

## ORIGINAL ARTICLE

# Dietary Intake of Mothers Who Practised Traditional Confinement During Exclusive Breastfeeding Period

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## ABSTRACT

**Introduction:** Nutritional requirements increase during lactation. However, maternal dietary intakes of Malaysian mothers are subjected to restrictions commonly included in traditional postpartum practices. This study aimed to assess the maternal dietary intake status during the recommended six month exclusive breastfeeding (part of which included the traditional confinement) period. **Methods:** Thirty-two Malay mothers aged 18-35 years, who had delivered full-term (at  $\geq 37$  weeks) singleton babies and were exclusively breastfeeding, were included in the study. Maternal dietary intake was assessed using multiple-pass diet recall on Days 10, 30, 60, 90, 120, 150, and 180, postpartum. The average total energy and macronutrient intakes were compared against recommended values. **Results:** The findings of this study demonstrated that maternal intakes of total energy ranged from 1,500-2,000kcal/day, carbohydrate 189-272g/day, protein 58-72g/day, and total fat 32-70g/day. Total calorie intake was the lowest during confinement period (Days 10 and 30) compared to the rest of the exclusive breastfeeding period. This is similar with total fat consumption. On the other hand, protein intake was the highest during confinement period whereas carbohydrate intake was consistent throughout the six-month period. Despite the increased requirements, intakes of total calories, protein, total fat, dietary fibre, and water, did not meet the recommended values throughout the exclusive breastfeeding period. **Conclusion:** Mothers' inability to fulfil their nutritional requirements during exclusive breastfeeding period may be associated with traditional postpartum dietary practices. Dietary advice with consideration for cultural food taboos practiced by local mothers during confinement may help to improve maternal nutritional intakes during this crucial time.

**Keywords:** Maternal diet, Exclusive breastfeeding, Total energy, Macronutrients, Traditional postpartum practices

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## INTRODUCTION

According to the World Health Organization (WHO), exclusive breastfeeding is the consumption of human milk without supplementation, except for vitamins, minerals, medicines, water, and drops of syrup (1). The WHO and United Nations Children's Fund (UNICEF) strongly advocate exclusive breastfeeding for the first six months after birth as the optimal way of feeding infants based on evidence which showed beneficial effects on child health, growth and development as well as positive implications on maternal wellbeing (2). Maternal energy needs increase during lactation period

by 25-30% (3). Therefore, it is crucial that mothers have sufficient nutritional intake in order to restore health and increase breastfeeding success. According to the latest Recommended Nutrient Intakes for Malaysia (RNI, 2017), breastfeeding mothers need an additional 500 kcal of total energy per day compared to non-lactating female adults (4). Other than that, protein requirement also increases by 19g per day for the first six months, to fulfil the nutritional requirements of lactation. The Institute of Medicine (IOM) (5) recommends daily carbohydrate intakes of 160-210g for breastfeeding women. This is to increase the amount of precursors for lactose synthesis which is one of essential nutrients in human milk (5).

Available literature of studies from Nigeria, United States of America (USA), Kenya, and Taiwan, revealed that maternal calorie and macronutrients intakes

during breastfeeding period have not been meeting the recommended values (6–9). Maternal calorie intake has been identified to be one of the factors associated with the duration of exclusive breastfeeding period (10,11). The findings of one study revealed that the calorie intake of mothers who succeeded to exclusively breastfeed for six months was significantly higher ( $2005 \pm 304$  kcal/day) compared to those who did not ( $1,503 \pm 434$  kcal/day). In addition, the multivariate analysis revealed that calorie consumption is the most dominant factor (OR: 0.65) that determines the duration of exclusive breastfeeding period (10).

In Malaysia, maternal intake may be subjected to dietary restrictions which are commonly included in traditional confinement practices after delivery. Traditional postpartum confinement practice is a norm among South East, East, and South, Asian communities (12–14). Commonly, Malaysian women practise confinement ranging from 30 days (mostly among Chinese and Indians) to 40–44 days (among Malays) after childbirth (12). Among the popular traditional confinement practices include postpartum massage, use of traditional herbs such as ginger, local roots, and plant-based spices, and beliefs and adherence to food taboos. As postpartum period coincides with lactation which increases the energy and nutrients requirements of the mothers, this practice may influence their ability to meet their nutritional recommendations. Thus, this study aimed to assess the status of maternal total calorie and macronutrients intakes during the six-month exclusive breastfeeding period as recommended by world health authorities (2).

## MATERIALS AND METHODS

This was a longitudinal study conducted in Bandar Indera Mahkota area in Kuantan, Pahang, from May 2016 until July 2017. The sample size for this study was calculated using single mean formula and the sample required was 152. Convenient sampling was used because the response rate among the eligible participants for the study was low, making randomized sampling very difficult to achieve within the study period. The study recruited respondents from several locations such as university, government, and health clinics attended by pregnant women for antenatal check-ups, near International Islamic University Malaysia (IIUM) Kuantan Campus. The women who attend these health clinics normally either live or work nearby (within 25 km radius). The close vicinity made it more accessible for the regular data collection and follow-up visits (either at the participants' home or work place). In addition, to increase participation rate, online advertisements for study volunteers were posted on social media groups (Facebook® and Whatsapp®) for public, as well as through e-mail announcements among IIUM Kuantan Campus community. Malay mothers aged 18–35 years, with singleton pregnancy (at  $\geq 32$  weeks gestation),

and intended to exclusively breastfeed their babies after delivery for at least six months, were invited to participate in the study. The mothers would be included in the study if they delivered at full-term ( $\geq 37$  weeks) and were exclusively breastfeeding (as defined by the WHO) their babies for at least six months.

## Data Collection

Prior to the estimated due date, the mothers who have expressed interest to be included in this study were contacted by researcher to check whether they have delivered their baby. Once the mother has delivered, an appointment date was set for the first session (within the first 10 days of delivery). The subsequent follow-up sessions on Days 30, 60, 90, 120, 150, and 180, were conducted either at participant's home or workplace according to participants' convenience and/or preference.

Pre-pregnancy body weight was self-reported by the study participants. The post-delivery body weight was measured using a portable weighing scale (Tanita, Japan) to the nearest 0.1 kg. Height was measured using a portable body meter (SECA, Germany) while participants stood erect on bare foot to the nearest 0.1 cm. Body mass index (BMI) was calculated as weight (kg) divided by height (m<sup>2</sup>) and was categorized according to the WHO (2000)'s classification: Underweight: BMI  $< 18.5$  kg/m<sup>2</sup>, normal: BMI 18.5–24.9 kg/m<sup>2</sup>, overweight or obese: BMI  $> 25.0$  kg/m<sup>2</sup>. Total gestational weight gained was then calculated by subtracting the pre-pregnancy weight from the current weight measured. It was then classified as less than recommendation, within recommendation, and more than recommendation, according to respective pre-pregnancy BMI (15).

Prior to reporting their dietary intake on Days 10, 30, 60, 90, 120, 150, and 180, the study participants were asked whether they were adhering to traditional confinement dietary practices and were practicing exclusive breastfeeding. Record of all foods and beverages consumed was obtained using multiple-pass diet recall for three successive days (two weekdays and one weekend day) at each time point during the six months of exclusive breastfeeding period. Common household utensils were used to aid the participants in estimating the amount of food they consumed. For commercial or packed foods, information was obtained from the nutrition labels on the package. Any supplement intake (including vitamins and minerals in the form of tablets, capsules, powder, or liquid) which might have contributed to the total calorie and other nutrients intakes were also recorded and analysed. The average nutrients intake was then calculated using nutrient analysis software, the Nutritionist Pro® Diet Analysis, which is based on the Nutrient Composition of Malaysian Foods database and the U.S. Department of Agriculture (USDA) Foods database. To assess the status, the dietary intakes were compared with the Malaysian

RNI (2017) and dietary reference intakes by IOM (2005).

Statistical analyses were performed using the SPSS Version 20. The significance level was set at 95% ( $p < 0.05$ ) confidence interval. Nutrients intake during exclusive breastfeeding period was analyzed descriptively and also compared with RNI (2017) and IOM (2005) using one-sample t-test.

Ethical approval for the study was obtained from the IIUM Research Ethics Committee (IREC 585). Written consents were obtained from the study participants after all study procedures had been clearly explained to them.

## RESULTS

Out of 175 potential participants approached, only 47 of them voluntarily responded (response rate: 27%). However, 12 of the mothers declined to participate after being briefed about the study procedures, whereas three were excluded for not meeting inclusion criteria. Thus, a total of 32 participants were included in this study. Table I summarises the characteristics of the participants. The mean age of respondents was  $31.1 \pm 4.7$  years. About half (53%) of the study participants were government employees and a majority (88%) had tertiary education. The mean pre-pregnancy BMI was  $23.5 \text{ kg/m}^2$  which falls in the normal category. In addition, 69% of the participants ( $N=22$ ) had total gestational weight gain within the recommended values. After birth, all the respondents ( $N=32$ ) reported to be adhering to the traditional confinement dietary practices for the first 40-44 days of postpartum period.

**Table I:** Characteristics of the Study Participants ( $N=32$ )

Characteristics	N (%)	Mean $\pm$ SD	Range
Age (years)		$30.6 \pm 4.4$	22 - 39
Employment			
• Government	17 (53)		
• Private	6 (19)		
• Unemployed (housewife)	6 (19)		
• Studying	3 (9)		
Highest education level			
• Secondary	4 (12)		
• Tertiary	28 (88)		
Mode of baby delivery			
• Normal vaginal delivery	27 (84)		
• Caesarean section	5 (16)		
Parity			
• 1	9 (28)		
• 2 or more	23 (72)		
Pre-pregnancy BMI ( $\text{kg/m}^2$ )		$23.5 \pm 4.8$	16.4 - 36.4
• Underweight	8 (25)		
• Normal	17 (53)		
• Overweight/obese	7 (22)		
Total gestational weight gain (kg)*		$11.9 \pm 4.4$	5.0 - 24.0
• Less than recommendation	3 (9)		
• Within recommendation	22 (69)		
• More than recommendation	7 (22)		
Infant's birth weight (kg)	32 (100)	$3.1 \pm 0.3$	2.6 - 3.8

\*Determined based on recommended gestational weight gain by the Institute of Medicine (IOM, 2009)

Table II demonstrates the total calorie intakes of the study participants, in comparison with the recommended values (RNI, 2017). The total energy intake ranged between 1,500 and 2,000 kcal during the exclusive breastfeeding period. The maternal calorie intakes within the confinement period (Day 10 and Day 30) were found to be the lowest but then gradually increased throughout the six months. In addition, the participants' calorie intakes remained significantly ( $p < 0.01$ ) below the recommended values throughout the entire duration, except for Day 120 (Table II).

**Table II.** Maternal Total Calories Intakes during Exclusive Breastfeeding Period ( $N=32$ )

Time points	Mean $\pm$ SD	RNI (2017)	% RNI <sup>1</sup>	<% RNI <sup>2</sup>	p-value
Day 10	$1,479 \pm 441$		62.4	90.9	<.0001*
Day 30	$1,532 \pm 418$		64.6	100.0	<.0001*
Day 60	$1,845 \pm 338$		77.8	94.2	<.0001*
Day 90	$1,742 \pm 474$	2,370	62.1	87.5	<.0001*
Day 120	$2,022 \pm 498$		85.3	84.6	0.270
Day 150	$1,701 \pm 126$		71.8	84.6	<.0001*
Day 180	$1,878 \pm 398$		79.2	80.0	0.006*

RNI – Recommended Nutrient Intakes for Malaysia (2017)

\* Significant p-value (one-sample t-test)

<sup>1</sup> Percentage of mean intake compared to RNI value

<sup>2</sup> Percentage of respondents consuming lower than RNI value

The macronutrients intake of the study participants is presented in Table III. Maternal protein intakes during exclusive breastfeeding period (58.0–72.0 g) were found to be significantly ( $p < 0.05$ ) below the recommended values (71.5 g). In fact, almost half (45.5%) of the study participants had protein intakes lower than recommendation during the confinement period. After the confinement period, protein intakes in the current study were shown to be further reduced. The mean carbohydrate intakes of our study participants from Day 10 to Day 180 (189 to 272 g/day) were significantly higher compared to the recommended value (160 to 210 g/day). The trend for carbohydrate intakes during confinement and post-confinement period was consistent, except for Day 180 which showed a slight decrease (Table III). During the confinement period (Day 10 and Day 30), the mean maternal fat intakes (32 to 33 g/day) were demonstrated to be lower compared to the rest of the lactation period (51 to 70 g/day).

Maternal dietary fatty acids intakes showed similar trend to the total fat intakes. Saturated fat intakes were within the limit of saturated fatty acid (SFA) proportion (1.7–5.1 % of total energy intake) over the study period (Table IV). During the confinement period, SFA intakes were the lowest ( $2.0 \pm 0.9\%$  at Day 10, and  $1.7 \pm 0.7\%$  at Day 30), and it increased by half after the confinement period. In addition, polyunsaturated fatty acid (PUFA) intakes were within the recommended values from Day 60 onwards (3.3 to 4.2% of total energy intake). On

**Table III:** Maternal Macronutrients Intakes (g/day) during Exclusive Breastfeeding Period (N=32)

Time points	Protein				Carbohydrates				Total fats			
	Mean ± SD <sup>1</sup> (g/day)	RNI (g/day)	p-value	% <RNI <sup>2</sup>	Mean ± SD <sup>1</sup> (g/day)	IOM (g/day)	p-value	% <IOM <sup>2</sup>	Mean ± SD <sup>1</sup> (g/day)	RNI (g/day)	p-value	% <RNI <sup>2</sup>
Day 10	70.6 ± 9.7		0.010*	45.5	217.0 ± 81.7		0.000*	36.4	33.4 ± 16.4		0.001*	81.8
Day 30	72.0 ± 17.5		0.022*	39.1	229.5 ± 51.2		0.000*	30.4	32.7 ± 15.7		0.000*	95.7
Day 60	62.2 ± 19.3		0.010*	64.7	231.5 ± 64.9		0.000*	17.6	59.5 ± 27.3		0.001*	58.8
Day 90	64.8 ± 23.0	71.5	0.010*	75.0	272.0 ± 76.9	160-210	0.000*	18.8	61.1 ± 35.2	66-79	0.001*	68.8
Day 120	66.9 ± 19.1		0.000*	61.5	243.1 ± 67.6		0.000*	0.0	70.2 ± 20.6		0.000*	46.2
Day 150	58.3 ± 21.9		0.010*	53.8	197.1 ± 83.1		0.000*	7.7	51.3 ± 23.5		0.001*	53.8
Day 180	61.5 ± 25.1		0.010*	50.0	188.8 ± 59.2		0.000*	11.1	56.9 ± 39.4		0.001*	70.0

RNI – Recommended Nutrient intakes for Malaysia (2017); IOM – Institute of Medicine (2005)

\* Significant p-value: one-sample mean test

<sup>1</sup> Adjusted by energy-nutrient residual method

<sup>2</sup> Percentage of respondents consuming below the RNI or IOM recommendations

**Table IV:** Maternal Fatty Acids Intake during Exclusive Breastfeeding Period (N=32)

Time points	Saturated fat				Polyunsaturated fat				Monounsaturated fat			
	Mean ± SD <sup>1</sup> (%)	RNI (%)	p-value	% >RNI <sup>2</sup>	Mean ± SD <sup>1</sup> (%)	RNI (%)	p-value	% <RNI <sup>3</sup>	Mean ± SD <sup>1</sup> (%)	RNI (%)	p-value	% <RNI <sup>3</sup>
Day 10	2.0 ± 0.9		0.000*	0.0	1.1 ± 0.8		0.000*	100	1.3 ± 0.9		0.000*	100.0
Day 30	1.7 ± 0.7		0.000*	0.0	1.4 ± 1.5		0.000*	95.5	1.8 ± 1.8		0.000*	100.0
Day 60	3.9 ± 1.1		0.000*	35.3	4.2 ± 2.6		0.008*	52.9	8.9 ± 4.6		0.000*	82.4
Day 90	4.7 ± 1.9	<10	0.000*	56.3	4.1 ± 2.3	3-5	0.657	50.0	8.6 ± 2.4	12-15	0.000*	93.8
Day 120	5.5 ± 1.5		0.000*	53.8	3.7 ± 1.8		0.001*	23.0	7.9 ± 1.7		0.000*	100.0
Day 150	3.6 ± 1.0		0.000*	30.8	3.3 ± 2.7		0.000*	61.5	7.9 ± 2.5		0.000*	100.0
Day 180	4.6 ± 1.1		0.000*	50.0	3.8 ± 1.8		0.007*	40.0	8.5 ± 2.1		0.000*	80.0

RNI – Recommended Nutrient intakes for Malaysia (2017)

\* Significant p-value: one-sample mean test

<sup>1</sup> Adjusted by energy-nutrient residual method

<sup>2</sup> Percentage of respondents taking above the RNI

<sup>3</sup> Percentage of respondents taking below the RNI

the other hand, PUFA intakes during the confinement period were only 1.1-1.4% of total energy intake, which did not meet the RNI recommendation. Meanwhile, the maternal intakes of monounsaturated fatty acid (MUFA)

did not meet the recommendation throughout the breastfeeding periods (1.3 to 8.9%).

The data in Table V illustrates the findings on maternal

**Table V:** Maternal Dietary Fibre and Fluid Intakes during Exclusive Breastfeeding Period (N=32)

Time points	Fibre				Fluid			
	Mean ± SD <sup>1</sup> (g/day)	RNI (g/day)	p-value	% <RNI <sup>2</sup>	Mean ± SD <sup>1</sup> (ml/day)	RNI (ml/day)	p-value	% <RNI <sup>2</sup>
Day 10	3.3 ± 1.76		<0.001*	100	814.7 ± 232.6		<0.001*	100
Day 30	3.3 ± 2.28		<0.001*	100	840.0 ± 240.8		<0.001*	100
Day 60	3.5 ± 3.88		<0.001*	100	931.5 ± 133.1		<0.001*	100
Day 90	3.2 ± 2.63	20-30	<0.001*	100	1019.3 ± 153.3	1600-2000	<0.001*	100
Day 120	3.7 ± 3.03		<0.001*	100	727.4 ± 144.7		<0.001*	100
Day 150	5.4 ± 5.13		<0.001*	100	937.8 ± 147.8		<0.001*	100
Day 180	4.5 ± 4.38		<0.001*	100	974.2 ± 150.7		<0.001*	100

RNI - Recommended Nutrient intakes for Malaysia (2017)

\* Significant p-value: one-sample mean test

<sup>1</sup> Adjusted by energy-nutrient residual method

<sup>2</sup> Percentage of respondents consuming below the RNI recommendation

dietary fibre and water intakes. It was found that the dietary fibre intakes ranged between 3-5 gram/day, which is very low compared to the recommended value (20-30 gram/day). None of the participants met the recommendation. In addition, it was observed that the maternal water intakes were lower during the breastfeeding period. It ranged from 815-1,019 ml (between four to five glasses) per day.

## DISCUSSION

Studies conducted in Malaysia reported that the traditional postpartum practices are commonly practiced among mothers after they delivered their baby (16,17). A cohort study in Singapore also revealed that most of its participants (Chinese: 95%, Malay: 92%, and Indian: 86%) adhered to traditional postpartum restrictions during confinement period (18). It has been known that confinement practices are prevalent in East-, South-, and South-East Asian cultures (12-14,19). The common purpose of these practices is to perceivably achieve the balance between the hot and cold states of the body. Giving birth is traditionally perceived as a cold state. One of the ways to balance the cold state is through dietary modifications. Mothers are encouraged to consume hot or warm foods and avoid foods which are considered as 'cold' such as pumpkin and water spinach. Other than that, mothers need to avoid fruits which are traditionally perceived to have 'sharp' properties such as watermelon and pineapple, and 'windy' (which may induce bloating) effect such as cold rice and yam (19, 20).

In the current study, maternal calorie intakes during the confinement period (on Day 10 and Day 30) were found to be the lowest during the recommended six-month exclusive lactation period (Table II). These findings can be associated with the restriction of types and amounts of foods among mothers who were practising the traditional confinement. In addition, the range of total energy intake in the current study was found to be similar to findings among a population which also observed traditional postpartum practices. A study from China reported that the range of maternal calorie intake throughout lactation period among their study participants were between 1,530-1,780 kcal/day (21). Nonetheless, maternal calorie intake in the current study remained below the recommended values even after the confinement period, despite the increasing pattern. Adequate calorie intake is important during the breastfeeding period. Studies have shown strong relationships (p-value: 0.004, OR: 5.6; p-value: 0.02, OR: 4.11) between maternal calorie intake during breastfeeding and successful exclusive breastfeeding (10,11). A research among 201 breastfeeding women in Indonesia found that the average total calorie intake was 2,143 kcal/day which was 86.4% of their recommended value (2,450 kcal/day) (11). Comparatively, a range of 62.1-85.3% of RNI (2017) for total energy was achieved

in the current study. It was also found that Indonesian women who exclusively breastfed for six months had significantly higher calorie intake ( $2,005 \pm 304$  kcal/day) compared to those who did not ( $1,503 \pm 434$  kcal/day) (10). This suggests that maternal total calorie intake is associated with the duration of exclusive breastfeeding.

Protein intake in the current study was found to be below recommended value and was showing reducing trend after the confinement period. Similarly, a study among Taiwanese women also revealed that the protein intake was higher during the first month of lactation (68.5 g/day) compared to after six months of lactation (62.4 g/day) (9). The relatively higher intake of protein during confinement compared to the rest of the exclusive breastfeeding period is believed to be due to awareness regarding the importance of protein for wound healing and recovery among the study participants. However, the protein choices may be limited cultural dietary restriction. For instance, the findings of a local study revealed that the only fish types allowed for consumption by Malay mothers during confinement period are Yellow-banded Trevally (or locally known as Selar) and Sand Goby fish (Haruan) as these fish are traditionally perceived not to have undesirable properties such as causing 'itchiness' and may promote wound healing (22). In comparison, the participants' protein intake is higher than non-breastfeeding/pregnant Malay women's intake (53.52 g/day) as revealed in the Malaysian Adult Nutrition Survey (MANS) (23). The higher protein intake among breastfeeding women may be related to the physiological changes that requires higher energy and nutrients intake.

Carbohydrate provides the most abundant source of energy in our diets. The IOM recommends a daily intake of 160 - 210g of carbohydrate for breastfeeding women (5). This is to ensure adequate production of milk, prevent ketonemia, and maintain maternal blood glucose during breastfeeding (24). The carbohydrate intake among mothers in the current study ranged from 197 - 272 g/day. This is comparable with the finding by a study by Durham and colleagues among 450 women who were fully breastfeeding (264 g/day) (7). Interestingly, they also found that women who were fully breastfeeding had higher intake of carbohydrates compared to those who were mix-feeding (202 g/day) or fully formula feeding their infants (236 g/day). This is because breastfeeding women were found to consume more whole wheat grains than others. Our findings also comparable to a study in Kenya which found that the mean maternal carbohydrate intake was 271 g/day (8). In contrast, participants' carbohydrate intake was higher compared to the non-breastfeeding Malay women in the MANS (187 g/day) (23).

The lower total fat intake during confinement period could be attributed to the cooking methods involving minimal use of fat such as steaming, brewing, baking,

grilling, etc., which are popularly used to prepare the foods during this time. Fatty and oily foods are traditionally avoided during confinement period, which may be related to the effort of lowering fat intake to reduce body weight and achieve a good body image (22). In contrast, the total fat intake of Chinese women in Malaysia during confinement period was found to be more than double (77 g/day) of the Malay mothers' in the current study (33.4 g and 32.7 g/day) and was within the recommended fats intake (25). The difference may be attributed by the culturally different confinement diets consumed by each ethnic in this country. Chinese women are encouraged to consume pork which has relatively high fat content after delivery. Moreover, sesame seed oil is among the foods traditionally categorized as 'must be eaten a lot', which may also contribute to the higher fat intake. Both of these foods are perceived as 'hot' foods which are beneficial for Chinese mothers during confinement period (25).

It is recommended for SFA intake to be less than 10% per day. The increased SFA intake after the confinement period is due to the lifted restriction of fatty foods and oil intake after the confinement period. Fatty meat and palm oil are among the main sources of SFA in Malaysian diet. Fatty meat such as beef, lamb and chicken, is widely available in the market, while palm oil is commonly used in local foods preparation. Meanwhile, the intake of SFA among Croatian women was reported to be higher ( $14.0 \pm 2.9\%$ ) than our current finding (26). This may be attributed by the different dietary pattern as evidenced by higher intake of milk and dairy products among the Croatian women.

Comparatively, women adhering to Mediterranean diet had PUFA intake which was slightly higher ( $6.7 \pm 2.8\%$ ) (26). The predominant PUFAs in diet include the omega-3 and omega-6 fatty acids such as docosahexanoic acid (DHA) and linolenic acid (LA). Omega-3 fatty acids are important for retinal growth and central nervous system development of infants. In addition, higher intake of omega-3 fatty acids is also associated with lower risk of cardiovascular diseases (27). The PUFAs can be found in plant oils such as corn and sunflower oils, and in deep sea fish such as mackerel, sardine, and black pomfret.

It is recommended that MUFA makes up 12 to 15% of total calorie intake. The MUFA intake in the current study was comparatively lower than the intake among Croatian women ( $15.2 \pm 3.7\%$ ) (26). Consumption of MUFA is highly recommended due to its many benefits especially on cardiovascular health. It is generously found in plant sources such as olive oil, canola oil, peanuts and peanut oil, and avocado. Palm oil, a commonly used cooking oil in Malaysia is also a good source of MUFA (28). However, healthier cooking methods using less fat and oil such as boiling and steaming are more often practiced during traditional confinement period. In addition, peanut is commonly

considered a prohibited food during confinement as it is believed to cause bloating (17). These may explain the results obtained by this study.

Dietary fibre intake was found to be lower than recommendation in the current study. This may have occurred due to the inadequate intake of high fibre foods such as vegetables, fruits, lentils, and wholegrain cereals among the research participants. This may be reflective of the low intake of dietary fibre among Malaysian women in general. Indeed, the findings from the MANS (2014), revealed that the mean intake of fruits among Malay women (aged 20-39 years old) was only 1.3 servings/day (23). This was similarly demonstrated in the present study in which the participants only consumed between 0.25 and 2 servings of fruits/day. In addition, the MANS (2014) reported that the mean vegetables intake of the same population was 1.4-1.6 servings/day. However, our study participants only consumed on average about 1.2 servings of vegetables daily. The low dietary fibre intake was also similarly demonstrated by the findings from the recent National Health Morbidity Survey (NHMS) (2015). The national study demonstrated that 94% of Malaysian adults did not consume adequate fruits and/or vegetables as recommended by the WHO (29). In addition, this may also be contributed by the limited choices of fruits and vegetables allowed to be consumed by mothers during the confinement period (20).

The Malaysian Dietary Guidelines (2010) recommends water intake of six to eight glasses per day (1,200-1,600 ml/day). In addition, breastfeeding women are encouraged to take an extra two glasses of water (400 ml) of water daily (30). Our findings were comparatively lower than the data from MANS (2014) which showed that the mean water intake of women (aged 20 to 39 years old) generally was approximately seven glasses per day, whereas Malay women in specific took about six glasses of water daily. For breastfeeding women, it is commonly suggested that they drink enough water to stay well hydrated. It is commonly assumed that higher water intake during breastfeeding will increase human milk volume (31,32). However, to this date, there are no reliable data that can prove the hypothesis.

This longitudinal study enabled the observation and analysis of changes of maternal dietary intake throughout the exclusive breastfeeding period. Other than that, this study also provides a quantitative assessment of maternal dietary intake during confinement and breastfeeding period among Malay women, the data of which are still limited up to this date. It should be noted that the findings of the current study are only applicable and true for Malay mothers in Malaysia. It may not be generalizable to other populations. This study focused on Malay mothers in order to minimize the effect of variability of dietary intake due to different traditional postpartum practices according to ethnics in

this country.

## CONCLUSION

The findings of this study suggest that traditional postpartum dietary practices may influence mother's ability to meet their nutritional requirements during lactation period. This is demonstrated by the lower total fat intake during the first month postpartum. In addition, at least three quarter of the research participants did not meet the total energy recommendation. The dietary fibre and water intakes were also found to be insufficient. Since breastfeeding would confer its benefits beyond childhood, necessary actions should be taken to improve the maternal dietary intakes during this vital period. Other than highlighting healthy and balanced nutrition, effective dietary advice for breastfeeding women should also address the cultural food taboos commonly practiced by local mothers especially during confinement.

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