP was measured between the different groups of gender, age and BMI status (Table III). The results showed fair levels of knowledge, attitude and practice among both male and female respondents. There was no significant difference in the mean attitude and practice scores between gender ($p>0.05$). However, there was a significantly higher knowledge score among females (61.05 (15.59)) compared to males (59.78 (19.72)) ($p>0.05$).

Among the two age groups of respondents, the one with a higher score's level of attitude and knowledge were in the age group of 16 years old with mean 66.15 (15.97) and 62.52 (17.84), respectively. Meanwhile, those aged 16 years old showed a low score's level of practice with a mean score of 55.29 (10.17) compared to the 14 years old. In general, age groups of 14 and 16 years old observed a fair level of KAP. However, there is no

Table III: Mean score on KAP of vegetable intake among respondents based on gender, age, and BMI (n = 160).

Aspects	Knowledge	Attitude	Practice
Gender			
Male (n=83)	59.78 (19.72)	65.15 (16.60)	56.39 (9.87)
Female (n=77)	61.05 (15.59)	64.97 (16.75)	54.55 (9.56)
p-value	0.041 $^{\$}$	0.693	0.530
Age groups			
14 years old (n=77)	57.84 (17.74)	63.79 (17.37)	55.84 (9.28)
16 years old (n=83)	62.52 (17.84)	66.15 (15.97)	55.29 (10.17)
p-value	0.651	0.429	0.245
BMI status (kg/m^2)			
Severely thin (n=10)	55.42 (15.01)	53.80 (17.15)	57.84 (11.94)
Thin (n=21)	64.21 (13.67)	68.47 (17.85)	56.52 (10.82)
Normal (n=74)	57.90 (17.57)	64.86 (17.00)	55.34 (9.27)
Overweight (n=24)	63.10 (18.69)	64.41 (13.83)	53.69 (10.09)
Obese (n=31)	63.14 (20.74)	67.51 (15.92)	56.10 (9.37)
p-value	0.264	0.121	0.723

Data represent as mean (SD).
$^{\$}$ Independent T-test, $p<0.05$
* One Way ANOVA test, $p<0.05$

significant difference in the average score of KAP with respect to the different age groups variables (p>0.05).

Meanwhile, the results showed that different levels of KAP with respect to the BMI status (kg/m2) were categorised as fair levels (Table III). There are no significant difference between the KAP levels with respect to BMI categories; severe thin, thin, normal, overweight and obesity (p>0.05). However, the results surprisingly observed higher scores of knowledge among overweight and obese respondents compared with normal BMI; mean 63.10 (18.69) and 63.14 (20.74), respectively. Whilst, thin and severely thin respondents had higher scores of attitudes and practices with mean 68.47 (17.85) and 57.84 (11.94), respectively. Whilst, normal BMI status of respondents gives lower scores of knowledge domain with mean 65.18 (14.80).

Correlation of KAP on vegetables intake

Table IV showed the correlation of knowledge, attitudes and practices on vegetable intake of respondents. The results show positive correlation from two main domains, among knowledge and attitudes (r = 0.37) and practices and attitudes (r = 0.25), p<0.01. However, there was no correlation observed among knowledge and practice towards vegetable intake. Apart from that, there were positive correlation between knowledge and attitudes with vegetable intake, respectively (p<0.01). Meanwhile, there was no significant correlation between practices and vegetable intake (p>0.05).

Table IV: Correlation between KAP on vegetables intake among respondents (n=160)

Levels	R	p-value
KAP Domains		
Knowledge – attitudes	0.37	0.000**
Knowledge – practices	0.02	0.842
Attitudes – practices	0.25	0.001*
KAP and vegetables intake		
Knowledge – vegetables intake	0.15	0.038*
Attitude – vegetables intake	0.20	0.006**
Practices – vegetables intake	0.07	0.352

* Correlation is significant at the 0.05 level (2 tailed)
**Correlation is significant at the 0.01 level (2 tailed)

DISCUSSION

According to the National Health and Morbidity Survey (NHMS) (3), 8% of Malaysian adolescents between the ages of 10 and 17 have at least 3 servings of vegetables per day. In the state of Terengganu, NHMS (3) stated that only 6.1% of adolescent populations met the vegetable intake's recommendation. Despite that in this study, it was observed that the majority (91%) of adolescents consumed less than 3 servings of vegetable intake per day. Only 9% of adolescents met the recommendation of adequate intake of 3 or more servings of vegetables per day; which is marginally higher than the current latest NHMS (3).

A recent systematic analysis of studies on the determinants of fruit and vegetable intake showed that gender is one of the key determinants of adolescent's consumption of fruits and vegetables, with girls reporting consuming more than boys in 14 of 17 European studies (23). For one of the behavioural belief elements comprising the attitudes model, Emanuel et al. (24) indicated women had more favourable beliefs than men by having 3 cups of vegetable consumption per day while men reported under 3 cups. However, Bere et al. (25) clarified that gender disparities can be caused by preferences and accessibility.

The perceived accessibility among females could be higher because parents raise their daughters differently from raising their sons when it comes to foods (25, 26). On the other hand, Wind et al. (27) observed daughter parents were more interested in the study of Pro Children and engage more frequently in the parental activities than boy parents. However, higher scores of attitudes and practices on male's vegetable intake were observed in this study compared to female although not significant. Regardless of that adolescent males in rural Terengganu had more preferences and accessibility than adolescent females, the contrary present research with the preceding would have. This analysis of KAP, however, cannot conclude on the relationships among determinants.

On the other hand, age is another major factor which was found to be important in relation to adolescent's vegetable intakes (23, 28). Ziaei et al. (29) reported 11th grade students had 90% higher odds of eating fewer vegetables than 2nd grade of high school, indicating the risk for decreases in vegetable intakes increased with high grade and age. Even though respondents aged 16 showed higher attitude scores of vegetable intake than 14 years of age in the present study, the practice scores recorded lower score than younger.

Practice or behaviour generally refers to an applied attitude (30); which are the actual patterns of physical behaviour, activity, or action. The lower scores of practices suggested, therefore lower or rising vegetable intake among respondents. The decreasing intake of vegetables among older adolescents could be due to the fact that these respondents have less parental activity and more exposure with friends outside the neighbourhood at fast food outlets (28, 30, 31). Nevertheless, the decreasing trends in vegetable intake among older adolescents compared with younger adolescents may persist from adolescents to adulthood (32, 33).

A research by Ziaei et al. (29) on the other hand, stated that overweight or obese students had 89% higher odds of eating less vegetables than normal weight students. Obesity or overweight generally considered to have a sedentary lifestyle / behaviour contributing to the consumption of unhealthy food options such as salty, fatty and processed foods and fewer fruit and vegetable

consumption (34, 35). While obese and overweight respondents had lower attitudes and practices of vegetable intake scores in this sample, these respondents reported higher scores of knowledge about vegetable intake compared to other BMI classifications. This could be due to the fact that obese / overweight respondents know each of the recommendations and benefits of the vegetables, but fail to practice because of their own preferences and perceived behavior. Nevertheless, the prevalence study reported an adequate intake of vegetables in the majority of respondents with normal BMI status, but not significantly different.

Overall, this study involved a KAP survey that measured changes in human knowledge, attitude, and practice regarding intake of vegetables. The results showed what the respondents think, how they felt about the issue, and their behaviour toward intake of vegetables. The KAP survey also focused on the social, cultural, and economic factors that may have affected the respondent's vegetable intake (30). Such KAP studies are appealing because of the underlying factors such as easy design, quantifiable data, concise representation of results, generalization of small sample outcomes to a wider population, cross-cultural comparison, speed of implementation, and ease of training (36).

The majority of adolescents (41%) obtained 'good' in knowledge in this study was far higher than attitudes and practices towards intake of vegetables in contrast. Environmental factors such as availability and free internet access to information, both forms of print and mass media that offer adolescents the opportunity to search for any relevant nutritional information, thus increase their awareness (18). Similarly, Silva et al. (18) stated high school students were well aware of the nutritional value of fruits and vegetables and their health benefits. Oldwega-Iheron & Edgal (22), on the other hand, observed that the majority of school students had poor knowledge of recommended vegetable intake per day (63%); lower than Beech at al. (37) which reported 80% lack of knowledge of recommended adolescent's vegetable intake. However, the different outcomes may be attributable to differences in demographic and socio-economic status among adolescents. Whilst, 19% and 42% of the respondents showed 'poor' attitudes and practices toward vegetables intake, respectively.

Following that, there was a significant, positive correlation between domains, namely between knowledge and attitude and attitude and practice among adolescents. This indicates that the respondent's level of knowledge had a significant influence on the attitude towards vegetable intakes but not significantly on the level of practices. In addition, the findings showed that only the level of the respondent's attitudes significantly affects the vegetable intake behaviors, but not significantly on the level of knowledge. In addition, the findings showed a positive correlation between three domains, knowledge, attitudes and practices towards vegetable intake but not significant at the level of practices.

Pilling et al. (38) stated knowledge alone is insufficient to guarantee the desired attitude and practice changes. In order to ensure a successful practice of vegetable intake, individuals must make the requisite efforts to turn the acquired knowledge into the desired attitude. It is also widely understood that any necessary behavioural changes would be accompanied by an acceptable mind-set based on new knowledge (39). It thus supports the point that knowledge must be in place before changes in attitude will lead to any changed practice (30). In other words, knowledge affects attitude, which then affects a person's pattern of practice or behaviour.

CONCLUSION

In conclusion, this study provided considerable insight into the KAP level of vegetable intake in rural Terengganu among adolescents. Promoting an increase in adolescent vegetable intake is a significant public health concern because it is related to multiple behavioral variables as well as socio-economic and demographic issues. However, adolescents with better knowledge were more likely to develop an improved sense of vegetable intake that will be reflected in their attitudes, and could therefore contribute to better intake practices. Therefore, adolescents can use the successful attitude and behaviour of occupied knowledge towards the realistic implementation of vegetable intake.

ACKNOWLEDGEMENTS

The authors would like to thank the UniSZA for the financial aid (UniSZA/2018/DPU/14), the Ministry of Education (MOE) and Jabatan Pelajaran Negeri Terengganu (JPNT) for approval to carry out research on secondary school students with reference number KPM.600-3/2/3-eras (2677) and ethics committee from the UniSZA Human Research Ethics Committee with reference number UniSZA/UHREC/2018/51. The authors would like to thank the school's representative and secondary school students meant for their hospitality and enthusiasm to engage in this study. Thanks also to all conspired researchers who cooperated and steering in this study.

REFERENCES

1. World Health Organization. Adolescent development. 2018. Available from: https://www.who.int/maternal_child_adolescent/topics/adolescence/development/en. [Accessed 8th August 2018].
2. World Health Organization. Diet, nutrition and the prevention of chronic diseases. Report of a Joint FAO/WHO Expert Consultation. Geneva, (WHO Technical Report Series, No. 916). 2013. Available from: http://www.who.int/dietphysicalactivity/

publications/f&v_promotion_initiative_report.pdf?ua=1 [Accessed 8th August 2018].
3. National Health and Morbidity Survey (NHMS). Institute for Public Health Adolescent Health Survey, Malaysia. NHMS 2017.
4. Peltzer K, Pengpid S. Fruits and vegetables consumption and associated factors among in-school adolescents in five Southeast Asian countries. Int J Environ Res Public Health. 2012; 9 (10): 3575–3587.
5. Gonzales JT, Raaij JV, Narciso ZV. Consumption pattern for fruits and vegetables of some Filipino adolescents in selected public schools in the City of Manila. J Nutr Disorders Ther. 2016; 6: 4.
6. Maiyaki MB, Garbati MA. The burden of non communicable diseases in Nigeria; in the context of globalization. Ann Afr Med. 2014; 13: 1 10.
7. Kim SA, Moore LV, Galuska D, Wright AP, Harris D. Vital signs: fruit and vegetable intake among children - United States, 2003 - 2010. MMWR Morb Mortal Wkly Rep. 2014; 63 (31): 671–6.
8. Othman KI, Shahrim M, Karim A, Karim R, Adzhan N, Halim NA, Osman S. Factors influencing fruits and vegetables consumption behaviour among adults in Malaysia. J Agribus Mark. 2012; 5: 29–46.
9. Daud NM, Fadzil NI, Yan LK, Makbul IAA, Yahya NFS, Teh AH, Rahman HA. Knowledge, attitude and practice regarding dietary fibre intake among Malaysian rural and urban adolescents. Malays J Nutr. 2018; 24 (1): 77–88.
10. Daniel WW. Biostatistics; a foundation for analysis in the health sciences. 7th edition. New York: John Wiley & Sons. 1999.
11. Mohd Adzim Khalili R, Azizul Fadzli WJ @ AR, Mohd Nizam Z, Aniza AA, Nik Ahmad Shaiffudin NH, Rosliza Y, Norhaslinda R, Mimie Noratiqah J, Sakinah H. Nutritional status of the Temiar orang asli community in Kuala Betis, Gua Musang, Kelantan. Pak J Nutr. 2018; 17 (7): 311–8.
12. Mohd Adzim Khalili R, Norhayati AH, Venkateshaiah MD, Mohd Nasir MN. Anthropometry and body composition status during Ramadan among higher institution learning centre staffs with different body weight status. Sci World J. 2013: 1-7.
13. World Health Organization. Calculator: WHO 2007 Z-scores. 2007. Available from: https://apps.cpeg-gcep.net/who2007_cpeg/ [Accessed 29th November 2018]
14. Mohamed K, Tin TS, Jalaludin MY, Al-Sadat N, Majid HA. Comparative validity of a Food Frequency Questionnaire (MyUM Adolescent FFQ) to estimate the habitual dietary intake of adolescents in Malaysia. Asia Pac J Clin Nutr. 2018; 27 (4): 898–907.
15. Hazreen MA, Su TT, Jalaludin MY, Dahlui M, Chinna K, Ismail M, Murray L, Cantwell M, Sadat N. An exploratory study on risk factors for chronic non-communicable diseases among adolescents in Malaysia; overview of the Malaysian Health and Adolescents Longitudinal Research Team study (The MyHeART study). BMC Public Health. 2014; 14:S6.
16. Khalili MAK, Ummu Habibah A, Norhayati AH, Zetty Hulwany MZ, Mohd Nasir MN, Intan Suhana Munira MA, Venkateshaiah MD. Nutritional status and quality of life during Ramadan among higher institution learning centre staffs with different body weight status. World J Pharm Res. 2014; 3 (6).
17. Malaysian Dietary Guidelines for Children and Adolescents. 2013. Available from http://nutrition.moh.gov.my/wp-content/uploads/penerbitan/buku/MDG_Children_adolescent_2014.pdf [Accessed 29th November 2018]
18. Silva OO, Ayankogbe OO, Odugbemi TO. Knowledge and consumption of fruits and vegetables among secondary school students of Obele Community Junior High School, Surulere, Lagos State, Nigeria. J Clin Sci. 2017; 14 (2): 68-73.
19. Makumbe B. Knowledge, attitude, practices and factors affecting fruit and vegetable consumption in adolescents (Gokwe South District). Doctoral dissertation, Midlands State University, Gweru. 2014. Available from http://ir.msu.ac.zw:8080/xmlui/handle/11408/2333 [Accessed 10th August 2018]
20. Harrington EM. Fruit and vegetable intake, attitudes, and beliefs of multicultural middle school students in Central Massacussetts. Master theses, University of Massachusetts Amherst. 2016. Available from https:// scholarworks. umass. edu/masters_theses_2/348 [Accessed 16th November 2018]
21. Larson R. A school-based approach to increasing fruit and vegetable intake of high school students. Master's Theses and Doctoral dissertation, Eastern Michigan University. 2008. Available from: https://pdfs.semanticscholar.org/d26c/df3bb91179c772cabdeae18b129d45637d08.pdf [Accessed 2nd December 2018]
22. Oldewage Theron WH, Egal AA. Nutrition knowledge and nutritional status of primary school children in QwaQwa. S Afr J Clin Nutr. 2010; 23: 149 54.
23. Rasmussen M, Krolner R, Klepp KI, Lytle L, Brug J, Bere E, Due P. Determinants of fruit and vegetable consumption among children and adolescents: systematic review of the literature. Part I: quantitative studies. Int J Behav Nutr Phys Act. 2006; 3: 22.
24. Emanuel AS, McCully SN, Gallagher KM, Updegraft JA. Theory of planned behaviour explains gender difference in fruit and vegetable consumption. Appetite. 2012; 59 (3): 693-7.
25. Bere E, Brug J, Klepp KI. Why do boys eat less fruit and vegetables than girls? Public Health Nutr. 2007; 11 (3): 321-5.
26. Brug J, Tak NI, Velde SJ, Bere E, de Bourdeaudhuij I. Taste preferences, liking and other factors related

to fruit and vegetables intakes among school children: results from observational studies. Br J Nutr. 2008; 99 (1): S7-S14.
27. Wind M, De Bourdeaudhuij I, te Velde SJ, Sandvik C, Klepp KI, Due P, Brug J. Correlates of fruit and vegetable consumption among 11-year-old Belgian-Flemish and Dutch schoolchildren. J Nutr Educ Behav. 2006; 38: 211–21.
28. Pearson N, Biddle SJ, Gorely T. Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. Public Health Nutr. 2009; 12: 267-83.
29. Ziaei, R., Shahi, H., Dastgiri, S, Mohammadi R, Viitasara E. Fruit and vegetable intake and its correlates among high-school adolescents in Iran: a cross-sectional study. J Public Health. 2019.
30. Chien-Yun D, Wan-Fei C, Yu-Hsi Y, Chia-Hung Y. A study on modification of knowledge, attitude and practices on vocational high school electronics courses integrated with nanotechnology concept. Int J Thermal & Environ Engineering. 2012; 4 (1): 73-9.
31. Silva DA, Silva RJ. Association between physical activity level and consumption of fruit and vegetables among adolescents in Northeast Brazil. Rev Paul Pediatr. 2015; 33: 167-73.
32. Mikkila V, Rasanen L, Raitakari OT, Pietinen P, Viikari J. Consistent dietary patterns identified from childhood to adulthood: the cardiovascular risk in young Finns study. Br J Nutr. 2005; 93: 923-31.
33. Neumark-Sztainer D, Story M, Hannan PJ, Croll J. Overweight status and eating patterns among adolescents: where do youths stand in comparison with the healthy people 2010 objectives? Am J Public Health. 2002; 92: 844–51.
34. Baygi F, Heshmat R, Kelishadi R, Mohammadi F, Motlagh ME, Ardalan G, Asayesh H, Larijani B, Qorbani M. Regional disparities in sedentary behaviors and meal frequency in Iranian adolescents: the CASPIAN-III study. Iran J Pediatr. 2015; 25: e182.
35. Kelishadi R, Ardalan G, Gheiratmand R, Gouya MM, Razaghi EM, Delavari A, Majdzadeh R, Heshmat R, Motaghian M, Barekati H, Mahmoud-Arabi MS, Riazi MM. Association of physical activity and dietary behaviours in relation to the body mass index in a national sample of Iranian children and adolescents: CASPIAN Study. Bull World Health Organ. 2007; 85: 19-26.
36. Launiala A. How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. Anthropol Matt J. 2009; 11 (1): 1-13.
37. Beech BM, Rice R, Myers L, Johnson C, Nicklas TA. Knowledge, attitudes, and practices related to fruit and vegetable consumption of high school students. J Adolesc Health. 1999; 24: 244–50.
38. Pilling VK, Brannon LA, Shanklin CW, Howells AD, Roberts KR. Identifying specific beliefs to target to improve restaurant employees' intentions for performing three important food safety behaviours. J Am Diet Assoc. 2008; 108: 991-7.
39. Sudsawad P. Knowledge translation: introduction to models, strategies, and measures. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research. 2007.