

Knowledge, Attitude and Practices among Mothers Regarding Childhood Obesity at Kuantan, Malaysia

Nur Khairul Bariyyah Mohd Hatta¹⁾, Nor Azlina A. Rahman¹⁾, Nor Iza A Rahman²⁾, Mainul Haque²⁾

ABSTRACT

Background: The prevalence of childhood obesity has been increasing alongside rapid global economic development including Malaysia. The aims of this study were to assess the knowledge, attitude and practices (KAP) of mothers regarding childhood obesity and to determine the factors associated with the KAP as well as to map the correlation between KAP.

Methods: A cross sectional study was conducted on 100 mothers aged above 18 years attending a Mother and Child Clinic in Kuantan, Malaysia. They had to fill up the consent form and questionnaires.

Results: The survey revealed that mothers had moderate KAP on childhood obesity. Twenty three to 87 mothers answered correctly on knowledge part, 4 to 54 mothers and 17 to 76 mothers answered correctly on attitude and practices respectively. The knowledge was associated with educational level ($t = -4.411, p < 0.001$), age ($r = +0.222, p = 0.026$) and income ($r = +0.337, p = 0.013$). While attitude was associated with educational level ($t = -4.384, p < 0.001$), occupation ($t = +2.082, p = 0.040$) and income ($r = +0.326, p = 0.016$). It indicates that as educational level and income increased, the knowledge and attitude also increased. While as age increased, knowledge also increased. Different type of mother's occupation showed a different attitude on childhood obesity. There was a correlation between attitude with knowledge ($r = +0.414, p < 0.001$) and practices ($r = +0.261, p = 0.009$) but there was no correlation between knowledge and practices ($r = +0.158, p = 0.116$).

Conclusions: It showed that a good attitude is related to higher knowledge and best practices, but high knowledge does not mean it had good practices. These findings may be useful in targeting programs and strategies for preventing and intervention of childhood obesity.

KEY WORDS

KAP, mothers, childhood obesity

INTRODUCTION

Obesity is one of the most blatantly obvious public health challenges of the current time (James *et al.*, 2001; Stettler, 2004; Caballero, 2007; Malik *et al.*, 2013; Daştan & Delice, 2015). The term of obesity is derived from the Greek expression: ob-edere which means overeating. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health (WHO, 2011). 'Worldwide obesity has more than doubled since 1980. In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these, over 600 million were obese. 39% of adults aged 18 years and over were overweight in 2014 and 13% were obese. Most of the world's population lives in countries where overweight and obesity kills more people than underweight. 42 million children under the age of 5 were overweight or obese in 2013' (WHO, 2015). "Although not all overweight infants become obese children, and not all overweight children become obese adults, there is a greater likelihood that obesity begins in early childhood will persist throughout the life span" (Huffman *et al.*, 2010). A number of studies revealed that childhood obesity becomes an epidemic and grave public health concern by promoting a number of chronic diseases (Bridger, 2009; Cameron *et al.*, 2006; Akhtar-Danesh *et al.*, 2011; He, 2007).

Many factors are associated with childhood obesity, such as physical inactivity, unhealthy eating patterns or combination of the two, genetic and lifestyle (Dietz, 1991). Moreover, most children are more likely to be watching television, playing video games or using a computer than taking part in outdoor activities such as jogging. 43% of adolescents watch television more than two hours per day (Akhtar-Danesh *et al.*, 2011; He, 2007). These situations may increase the prevalence of childhood obesity.

The mother is the closest person to any children. She is the first person who will introduce healthy behaviors in shaping their children's lifestyle. So, she plays an essential role in fighting childhood obesity. However, to reduce childhood obesity effectively the mother needs to be motivated and to understand healthy eating patterns and exercise that helps her child lead a healthy life (Akhtar-Danesh *et al.*, 2011; He, 2007). Therefore, this study aims to gain preliminary data on KAP of mothers regarding childhood obesity problem and provide useful information for controlling this growing epidemic among children.

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1) Department of Biomedical Science, Kulliyah of Allied Health Sciences, IIUM Kuantan Campus Malaysia

2) Faculty of Medicine and Defense Health, Universiti Pertahanan Nasional Malaysia (National Defense University of Malaysia) Kem Sungai Besi, 57000 Kuala Lumpur, Malaysia

Correspondence to: Nor Azlina A. Rahman

(e-mail: nazara@iiium.edu.my)

Table 1. Comparison of knowledge, attitude and practice scores towards childhood obesity between Malays and non-Malay mothers (Mann-Whitney U-test)

Variables	N	Knowledge		Attitude		Practice	
		Median (iqr)	p-value	Median (iqr)	p-value	Median (iqr)	p-value
Malays	90	43.50 (5.00)	0.166	38.00 (5.00)	0.686	55.00 (6.25)	0.108
Non-Malays	10	41.00 (10.25)		35.50 (10.25)		57.50 (10.25)	

* iqr = interquartile range

Table 2. Comparison of knowledge, attitude and practice towards childhood obesity between different educational level and occupation of mothers using an independent t - test.

Variables	N	Knowledge		Attitude		Practice	
		Mean (sd)	p-value	Mean (sd)	p-value	Mean (sd)	p-value
Educational level							
High	32	2.63 (0.164)	< 0.001	4.46 (0.346)	< 0.001	3.59 (0.466)	0.963
Low	68	2.40 (0.363)		4.09 (0.424)		3.59 (0.404)	
Occupation							
Working	58	2.51 (0.283)	0.174	4.28 (0.399)	0.040	3.58 (0.418)	0.750
Housewife	42	2.42 (0.384)		4.10 (0.468)		3.60 (0.432)	

Table 3. Correlation between knowledge, attitude and practices of mothers regarding childhood obesity with age and income of mothers, the number of children and children's body mass index (BMI) using a Pearson correlation test.

Variables	Knowledge		Attitude		Practices	
	r	p-value	r	p-value	r	p-value
Age	+0.222	0.026	+0.179	0.074	+0.088	0.382
Income	+0.337	0.013	+0.326	0.016	+0.130	0.348
Number of children	-0.010	0.919	-0.066	0.512	+0.028	0.780
Children's BMI	-0.099	0.522	-0.048	0.758	+0.009	0.953

per month", "one to two times per week", "more than three times per week" and "everyday" were used in this section. The questions asked about smoking and breastfeeding practices, meal preparation and the children's activities.

The questionnaire used was validated by conducting a pilot study. In this research, content validity was checked by well-known experts from International Islamic University Malaysia and face validity involved ten mothers by interviewing them and getting their feedback on the understandability of the questions and on the questionnaire itself. The necessary questions were modified to reflect the results of pre-testing. The data collected from the questionnaires were compiled, coded and analyzed using Statistical Package for Social Sciences (SPSS). Each question in section 1, 2 and 3 was scored, and the total scores were used to find the correlation between the KAP and its associated factors.

For the ethical consideration, approval had been obtained from the Ministry of Health, Medical Research Ethics Committee (MREC) (Ref: KKM / NIHSEC / 08 / 0804 / P12-242).

MATERIALS AND METHODS

This was a descriptive, quantitative and cross-sectional study. This study involved guided interviews with mothers based on structured questionnaires. The study design was chosen due to its simplicity and feasibility of execution and also inexpensive. The study was conducted from 13-02-2012 to 29-03-2012 among mothers attending a Mother and Child Clinic in Kuantan, Malaysia. Convenience sampling was used in this research. The participants were selected according to inclusion and exclusion criteria. Inclusion criteria: Malaysian, age above 18 years old, women who have at least one previous child age above two years old. Exclusion criteria: Participants who do not understand Malay or English language and would not consent to participate in this study.

The questionnaire was divided into four sections consisted of multiple choice questions and statements which required the participants to rate on three and five-point Likert scale (Akhtar-Danesh *et al.*, 2011; He, 2007). **Section 1:** Designed to cover the background information and personal details of the participants as well as one of their children. The information that was obtained from participants consists of age, race, occupation, income, level of education and the number of children while the information from their selected children is numbered in sibling, age, gender, weight, height and BMI. **Section 2:** Regarding the knowledge of the participants on obesity in children. There were seven questions in this section with answer choices of "yes", "no" and "do not know". The questions discussed on the definition, causes and consequences of childhood obesity, as well as other general knowledge on childhood obesity. **Section 3:** Addressing the mother's attitude towards childhood obesity. This section consisted of nine questions with five-point Likert scale ranging from "strongly agree" to "strongly disagree." **Section 4:** Regarding the practices in childhood obesity issue. Multiple choice questions and five-point Likert scale of "no", "one to two times

RESULT

Sociodemographic characteristics of participants

A total of 100 mothers attending Mother and Child Clinic participated in this study. As our sample size is 100 thus, we will only mention the percentage because both the frequencies and percentages are the same. The mean age of the respondents was 33.05 ± 6.784 years old. The majority (90%) of participants were Malay while the remaining was non-Malays (10%), which consists of two Chinese, six Indian and two other ethnic groups comprising of Aborigine and Dusun. Sixty-eight percent of the participants had a low educational level with the remaining 32% had a high educational level. On the other hand, 58% participants were working, and the remaining 42% were housewives. Regarding the number of children, 23%, 35%, 12%, 13%, 8%, and 9% of the respondents had one, two, three, four, five and six children, respectively. The mean of a number of children were 1.579 ± 2.75 . There were 56 participants who did not provide enough information to determine BMI for their children. Therefore, the information from the 44 participants shows that 20 (45.5%) of them had children with normal weight, 10 (22.7%) had obese children, followed by 9 (20.5%) and 5 (11.4%) participants had underweight and overweight children, respectively.

KAP towards childhood obesity

Regarding the knowledge of childhood obesity, 78%, 55%, 69%, 56% and 37% of the participants knew that childhood obesity means a condition where excess body fat, obesity and overweight are different, children's BMI can be measured by BMI chart, measurement of chil-

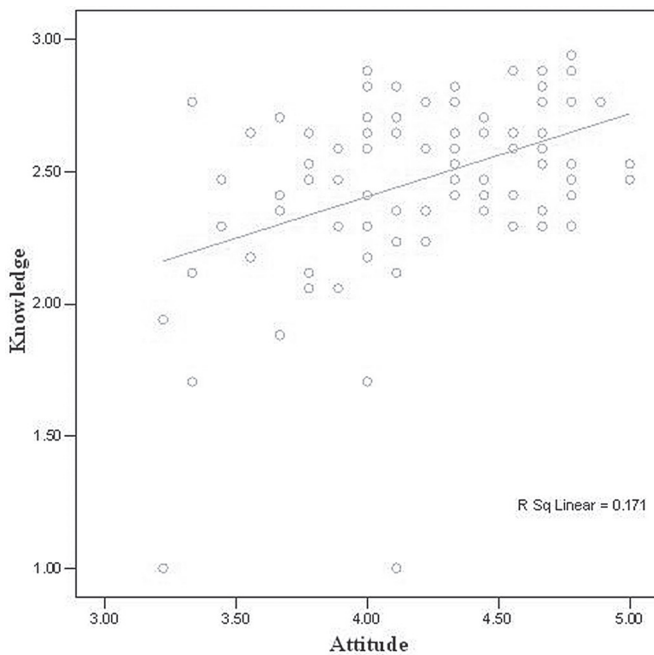


Figure 1. Correlation between knowledge and attitude of mothers regarding childhood obesity

children's BMI is different from adult's, and measurement of children's BMI is different between boys and girls, respectively. On the other hand, 69%, 75%, 61%, 85% and 87% of respondents knew that genetics, physically inactive, parental influence, family lifestyles and unhealthy eating practice, respectively, are the risk factors for obesity. It was also found that 86%, 68%, 75%, 61%, 23%, 72% and 84% of the participants knew that obese children may experience diabetes, hypertension, heart disease, sleep disorder problems, early puberty or menarche, bronchial asthma and other respiratory disease, and hypercholesterolemia, respectively.

The section on attitude towards childhood obesity shows that 89% of the respondents either strongly agreed (35%) or agreed (54%) that obesity in children is a serious problem. Similarly, the majority (64%) of them either disagreed (60%) or strongly disagreed (4%) that obese children mean that they are healthy. Another question indicates that 91% of the respondents either strongly agreed (34%) or agreed (57%) that obese child should exercise regularly. It was also noted that 98% (54% + 44%), 98% (52% + 46%), 98% (40% + 48%), 92% (47% + 45%) and 99% (46% + 53%) of respondents either strongly agreed or agreed that parents should play a role in combating obesity, give efforts to promote active lifestyles, limit children's television viewing or video games to 1-2 hours per day, restrict the children's junk-food intake, and to bring their obese children to seek physician advice, respectively.

On the practice regarding childhood obesity, the majority of respondents were non-smokers (96%) and breastfed their children (92%). Half of the respondents encouraged their children to perform physical activity, and 70% admitted that their children were physically active. Forty percents of the respondents prepared one to two servings of oily foods per day. However, 46% and 70% of them included plenty of fresh fruits and vegetables in their children's meals, respectively. The majority of them reduced salt (70%) and sugar (68%) consumption for their children's meals, but more than half of the respondents (68%) brought their children for fast food one to two times per month. A few of them (32%) did not allow snack intake among their child, but 50% allowed their children to watch television for 4-6.5 hours per day. Furthermore, 40% did not limit their children in spending time with using a computer or playing video games.

The factors associated with KAP towards childhood obesity

The comparison of the KAP of the participants on childhood obesity between different ethnicity was investigated using Mann-Whitney U-Test because the normality assumption was not achieved. The results show that there was no significant difference in knowledge ($Z = -1.384$, $p = 0.166$), attitude ($Z = -0.404$, $p = 0.686$) and practice ($Z = -1.607$, $p = 0.108$) of the participants between Malays and non-Malays (Table 1).

However, independent t-test shows a significant difference in knowledge ($t = -4.411$, $p < 0.001$) and attitude ($t = -4.384$, $p < 0.001$) towards childhood obesity between low and high educational level. The attitude of participants towards childhood obesity was also found to be significantly different between different types of occupation ($t = +2.082$, $p = 0.040$), but not in knowledge ($t = +1.311$, $p = 0.174$) and practice ($t = -0.320$, $p = 0.750$). Similarly, practices had no significant difference between low and high educational level ($t = -0.047$, $p = 0.963$) (Table 2).

The relationship between the KAP of participants on childhood obesity with age, income, number of children and children's BMI was investigated using Pearson product-moment correlation coefficient. Statistically significant, but weaker positive correlation was found between knowledge and age of the respondents ($r = +0.222$, $p = 0.026$) while moderate positive statistical significance was found between knowledge and attitude with income ($r = +0.337$, $p = 0.013$ and $r = +0.326$, $p = 0.016$, respectively). A positive, but not statistically significant relationship existed between attitude and age ($r = +0.179$, $p = 0.074$). Practices had positive but not statistically significantly related to age ($r = +0.088$, $p = 0.382$), income ($r = +0.130$, $p = 0.348$), number of children ($r = +0.028$, $p = 0.780$) and children's BMI ($r = +0.099$, $p = 0.953$). On the other hand, negative, but not a statistically significant correlation was noted between knowledge with a number of children ($r = -0.010$, $p = 0.919$) and children's BMI ($r = -0.099$, $p = 0.522$). The attitude was found to have no statistical significantly correlated with the number of children ($r = -0.066$, $p = 0.512$) and children's BMI ($r = -0.048$, $p = 0.758$). The results above is summarized in Table 3.

Correlation between KAP towards childhood obesity

The knowledge has a moderate positive, statistically significant correlation with attitude ($r = 0.414$, $p < 0.01$) which means a high level of knowledge associated with high level of attitude (Figure 1). While attitude and practices are positively correlated with $r = 0.261$ and $p = 0.009$ which indicate that increase attitude may increase the practices of the respondents (Figure 2). However, knowledge has no statistical association with practices ($r = 0.158$, $p = 0.116$) (Figure 3).

DISCUSSION

One hundred participants with different background willingly participated in this study. Another Malaysian study revealed that 10.5% children were overweight, and 5.9% were obese (Wahida *et al.*, 2011). The BMI status of the children of the current study was higher than previous studies. Childhood obesity means a condition where excess body fat or adiposity (Whitlock *et al.*, 2010). 78% of the respondents answered correctly about childhood obesity and also knew it correctly that obesity and overweight are different. These findings were similar to another study (Soo *et al.*, 2011). One research study reported that children have a lower BMI than adults and also differs between boys and girls (Reilly, 2007). The present study respondents also have similar knowledge regarding BMI.

The current study respondents opined that childhood obesity occurs due to some reasons such as genetics, physically passive, parental influence, family lifestyles and unhealthy eating patterns. These factors might lead to various adverse health effects. A number of studies reported that gene has a correlation with childhood obesity (Lyon & Hirschhorn, 2005; Zhao & Grant, 2011; Walley *et al.*, 2006; Jadavji, 2006). Lack of exercise and increase physical activity might also contribute and reduces the risk of obesity, respectively (Jadavji, 2006; Noor *et al.*, 2005). Moreover, parents and family lifestyle also might influence children in determining dietary preferences and physical activity patterns (Etelson *et al.*, 2003). Similarly, sedentary behavior and junk-food increase the prevalence of childhood obesity. The current study respondents were also similarly reported. The majority of respondents answered correctly the consequences of childhood obesity like diabetes, hypertension, and heart disease. This may be due to the exposed of information on the effects of childhood obesity, which is available in internet and mass media. In a pediatric obesity, study revealed that 25% children and 21% adolescents had impaired glucose intolerance and 4% of them experience asymptomatic type II diabetes (Field, 2006). Obese children are threefold higher risk for hypertension compared to leaner children (Sedik & Ahmed, 2004). In addition, based on Australian study heart disease, sleep problems, early puberty, asthma and high cholesterol also, might be experienced by the children (Covic *et al.*, 2007).

The current study respondents have a good view of the seriousness

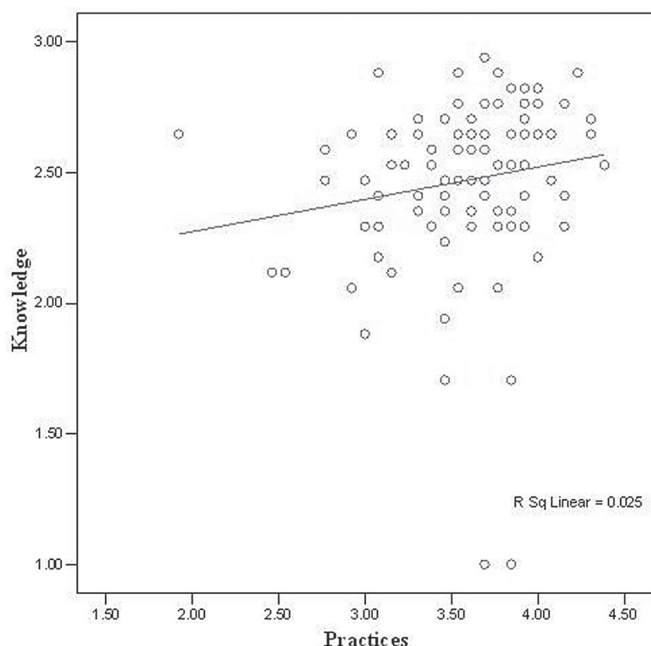


Figure 2. Correlation between knowledge and practices of mothers regarding childhood obesity

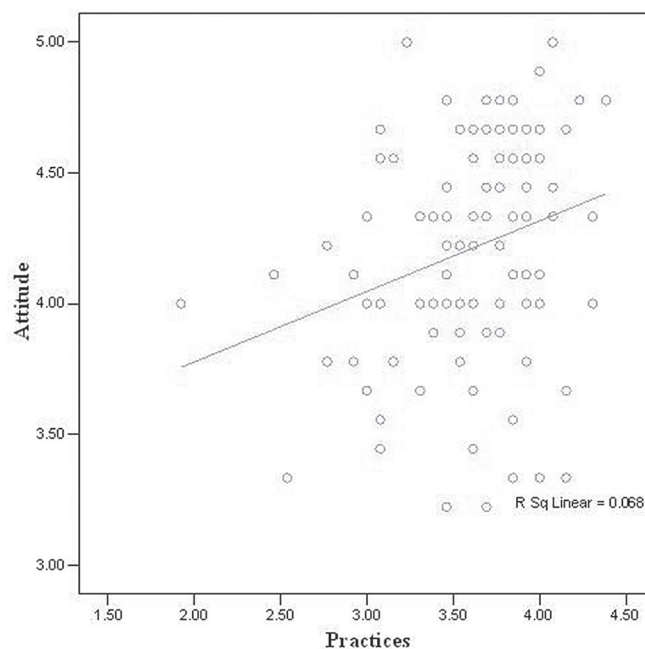


Figure 3. Correlation between attitude and practices of mothers regarding childhood obesity

of this problem compared to Mexican American mother's view (Sosa, 2009). The majority of the current study respondents disagreed that obese children mean healthy. Another study reported exactly opposite findings fat often considered to be a sign of good health (Papoutsis *et al.*, 2012). Therefore, Malaysian mothers have a much better, more understanding than Mexican American mothers regarding childhood obesity. Similarly, Latina Mothers viewed that lower BMI indicates they had poor or fair health whereas children who had high BMI means they had good or excellent health (Sosa, 2009). In Malaysia, a study among Chinese family suggested that overweight is a sign of prosperity, success and good health and encouraged their children to eat more (Soo *et al.*, 2011). It is reported that exercise reduces the chance of obesity (Jadavji, 2006). The mainstream study population similarly agreed that regular exercise, active lifestyle reduces weight. The parent should promote a healthy and active lifestyle where appropriate dietary habits and physical activity introduce to their children (Soo *et al.*, 2011). The majority of the study respondents approved that they should restrict non-energy expenditure activities of their children. This can be explained as the mothers already realize the causes of obesity and its 'consequences. One research similarly suggested that parents should limit television-viewing time (Boyse, 2009). Television food advertising might influence children to increase their calorie intake (Goris *et al.*, 2010). These sedentary activities in children should be replaced by active physical and power games. Nowadays, snacks between meals are common as parents afford to provide up to 6 times per day compared to 30 years back. The majority current study respondents decided to limit their children snack. It showed that most mothers were quite developed regarding balanced food. The majority of the study responded accepted that they will pursue physician advise if their children have high BMI. This shows the respondent's positive attitude towards obesity control. In many modern countries, there are the most established childhood obesity clinics. These clinics provide multivariate service, like motivation in changing lifestyle and support the families. Malaysia Ministry of Health had also developed a lot of study in dealing with obesity problem across the country. Most of the clinics also provide clinician and dietician for childhood obesity advice and treatment.

This study revealed that 96% of respondents are non-smokers revealing good practice. Maternal smoking habits may have a bad impact on their children. Multiple studies have revealed that mothers who smoke during pregnancy had increased the prevalence of obese children (Toschke *et al.*, 2002; Kiess *et al.*, 2004). 92% of respondents had practiced breastfeeding revealing good practice. Multiple studies observed that exclusive breastfeeding and a longer period of breastfeeding lowers the risk of obesity (Sedik & Ahmed, 2004; Kiess *et al.*, 2004; Taveras and Gillman, 2006; Twells and Newhook 2010). Most of the respondents encourage their children to be physically active. This find-

ing was also in the same with a number of studies (NHMS 2011; Dan *et al.* 2011). A good percentage of our respondents serve their balanced food with low oil content and provide a plenty of fruits and vegetables and reduce sugar and salt intake. These practices are good compared to the American community because they are eating 56% more fats and oils and 14% more sugar and beverages (Papoutsis *et al.*, 2012). Fast food has become one of the parents' choices for their kids. 68% of respondents brought their children for fast food only 1-2 times per month. Fast food consumption has a clear and strong contribution to childhood obesity because it contains high fat, cholesterol, salt, and sugar contents (Papoutsis *et al.*, 2012). In addition, 32% mothers do not allow their children to have snacks while 31% mothers allow their children to take a snack 1-2 times per month. Although the choice of selecting the food under parents, children have 'pester power' (persistent request) to persuade their parent on request foods (Sosa, 2009). In the era of technology, it had been seen that sedentary lifestyle had increased dramatically. Most children are more likely to participate in an activity that required less energy expenditure such as watching television and playing video games. This situation might lead to childhood obesity. A study showed that children spent greater than 2.8 hours per day on viewing television and spent greater than 2.3 hours per day on using a computer are more likely to be obese (Arluk, 2003). This study respondent about 50% limit their children to watch television 4-6.5 hours per day, and most of them did not limit their children spending their time on the computer. It showed that Malaysian children have a sedentary lifestyle.

This study also revealed that educational level had a statistically significant association between knowledge and attitude. It indicates that the educational level of mothers may influence their knowledge and attitude but not their practices. Educated mothers may have higher knowledge and a good attitude, but did not mean they had good practices in preventing childhood obesity. However, there was study showed mothers with less education less likely to perceive their children as overweight (Goins, 2007). Occupation also had a statistical association with an attitude of mothers. It showed that working mother, had a positive attitude toward childhood obesity issue compared to the housewife. There was no association between ethnicity with KAP of mothers on childhood obesity. Age is positively correlated with knowledge of mothers which means older people had more knowledge of childhood obesity. Whereas income is positively related to knowledge and attitude of mothers. This indicates the mothers who had higher salary might have higher knowledge and good attitude toward obesity in children. This is might due to the exposure of mothers to childhood obesity information. One study reported that low income mothers believe that by having a large child means the child is healthy, and they are a good parent (Goins, 2007). While the other variables showed no significant correla-

tion with KAP. The result of this study showed that knowledge had a positive correlation with an attitude of mothers on childhood obesity ($r = +0.414$, $p < 0.01$). It indicates that mother who had knowledge of obesity of children have a positive attitude toward this issue. Attitude and practices also showed a positive relationship ($r = +0.261$, $p = 0.009$) which indicated that having a good attitude improve their practices on combating childhood obesity. However, there is no relationship between knowledge and practices of mothers on preventing childhood obesity ($r = +0.158$, $p = 0.116$). It means, although the mothers knew about the effect of childhood, of obesity, it might not influence their practice in preventing it. Therefore, in order to fight the increasing of the prevalence of childhood obesity, it is important to change the attitude of mothers toward childhood obesity, which may result in changing their meal preparation habits as well as their patterns of diet. Malaysia is the top among the Association of Southeast Asian Nations (ASEAN) countries had a higher prevalence of obesity and 6th in Asia Pacific. Malaysia is developing a country which has a variety of high calorie food. Thus, the Ministry of Health has planned a strategy most importantly; develop a guideline for preventing obesity. Furthermore, Ministry of Health with the collaboration of other agencies carried out a study of KAP on food and nutrition among various target groups to obtain baseline data (Sedik & Ahmed, 2004). This is a cross-sectional study with only 100 samples. Therefore, this data restricted the generalizability of findings to the whole population in Kuantan, Malaysia.

CONCLUSION

This study identified the factors that were associated with KAP and determined the correlation between KAP of mothers on obesity in children. The knowledge of mothers on childhood obesity had a correlation with age, the attitude of mothers was related to occupation, and the knowledge and attitude of mothers were related to the income and educational level. Then, the attitude had the relationship between knowledge and practices while knowledge and practices had no correlation. Consequently, to fight against childhood obesity, mothers attitudes need to be changed so that they will change their practices as well. Well-designed prospective with large sample size is recommended in order to get accurate results so that it can be generalized to the population.

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REFERENCES

- Akhtar-Danesh N, Dehghan M, Morrison KM, *et al.* (2011). Parents' perceptions and attitudes on childhood obesity: a Q-methodology study. *J Am Acad Nurse Pract*, 23(2), 67-75.
- Arluk SL, Branch JD, Swain DP, *et al.* (2003). Childhood obesity's relationship to time spent in sedentary behavior. *Mil Med* 168 (7), 583-586.
- Boyse K (2009). A guide to managing television: tips for your family. <http://www.med.umich.edu/yourchild/topics/managementv.htm>. [Retrieved October 10, 2015]
- Bridger T (2009). Childhood obesity and cardiovascular disease. *Paediatr Child Health*, 14(3), 177-182.
- Caballero B. (2007). The global epidemic of obesity: an overview. *Epidemiol Rev*, 29(1), 1-5.
- Cameron N, Norgan NG, Ellison GTH. (2006). *Childhood obesity contemporary issues*. Boca Raton, FL: CRC Press. Taylor & Francis Group, (pp. 33487-2742).
- Covic T, Roufeil L, Dziurawiec S. (2007). Community beliefs about childhood obesity: its causes, consequences and potential solutions. *J Public Health*, (Oxf) 29(2), 123-131.
- Dan SP, Mohd NM, Zaililah MS. (2011). Determination of factors associated with physical activity levels among adolescents attending school in Kuantan, Malaysia. *Malays J Nutr*, 17(2), 175-187.
- Daştan I, Delice E. (2015). A review of global childhood obesity epidemic and potential determinants. *Izmir Review Social Sciences*, 2(2), 57-71.
- Dietz W. (1991). Factors associated with childhood obesity. *Nutrition*, 7(4), 290-1.
- Etelson D, Brand DA, Patrick PA, *et al.* (2003). Childhood obesity: do parents recognize this health risk? *Obes Res*, 11, 1362-1368.
- Field AE. (2006). Epidemiology of the health and economic consequences of pediatric obesity. In: MI Goran, MS Sothern (Ed.), *Handbook of pediatric obesity: etiology, pathophysiology, and prevention*. (pp. 33487-2742). Boca Raton: Florida, CRC Press. Taylor & Francis Group.
- Goins PF (2007). Caregivers' perception of childhood obesity. Master thesis. Mountain State University, USA.
- Goris JM, Petersen S, Stamatakis E, *et al.* (2010). Television food advertising and the prevalence of childhood overweight and obesity: a multicountry comparison. *Public Health Nutr*, 13(7), 1003-1012.
- He M. (2007). Are parents aware that their children are overweight or obese? do they care? *Canadian Family Physician*, 53(9), 1493-1499.
- Huffman FG, Kanikireddy S, Patel M. (2010). Parenthood-a contributing factor to childhood obesity. *Int J Environ Res Public Health*, 7(7), 2800-2810.
- Jadavji NM. (2006). Literature review-a 21st century epidemic: childhood obesity in North America. *Journal Young Investigators*. <http://www.jyi.org/issue/literature-review-a-21st-century-epidemic-childhood-obesity-in-north-america/> [Retrieved October 10, 2015]
- James PT, Leach R, Kalamara E, *et al.* (2001). The worldwide obesity epidemic. *Obes Res*, 9(Suppl 4), 228S-233S.
- Kiess W, Marcus C, Wabitsch M. (2004). *Obesity in childhood and adolescence*. Vol. 9. Basel, Karger Medical and Scientific Publishers.
- Lyon HN, Hirschhorn JN. (2005). Genetics of common forms of obesity: a brief overview. *Am J Clin Nutr*, 82(1), 215S-217S.
- Malik VS, Willett WC, Hu FB. (2013). Global obesity: trends, risk factors and policy implications. *Nature Reviews Endocrinology*, 9, 13-27.
- National Health and Morbidity Survey. (2011). Fact Sheet. www.moh.gov.my/ [Retrieved October 10, 2015]
- Noor MI, Koon PB, Zawiah H. (2005). Strategy for the prevention of obesity-Malaysia. Malaysian Association for Study Obesity. 1st ed. Malaysia. http://www.maso.org.my/spom/spom_intro.pdf [Retrieved October 10, 2015]
- Papoutsis GS, Drichoutis GS, Nayga RM. (2012). The causes of childhood obesity: a survey. *Journal Economic Surveys*, 27(4), 743-767.
- Reilly JJ. (2007). Childhood obesity: an overview. *Children Society*, 21(5), 390-396.
- Sedik SM, Ahmed R. (2004). Childhood obesity: contributing factors, consequences and intervention. *Malays J Nutr*, 10(1), 13-22.
- Soo KL, Wan AM, Abdul MH, *et al.* (2011). Dietary practices among overweight and obese chinese children in Kota Bharu, Kelantan. *Malays J Nutr*, 17(1), 87-95.
- Sosa ET. (2009). Mexican american mothers perceptions of childhood obesity and their role in prevention. Doctor Philosophy Thesis. Texas A&M University, San Antonio, USA. <http://oaktrust.library.tamu.edu/bitstream/handle/1969.1/ETD-TAMU-2009-12-7235/SOSA-DISSERTATION.pdf> [Retrieved October 10, 2015]
- Stettler N. (2004). Comment: the global epidemic of childhood obesity: is there a role for the pediatrician? *Obesity Reviews* 5 (Suppl. 1), 1-3.
- Taveras EM, Gillman MW. (2006). Breastfeeding and Overweight. In: MI Goran, MS Sothern(Eds.), *Handbook of pediatric obesity: etiology, pathophysiology, and prevention*. (pp. 33487-2742). Boca Raton, FL: CRC Press (Taylor, Francis Group).
- Toschke AM, Koletzko B, Slikker W Jr, *et al.* (2002). Childhood obesity is associated with maternal smoking in pregnancy. *Eur J Pediatr*, 161 (8), 445-448.
- Twells L, Newhook L A. (2010). Can exclusive breastfeeding reduce the likelihood of childhood obesity in some regions of Canada? *Can J Public Health*, 101 (1), 36-39.
- Wahida FZ, Nasir MTM, Hazizi AS. (2011). Physical activity, eating behavior and body image perception among young adolescents in Kuantan, Pahang, Malaysia. *Malays J Nutr*, 17(3), 325-336.
- Walley AJ, Blakemore AIF, Froguel P. (2006). Genetics of obesity and the prediction of risk for health. *Hum Mol Genet* 15(Suppl 2), R124-R130.
- Whitlock EP, O'Conner EA, Williams SB, *et al.* (2010). Effectiveness of primary care interventions for weight management in children and adolescents: an updated, targeted systematic review for the USPSTF [Internet]. Rockville (MD): agency for healthcare research and quality (US); 2010 Jan. (Evidence Syntheses, No. 76.) <http://www.ncbi.nlm.nih.gov/books/NBK36416/> [Retrieved October 10, 2015]
- World Health Organization. (2011). Obesity and overweight. <http://www.who.int/mediacentre/factsheets/fs311/en/>. [Retrieved October 10, 2015]
- World Health Organization. (2015). Obesity and overweight. Media Centre. Fact Sheet N° 311.2015. <http://www.who.int/mediacentre/factsheets/fs311/en/> [Retrieved October 10, 2015]
- Zhao J, Grant SFA. (2011). Genetics of childhood obesity. *Journal Obesity*, 2011, Article ID 845148.