

ORIGINAL ARTICLE

Awareness, Attitude and Behaviour Related to the Intake of Dietary Supplements among Malaysian Pregnant Women

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ABSTRACT

Introduction: With the expanding need of nutrients to support fetal growth during pregnancy, pregnant women are recommended to take dietary supplements. However, the intake of these supplements in Malaysia are not much reported. We aimed to determine the awareness, attitude and behaviour among pregnant women related to intake of dietary supplements during pregnancy and associated factors. **Methods:** A cross-sectional survey was conducted among pregnant women attending Obstetrics and Gynecology Specialist Clinic at Penang General Hospital between April and June 2018. Convenience sampling was used, and data was collected using a self-administered questionnaire. Awareness, attitude and behaviour were reported as frequency and percentages, and logistic regression was used to report associated factors. Analyses were performed using SPSS Statistics (Version 22). **Results:** A total of 273 respondents completed the questionnaires. While the awareness level on the role of dietary supplements during pregnancy is high (87.9%, n=240), only half of the respondents had a good attitude (53.5%, n=146) and had been taking essential supplements during pregnancy (49.1%, n=134). Having health problem was inversely associated with a good attitude towards the use of dietary supplements (OR=0.52, 95% CI 0.31-0.88), while respondents with a good awareness and a good attitude were more likely to consume dietary supplements (OR: 6.51, 95% CI 2.42 – 17.55, OR: 2.07, 95% CI 1.26 – 3.41, respectively). **Conclusion:** While the awareness level on the role of dietary supplements during pregnancy is high, only half of the respondents had a good attitude towards its intake and had been taking essential supplements during pregnancy.

Keywords: Dietary supplements, Prenatal nutrition, Prenatal care, Pregnancy nutrition, Pregnancy

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INTRODUCTION

Good nutrition is important during early stages of life, beginning early in the pregnancy stage. Common nutritional issues related to pregnant women include anemia, iodine deficiency and poor maternal weight gain. According to National Plan of Action for Nutrition of Malaysia, the concept of the first 1,000 days of life is integrated into activities to promote action and improve nutrition for mothers and children, which include folic acid, iron and vitamin B complex supplementation (1).

According to the World Health Organization (WHO), approximately 42 percent of pregnant women across the world were anemic (hemoglobin level 110g/L or below) in the first and third trimesters (2). This is mainly attributed to iron deficiency and have been linked with an increased risk of maternal and child mortality, premature delivery, and negative developmental outcomes on the infant (2,3). WHO has recommended daily use of iron

(30-60 mg) and folic acid (400 mcg) supplementation throughout pregnancy to reduce the risk of maternal anemia, iron deficiency and fetal low birth weight (4). Routine iron and folate supplementation during pregnancy was shown to be successful in reducing 69% of the incidence of anaemia at term and cause a 20% reduction in the incidence of infant low birth weight (5,6). In addition, recent meta-analysis study had reported that vitamin B12 deficiency during pregnancy was associated with a 15% higher risk of fetal low birth weight and 21% higher risk of preterm birth (7).

Folic acid supplementation is also recommended for women in childbearing age and pregnant women for the prevention neural tube defects (4). Adequate intake of folic acid will significantly reduce the risk of neural tube defects in fetus, especially for women with high risk pregnancies (8,9). Low levels of maternal folic acid during pregnancy has also been associated with higher body mass index (BMI) in their children at the age of five to six years, suggesting the role of prenatal maternal nutrition in child health status and development (10).

The use of maternal dietary supplementation, which refers to the vitamins and mineral supplements, at any

time during pregnancy is generally common in Asia. A study in China reported that 83.9% of women took at least one kind of micronutrient supplement before or during pregnancy, particularly folic acid, iron, calcium, although the adherence was low (11). In Vietnam, the adherence to maternal supplementation was high with 78% and 82% of the women consuming more than 80% of the preconception and prenatal supplements, respectively (12). However, based on a survey done in urban and rural area of Malaysia, only half of the respondents were compliant to the supplements given during pregnancy (13), which might be related to a prevalence of between 29.3 to 50% of anemia cases among pregnant women in this country (13–15). Low compliance to this supplementation might be caused by low awareness and poor attitude on the dietary supplementation in pregnancy, but evidence is still currently lacking. We therefore aimed to determine the awareness and attitude of pregnant women in Malaysia on the role of dietary supplementation during pregnancy, their behavior in supplement use and possible predictors influencing those thought and actions.

MATERIALS AND METHODS

Study design and settings

A cross sectional study was conducted between April 2018 and June 2018 to assess the awareness and attitude of pregnant women regarding dietary supplement use. Ethical approval was obtained from the Malaysian Medical Research & Ethics Committee with the approval number NMRR-18-431-40409.

Study population

The study population comprised of pregnant women who visited the Obstetrics and Gynecology (OBG) Specialist Clinic at Penang General Hospital (PGH) for follow up treatment between April 2018 and June 2018. The inclusion criteria are Malaysian nationality, being pregnant at any stage of pregnancy during the data collection process, able to understand English, and women with or without medical problems or pregnancy-related issues (e.g. gestational diabetes, hypertensive disorders, twin/ triplets pregnancy). Convenience sampling method was used in this study. A written informed consent was administered together with the questionnaires and were obtained from the participants before they started answering the questionnaires.

Sample size calculation was performed using Raosoft calculator using this formula: $n = N * X / (X + N - 1)$, where, $X = Z_{\alpha/2} * p * (1-p) / MOE^2$. ' $Z_{\alpha/2}$ ' is set as 1.96 when α is 0.05 and of confidence level of 95%; MOE (margin of error) is 5%, p (sample proportion) is 50% based on the expected proportion of population using of dietary supplementation in Malaysia (11), and N (population size) is 600 pregnant women attending OBG clinic in PGH throughout the data collection period (13). The minimum sample size needed is 235.

Questionnaire

The questionnaire was in English and included mainly close-ended questions. It comprised of four sections: a) personal information; b) awareness on dietary supplement use during pregnancy ; c) attitude towards the use of dietary supplements during pregnancy ; and d) behaviour towards its use during pregnancy. The awareness domain in section b) consisted of six questions assessing the respondents' awareness on the benefits of several nutrients and minerals during pregnancy and safety of dietary supplementation during pregnancy. Scores were given according to the answer options; No (1), I don't know (2) and Yes (3). The attitude domain in section c) consisted of seven items assessing respondents' attitude towards the importance of dietary and herbal supplementation and its safety during pregnancy. A 5-points Likert scale was used to measure the outcome (Strongly disagree (1)/ Disagree (2) / Neutral (3) / Agree (4)/ Strongly Agree (5)). The behaviour section consisted of four questions including three sub questions, but only one question was used to report the frequency and percentage of respondents taking dietary supplements at any time during pregnancy. It is based on the question: 'Do you ever take any dietary supplements during pregnancy?' The responses from other questions in this section were reported descriptively.

The questionnaire was assessed for face and content validity by four experts (three pharmacists/ researchers, one obstetrics and gynaecology specialist), and some questions were subsequently revised to be more precise and concise. A reliability analysis was performed using 36 respondents, and the Cronbach's alpha (CA) for awareness and attitude domains are 0.61 and 0.67, respectively.

Data collection

Questionnaires were administered to the eligible subjects by the researcher during clinic hours, and they were given time to fill it in. The completed questionnaires were then collected by the researcher.

Statistical analysis

For statistical analysis, the levels of education reported by respondents were grouped into three levels: low (up to high school), middle (up to diploma or degree), and high (postgraduate qualifications). The responses to questions on awareness and attitude towards the use of dietary supplements were reported as frequency and percentages.

Respondents were considered to have high awareness level when they answered 'Yes' to four or more the questions in section b). In section c) assessing the attitude, answers were grouped into two scoring scheme according to the item; (1) Agree (strongly agree and agree); and (0) Others (neutral, disagree and strongly disagree) for item A1 until A4, while (1) Disagree (strongly disagree and disagree) and (0) Others (neutral, agree and strongly

agree) for item A5 until A7. Using original Bloom's cut-off point, respondents are considered to have good attitude towards the use of dietary supplements during pregnancy if they agreed to at least five of the seven items (80–100%).

Simple logistic regression with complete case analysis were performed to analyse associations between potential determinants (i.e. age, marital status, educational level, medical history) and sum scores in terms of the dependent variables (i.e. awareness of, attitude towards, and behavior on the use of dietary supplements during pregnancy). Associations were expressed as odds ratios (OR) with 95% confidence intervals. Analyses were performed using SPSS Statistics, Version 22 (IBM Corporation, Armonk, NY, USA).

RESULTS

Respondents' characteristics

From 300 administered questionnaires, 283 were returned and 273 have been completed. The general characteristics and medical/medication history of the respondents are shown in Table I. Majority of the respondents was between 23 and 32 years old (n=199, 72.9%) and almost all of them are married (n=261, 96.0%). The mean pregnancy week of all respondents was 26 ± 9.7 weeks, ranged between two to 40 weeks. Nearly half of the respondents were in the third trimester of pregnancy. A considerable number of respondents (n=169, 66.0%) had completed diploma or degree as their highest education level and slightly over two thirds of them were employed (n=186, 69.1%), while more than half had an income between RM1001 to RM3000 (n=150, 62.8%). In terms of health problems, 88 (32.2%) of the respondents claimed to have medical problems such as diabetes mellitus, anemia, hypertension, asthma and thyroid disorders.

Awareness on the use of dietary and herbal supplements during pregnancy

In general, there was a high awareness level towards the role of dietary supplements during pregnancy among studies population. A total of 240 (87.9%) of them had correctly answered at least four of the questions in this domain (Fig. 1). Mean total score was 15.7 (s.d. 2.3) out of 18 total scores, with median (16), Q1 (14) and Q3 (18). Most of them knew that there are several important nutrients needed during pregnancy, including the role of folic acid and iron during pregnancy to prevent neural tube defect and anemia, respectively. Over two thirds of the respondents understood that brain development in fetus can be enhanced by omega 3 and omega 6, while nearly half of them are not aware that coenzyme Q10 can help their body produce energy needed during pregnancy. In addition, many of them (n=232, 86.2%) were aware that certain dietary supplements can be harmful when used during pregnancy.

Table 1: General characteristics and medical/medication history of the respondents (N=273)

Characteristics	Respondents, n (%)
Age group	
18-22 years	9 (3.3)
23-27 years	88 (32.2)
28-32 years	111 (40.7)
33-37 years	54 (19.8)
38 years and above	10 (3.7)
Pregnancy, mean weeks (SD)	26 (9.7)
Trimester of pregnancy	
First trimester (0-13 weeks)	43 (15.8)
Second trimester (14-27 weeks)	32.2 (32.2)
Third trimester (more than 27 weeks)	136 (49.8)
Education level	
High school	75 (27.5)
Diploma/degree	169 (66.0)
Masters/PhDs	8 (3.1)
Others	4 (1.5)
Marital status	
Married	261 (96.0)
Single	10 (3.7)
Divorced	1 (0.4)
Working status	
Employee	186 (69.1)
Housewife	69 (25.7)
Student	5 (1.9)
Others	9 (3.3)
Income (permonth)	
≤ RM 1000	27 (11.3)
RM1001 - 3000	150 (62.8)
RM 3001 - 8000	59 (24.7)
≥ RM8001	3 (1.3)
Health problems*	
Diabetes mellitus	33 (16.1)
Anemia	26 (9.5)
Hypertension	13 (4.8)
Asthma	10 (3.7)
Thyroid disorder	5 (1.8)
Others	1 (0.4)
Number of children	
None	60 (22.0)
1 – 2	151 (55.3)
3 – 5	58 (21.2)
6 or more	3 (1.1)

Note. * one respondent may have more than one answer; % valid percent

Attitude towards the use dietary and herbal supplements

Over half of the respondents agreed that pregnant women should take additional nutrients to maintain a good health status during pregnancy, and fetal development may benefit from dietary supplements (Fig. 1). Mean

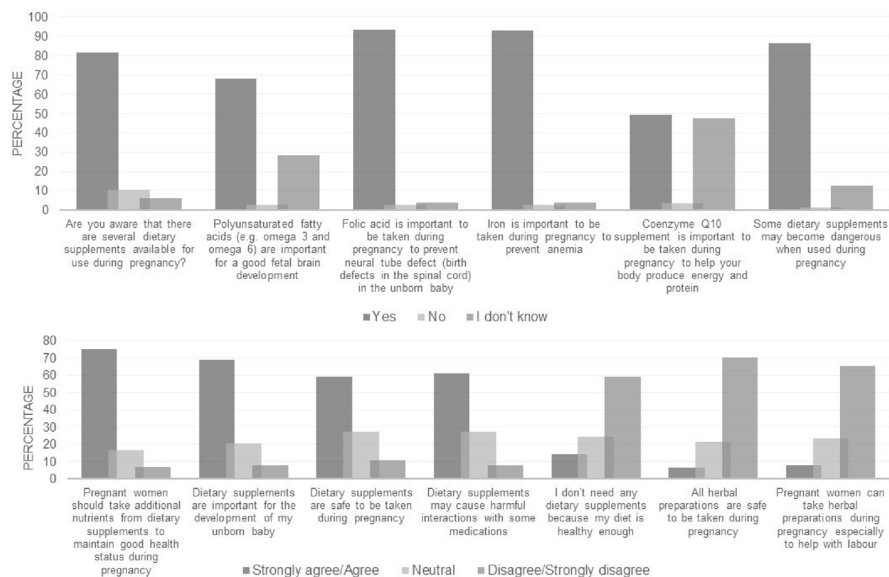


Figure 1: Awareness and attitude among the pregnant women regarding the dietary supplement intake during pregnancy (n=273)

total score was 21.6 (s.d. 3.1) out of 35 total scores, with median (22), Q1 (20) and Q3 (23). In addition, only 38 (13.9%) of them agreed that dietary supplements are unnecessary if their diet was healthy. Regarding the safety of dietary supplements use, 68.9% of the respondents agreed that dietary supplements are safe to be taken during pregnancy, while 61.2% agreed that it may cause harmful interactions with some medications. It may indicate that the latter group will take precautions in taking dietary supplements when they already taking any chronic medication(s). Between 60 to 70% of them agreed that not all herbal preparations are safe to be taken during pregnancy, and pregnant women should not take herbal preparations during pregnancy, especially to help during labor. Overall, a good attitude towards dietary supplements during pregnancy, determined by the score of 5 and above, was observed in 146 (53.5%) of the respondents.

Behavior towards the use of dietary and herbal supplements

About half (n=134, 49.1%) of the respondents claimed that they have used dietary supplements during pregnancy. Out of these 134 respondents, majority of them had taken multiple micronutrient supplements, with most reported ingredients include folic acid, iron, multivitamin, calcium, B complex, vitamin C and zinc. 12% of them were taking iron supplements and 7.5% taking haematinics. About 6% of the respondents only took iron supplements, and nearly 4% were taking haematinics only. Other reported supplements taken by the respondents, either in combination or taken alone, include virgin coconut oil, pomegranate concentrate, fish oil, placenta pills and organic seaweed.

Among the reasons of taking those dietary supplements were mainly because of anemia in pregnancy (n=54, 19.8%) and because the respondents thought that fetal requirement exceeds their usual diet (n=52, 19%). For

half of the respondents, these supplements were taken starting from the first trimester, while about one third started taking it during the second trimester. For folic acid supplementation, about one third of the respondents started taking it within the first trimester and about half during the second trimester. A minority of them never took folic acid supplements (n=8, 2.9%). When asked whether they plan to take herbal preparations before the labor, nine answered 'Yes' and one of them mentioned 'air selusuh'. Meanwhile, majority of the respondents answered 'No' (n=201, 73.6%), 36 (13.2%) were undecided, while 27 (9.9%) did not answer the question. The respondents were mainly getting the information regarding the dietary and herbal supplements through family and friends (n=118, 43.2%), followed by the attending physician (n=99, 36.3%), through Internet or social media (n=78, 28.6%), through media/advertisement (n=59, 21.6%), and from traditional midwives (n=23, 8.4%).

Predictors of good awareness, good attitude and behavior

Respondents with a history of health problems were more likely to have poor attitude towards the use of dietary supplements (OR=0.52, 95% CI 0.31-0.88) (Table II). Meanwhile, a good awareness level was significantly associated with a good attitude towards the intake of dietary supplements during pregnancy (OR=4.61, 95% CI 1.91-11.17).

Most of the variables were not found to be the predictors of use of dietary supplement intake during pregnancy, except for the level of awareness and attitude towards its use. Respondents with a good awareness level were six times more likely to consume dietary supplements (OR: 6.51, 95% CI 2.42 – 17.55), while those with a good attitude were two times more likely to do the same (OR: 2.07, 95% CI 1.26 – 3.41).

Table II: Predictors of awareness, attitude and behaviour towards the intake of dietary supplements during pregnancy (n=273)

Predictors	Number of respondents, n (%)		OR (95% CI), p value	Number of respondents, n (%)		OR (95% CI), p value	Number of respondents, n (%)		OR (95% CI), p value
	Good awareness	Poor awareness		Good attitude	Poor attitude		Taking dietary supplements	Not taking dietary supplements	
Age (28 years above vs. below)	152/240 (63.3)	22/31 (71)	0.71 (0.31 – 1.60), 0.266	96/145 (66.2)	77/122 (63.1)	1.15 (0.69 – 1.90), 0.345	84/133 (63.2)	84/129 (65.1)	0.92 (0.55 – 1.52), 0.420
Educational level (at least diploma vs. high school)	159/224 (71)	17/27 (63)	1.44 (0.63 – 3.31), 0.258	96/135 (71.1)	80/113 (70.8)	1.02 (0.59 – 1.76), 0.534	86/126 (68.3)	88/118 (74.6)	0.73 (0.42 – 1.28), 0.171
Marital status (Married vs. divorced/single)	229/239 (95.8)	31/32 (96.9)	0.74 (0.09 – 5.97), 0.619	138/146 (94.5)	118/121 (97.5)	0.44 (0.11 – 1.69), 0.180	130/134 (97.0)	123/129 (95.3)	1.59 (0.44 – 5.75), 0.351
Income (RM3001 or more vs. less)	55/212 (25.9)	6/26 (23.1)	1.17 (0.45 – 3.06), 0.481	31/129 (24.0)	30/105 (28.6)	0.79 (0.44 – 1.42), 0.262	36/116 (31.0)	25/116 (21.6)	1.64 (0.91 – 2.96), 0.680
Occupation (Employee vs. others)	166/238 (69.7)	19/30 (63.3)	1.34 (0.60 – 2.95), 0.301	107/146 (73.3)	76/119 (63.9)	1.55 (0.92 – 2.62), 0.065	95/134 (70.9)	86/126 (68.3)	1.13 (0.67 – 1.92), 0.371
Health problem (Yes vs. No)	70/240 (29.2)	11/32 (34.3)	0.79 (0.36 – 1.172), 0.338	35/146 (24.0)	46/122 (37.7)	0.52 (0.31 – 0.88), 0.011	41/134 (30.6)	37/129 (28.7)	1.10 (0.65 – 1.86), 0.419
Number of children (3 or more vs. less)	51/239 (21.3)	10/32 (31.3)	0.60 (0.27 – 1.34), 0.150	36/146 (24.7)	24/121 (19.8)	1.32 (0.74 – 2.37), 0.214	28/133 (21.1)	31/129 (24.0)	0.84 (0.47 – 1.51), 0.334
Good awareness	-	-	-	139/146 (95.2)	99/122 (81.1)	4.61 (1.91 – 11.17), <0.001	129/134 (55.6)	103/129 (44.4)	6.51 (2.42 – 17.55), <0.001
Good attitude	-	-	-	-	-	-	86/133 (58.9)	60/128 (41.1)	2.07 (1.26 – 3.41), 0.003

*good awareness was defined as answering 'Yes' to four or more of the questions

**good attitude was defined as answering to 'Strongly agree or agree' to five or more of the questions

DISCUSSION

Majority of the women who took part in this study were relatively young, aged between 28 and 32 years, and over half of them had child/children before this current pregnancy. Our respondents were generally aware of the importance of taking dietary supplements to support the increased nutritional requirement during pregnancy. Folic acid is given as a standard supplement for pregnant women undergoing follow up in government maternity clinics. This might be the reason of high awareness level among the respondents on its importance to reduce the risk of major congenital anomalies particularly neural tube defect in fetus (16).

Our findings showed that the concept of taking supplements during pregnancy was universally accepted by the public, regardless of socioeconomic and educational background. In previous studies, age group and education level were associated with a good awareness level on prenatal dietary supplementation (17,18). Barisic et al. (2017) had reported that highly educated women are more likely to know the benefits of folic acid and magnesium supplementations during pregnancy (17). On the other hand, Ren et al. (2006) had reported that pregnant women between 25 to 29 years old have higher awareness level on folic acid supplements as compared to other age groups (18).

Only half of the respondents (49.1%) claimed to take dietary supplements during pregnancy, which is much lower as compared to the reported prevalence from other countries; China (80% to 90%) (11,19), USA (77.6%) (20), Australia (93.8%) (21) and Korea (88%) (22). Our result, however, was consistent with the reported prevalence of use of vitamin and mineral supplements among adolescents in Malaysia, which is around 50% (23). It suggests that dietary supplementation was not widely practiced earlier in life, at least for the vitamins and minerals. However, with the influx of information and increasing selection of dietary supplement products, Malaysians have now begun to seek such products to maintain and increase overall wellbeing. Having a high awareness level on the role of certain nutrients during pregnancy was shown to be correlated with the actual intake of dietary supplements among our respondents.

Determinants of adherence to prenatal supplementation may include socioeconomic status, parity and education level, as reported previously (19,24). Those with higher education level, higher income and having no previous child, were more likely to adhere to supplements. Our result found that those with medical problems were more likely to have a poor attitude towards dietary supplements. It is partly expected, as poor attitude on basic nutrition needs during pregnancy may reflect maternal lifestyle choice, general health and wellbeing.

Other studies have reported correlations of dietary supplement use in pregnant women with higher income and educational status (24–26), which was not observed among our respondents. A good awareness and a good attitude towards the role of dietary supplements in pregnancy were significantly associated with an action of taking dietary supplements at any stage of pregnancy. It shows that this action was governed by informed decision and awareness on a nutritional requirement during pregnancy as well as the consequences on maternal and child outcomes.

Most of the dietary supplements used were mostly a combination of nutrients, including folic acid, iron, multivitamin and calcium. Apart from the basic folic acid, iron and vitamin B complex provided at the government maternity clinics, there is a wide choice of prenatal supplements available in the market. Studies performed in low and middle-income countries had found that the women who received multiple micronutrient supplementation had fewer low birth weight babies and small-for-gestational-age babies as compared to standard folic acid and/or iron supplementation (2,27). Based on a previous finding, the intake of folate, iron and vitamin B12 among Malaysian women of childbearing age was below the recommendation by Malaysian Recommended Nutrient Intakes, and 15.1% of the subjects presented with folate deficiency (28). Compliance and tolerance to side effects of these supplementations were among the issues needed to be further addressed to enhance the effectiveness of these supplementation program in public health facilities (29). Dietary supplements are more popular among the pregnant women as compared to herbal preparations. Our study population were generally quite reserved on the use of herbal supplements during pregnancy, as compared to other populations. However, a previous study had reported that 34.3% of Malaysian pregnant women had used at least one type of herbal medicine during pregnancy, and most of them aged more than 30 years old (30). Majority of the users took the herbal supplements to facilitate labor and they obtained it from traditional midwives or herbal shops and stores (30). Our population was comparatively of a younger generation (less than 32 years old), and their informed beliefs might be slightly different from the population in the previous study. Moreover, majority of our respondents disagreed that all herbal preparations are safe to be taken during pregnancy. It showed that they might have avoided these herbal preparations with the perception that they can adversely affect the fetus.

Source of information regarding dietary supplements during pregnancy is mainly from family and friends, which is not surprising, considering that Malaysia is among the countries with a high birth rate in South East Asia (15.9 per 1,000 population in 2017) (31). Therefore, they may have sought advices from family members and friends. This is also observed by Sooi

and Keng, whereby the information source for the use of herbal supplements during pregnancy was mainly from the parents (30). About 30% of them regarded their physicians as the source of information, followed by the Internet and social media. Therefore, more efforts are needed to convey the correct information regarding the safe use of dietary and herbal supplements during pregnancy, for example using information technology such as mHealth platform. mHealth intervention approach leverages the usage of mobile phones in improving adherence to taking nutrient supplements in pregnancy, whereby information and reminders were delivered via SMS, audio voice messages or phone calls. These interventions had been associated with a lower incidence of anemia during pregnancy and found to be effective in improving the use of micronutrient supplements by pregnant women in low and lower-middle income countries (32).

There are several limitations to our study. First, the study was institution-based and was conducted in a single center in Penang; hence, the findings of the study may not accurately reflect the condition in other parts of Malaysia. Second, selection bias may occur as these women are under follow up with the specialist at the O&G clinic in Penang General Hospital, indicating that they were either having complications or dealing with high risk pregnancies. Third, the questionnaires used were newly developed for the purpose of this study and factor analysis was not performed to measure the internal consistency of the instrument. However, a reliability testing was performed and the score for awareness and attitude domains are just below the usual cutoff point of 0.7. As for the attitude domain, two questions on herbal supplementation caused a reduction in CA; A5: I don't need any dietary supplements because my diet is healthy enough; A6: All herbal preparations are safe to be taken during pregnancy. However, both questions were not excluded as both are deemed important in the context of study objectives. Lastly, there may be information bias towards women who were more health-literate as compared to pregnant women undergoing follow up in the district maternity clinics.

A key strength of our study is that we focused on a currently pregnant population, which eliminates any recall bias on the respondents' view and practice on the intake of dietary supplements during pregnancy. This study is the first to report on the respondents' awareness regarding several important nutrients. While awareness of the importance of these nutrients appears to be high, their intake of supplementation is not that satisfactory.

CONCLUSION

While the awareness level on the role of dietary supplements during pregnancy is high, only half of the respondents had a good attitude towards its intake and had been taking essential supplements during

pregnancy. This may implicate both maternal health outcome and infant growth and development, including maternal anemia, low fetal birth weight and increased risk of congenital anomalies. Those with a history of health problems were more likely to have a poor attitude towards the use of dietary supplements, while good awareness and attitude levels lead to a better compliance towards essential supplements during pregnancy. More educational materials on dietary requirements and supplements for pregnant women are required, especially those with existing comorbidities. Utilizing the technology in conveying information and assessing the compliance to dietary supplements during pregnancy may be the way forward in improving the nutritional status of pregnant women.

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