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Compliance to Vitamin and Mineral Supplementation among Pregnant Women in Urban and Rural Areas in Malaysia

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Abstract: Low compliance has been linked to the ineffectiveness of supplementation programme among pregnant women. This cross-sectional study was carried out to determine the compliance of vitamin and mineral supplementation among pregnant women attending public antenatal clinics in urban and rural areas. A total of 118 pregnant women aged 28±4 years (urban areas = 62; rural areas = 56) were recruited. Socio demographic data and compliance to supplementation were obtained through self-reported questionnaire. Haemoglobin concentration (Hb) was obtained from the antenatal records. More than two-thirds of the subjects (79.7%) were in third trimester and less than a third (20.3%) was in second trimester. Overall, 49.2% of subjects complied with vitamin and mineral supplementation. The mean of weight and haemoglobin concentration were 63.7±15.1 kg and 11.3±1.1 g d/L, respectively. The overall percentage of subjects who complied with vitamin and mineral supplementation was 49.2%. There was no significant difference in percentage of subjects who complied with the supplements in urban (46.8%) and rural areas (51.8%) ($p = 0.587$). The prevalence of anaemia among the subjects (Hb <11 g d/L) was 42.3% ($n = 50$). Prevalence of anaemia was lower in the compliant group compared with the non-compliant group (34.5% vs 50%, $p = 0.01$). Pregnant mothers who did not comply to the supplementation had significantly lower haemoglobin concentration (11.0±1.0 g d/L) compared with those who complied (11.5±1.2 g d/L) ($p = 0.01$). Percentage of compliance in anaemic and non-anaemic subjects were 34.5 and 65.5%, respectively ($p = 0.088$). The main reasons for non-compliance reported by subjects in both areas were forgetfulness (33.9%), side effects (nausea and vomiting) (11.9%) and worry regarding big size of babies (5.1%). In summary, the incidence of anemia is still high while compliance to supplementation is still low. Comprehensive nutrition education and health promotion programme should be carried out targeting pregnant women in urban and rural to educate the importance of compliance with the vitamin and mineral supplementation during pregnancy.

Key words: Anaemia, compliance, haemoglobin, pregnancy, supplementation

INTRODUCTION

Anaemia in pregnancy is defined as reduction in the oxygen carrying capacity of the blood as a result of fewer circulating erythrocytes than normal or a decrease in the concentration of Haemoglobin (Hb) (Hoque *et al*., 2009). During pregnancy, there is an increase in amount of iron required to increase red cell mass, expand plasma volume and to allow growth of fetal-placental unit (Scholl, 2005). The deficiency occurs through reduced production or an increased loss of red blood cells. Anaemia in pregnant women in developing countries is generally presumed to be the result of nutritional deficiency. In Malaysia, the incidence of anaemia among pregnant mothers attending public antenatal clinics was reported to be 35% (Jamaiyah *et al*., 2007). Hadipour *et al*. (2010) reported a higher incidence of anaemia among Iranian pregnant women i.e. 51.4%. Iron deficiency anaemia is the most prevalent nutritional deficiency problem affecting pregnant women. Pregnant women are considered to be the most vulnerable group, since the additional demands that are made on maternal stores during this period exposes them to various latent deficiencies that manifest themselves as anaemia (Hoque *et al*., 2009). Increased iron requirements, low pre-pregnancy iron stores and continued inadequate dietary intakes of iron exacerbate this physiologic anaemia during pregnancy in many regions of this world (Christian *et al*., 2003). Brabin *et al*. (2001) reported a strong association between severe anaemia (OR 3.51, 95% CI: 2.05-6.00) and maternal mortality.

Anaemia may result from both nutritional and non-nutritional factors, specifically besides iron, deficiency of micronutrients such as vitamins A, C and B-12 and folic acid may contribute to the development of anaemia. These nutrients may affect haemoglobin synthesis either directly or indirectly by affecting absorption and/or mobilization (Ramakrishnan *et al*., 2004). Systemic

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evaluation of the efficacy of antenatal iron supplementation is known to raise haemoglobin concentration, although it effects are influenced by dose and compliance level (Christian *et al*., 2003). Inability to meet the required level for iron and other vitamins either as a result of dietary or supplementary gives rise to anaemia (Idowu *et al*., 2007). According to the World Health Organization (WHO, 1998), anaemia should be considered when the hemoglobin level is below 11 g/dL. Anaemia ranges from mild, moderate to severe and WHO classifies the hemoglobin level for each of these types of anemia in pregnancy at 10.0-10.9 g/dL (mild anemia), 7-9 g/dL (moderate anemia) and <7 g/dL (severe anemia).

Anaemia during pregnancy remains a problem in different settings despite the fact that routine provision of iron supplements has been recommended for pregnant women. The failure of iron supplementation programs to reduce anaemia in pregnant women has been attributed to various factors that influence the program delivery. Many pregnant women have little or no iron reserves and that is the reason why proper iron supplementation on a daily basis is recommended in antenatal clinics. Oral iron supplementation has been clinically shown to prevent iron deficiency (Jasti *et al*., 2005). Most Ministries of Health in developing countries including Malaysia have policies to give pregnant women either iron by itself or combined with folic acid in tablet form or prenatal vitamins. For example, national protocols in Malaysia require the provision of tablets of ferrous fumarate, folic acid, vitamin B complex and vitamin C. All pregnant women are prescribed prophylactic oral iron and folic acid supplements together with vitamin B complex and vitamin C and if the haemoglobin level ranges between 10-11 g/dL, oral treatment is indicated (Ministry of Health Malaysia, 2006). Despite these policies, prevalence of anaemia during pregnancy has not declined significantly. Many nutrition experts believe that one of the main reasons national iron supplementation program has failed is women's "non-compliance" with taking iron supplements daily (Galloway *et al*., 2002).

In Malaysia, vitamin and mineral supplementation programs have been a major strategy to reduce iron deficiency in pregnancy and the dynamic nature of nutrition problems meaning that strategies need regular review to maintain and improve their effectiveness. Despite efforts to reduce anaemia during pregnancy, information on compliance with vitamin and mineral supplementation is still considered limited. Since managing anaemia in late pregnancy poses a big challenge as it takes as long as two weeks to increase the haemoglobin level by 1 g/dL, detailed knowledge on supplements compliance might contribute to targeting efforts to those subgroups that are at higher risk. To the best of our knowledge, there is an absence of reliable epidemiological data in relation to compliance to supplementation locally. Therefore, it is difficult to evaluate intervention programme. In view of this limitation, this study was conducted with the aim of identifying compliance level with vitamin and mineral supplementation among pregnant women in urban and rural areas, factors associated with non-compliance and a comparison between blood haemoglobin and compliance level. It is hypothesized that percentage of pregnant women who complied with the supplementation is higher in urban area and haemoglobin concentration is higher in pregnant women who complied with the supplementation.

MATERIALS AND METHODS

Study locations and subjects: A cross-sectional study was conducted in three maternal and child health clinics in Selangor, central Malaysia representing urban area and five maternal and child health clinics in Johor, southern Malaysia representing rural areas. A total of 195 pregnant women were recruited by convenience sampling method. However, only 118 subjects were eligible and met the criteria of the study. The inclusion criteria in this study were Malay pregnant women of 21 to 40 years old and free from any health or obstetrics complications. Women with multiple pregnancies, gestational diabetes mellitus pregnant women or had other medical problems such as thalassemia were excluded from this study. Inform consent was obtained from each participant and ethical approval for the study was obtained from the Medical Research Ethics Committee of Universiti Kebangsaan Malaysia.

Questionnaire: A structured questionnaire was used to obtain information on demography profile, pregnancy history, eating habits during pregnancy, supplements intake, self-reported compliance level and knowledge about anaemia. This questionnaire was modified from Kalimbira *et al*. (2009). The questionnaire had been pilot-tested and tested on reliability (Cronbach-alpha = 0.825) in pregnant women attending antenatal care at maternal and child health clinic in Penang, northern Malaysia. Visits to clinics were paid to discuss about the protocol with the clinic's staffs. Subjects of the study were asked to fill in the questionnaire during their routine antenatal care at their respective clinics. Their antenatal data such as gestational week, weight and haemoglobin level were obtained from their antenatal record in the clinic. Haemoglobin level was measured using haematology analyzer available at the respective clinics. The haemoglobin values were classified according to the WHO (1972) anaemia categories [10.0 -10.9 g/dL (mild anaemia), 7-9 g/dL (moderate anaemia) and <7 g/dL (severe anaemia)].

According to Cramer *et al*. (2007), medication compliance refers to the act of conforming to the recommendations made by the provider with respect to

timing, dosage and frequency of medication taking. Therefore, medicated compliance may be defined as the extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen. Compliance is measured over a period of time and reported as a percentage. Compliance level in this study were assessed based on the subjects' self-report questionnaire on their supplements ingestion for the past 30 days. Supplements ingestion as reported by the subjects were then compared to the prescription by doctors at the health clinic. Ingestion lower than the actual prescription was categorized as low compliance.

Statistical analysis: SPSS programme version 17.0 (Statistical Package for Social Science) was used to analyze the data. Data were summarized by using means and standard deviations and percentages. Categorical variables were expressed as counts and percentages. Data normality was checked using Kolmogrov-Smirnov test before statistical test was carried out. Group comparisons with respect to categorical data were performed by using Chi-square test. Multinomial Logistic Regression test were performed to assess the factors that contributes significantly to the compliance level. One way ANOVA was used to compare blood haemoglobin level and compliance level. The significance level was preset at 0.05.

RESULTS

Demographic profile: Of the 118 subjects, 62 (52.5%) were from urban areas and 56 (47.5%) were from rural areas (Table 1). Majority of the subjects were in the age group of 26 to 30 years old (44.9%). A large number of the subjects (67.8%) were working and having an education level up to secondary education (55.9%). More than half of the subjects' family (53.4%) had a household income between RM 1500 to RM 3500 (USD 458 to USD 1068) per month.

Antenatal profile: More than three quarter of the subjects (79.7%) were in the third trimester of pregnancy compared to 20.3% were in the second trimester. Majority of them were multiparous (58.5%) while the rest were primiparous (41.5%). For all subjects, the mean±SD of body weight was 63.7±15.1 kg and their haemoglobin concentration was 11.3±1.1 g/dL.

Compliance level among subjects: Overall, a half of the subjects did not comply with supplementation (50.8%) while 49.2% were compliant (Fig. 1). More subjects in urban areas were found to be non-compliant (53.2%)

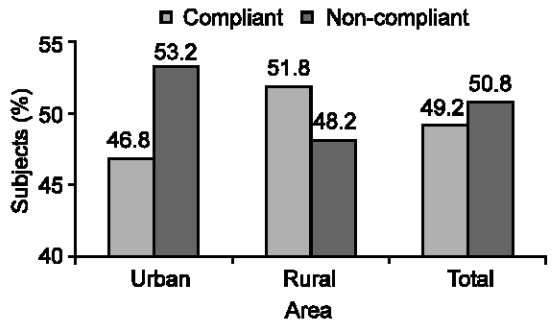

Fig. 1: Self-reported compliance with the supplementation according to areas

Table 1: Socio-demographic and antenatal characteristics of subjects

	Urban n = 62		Rural n = 56		Total n = 118	
Data	n	%	n	%	n	%
Age (years)						
21-25	14	22.6	15	26.8	29	24.6
26-30	32	51.6	21	37.5	53	44.9
31-35	12	19.4	13	23.2	25	21.2
36-40	4	6.5	7	12.5	11	9.3
Occupation						
Working	41	66.1	39	69.6	80	67.8
Housewives	21	33.9	17	30.4	38	32.2
Household income						
< RM 1500 (USD 458)	14	22.6	23	41.1	37	31.4
RM 1500-RM 3500 (USD 458-USD1068)	38	61.3	25	44.6	63	53.4
> RM 3500 (USD 1068)	10	16.1	8	14.3	18	15.3
Education						
Primary school	-	-	4	7.1	4	3.4
Secondary school	37	59.7	29	51.8	66	55.9
Tertiary level	25	40.3	23	41.1	48	40.7
Parity						
Primiparous	31	50	18	32.1	49	41.5
Multiparous	31	50	38	67.9	69	58.5
Trimester						
Second	8	12.9	16	28.6	24	20.3
Third	53	87.1	40	71.4	94	79.7

with supplements compared to their counterparts in the rural area (48.2%). The percentage of subjects in the urban areas who complied with the supplementation was slightly lower (46.8%) than their counterparts (51.8%) in the rural areas. However, this difference was not statistically significant (p = 0.305).

Incidence of anaemia during pregnancy: A total of 42.3% of the subjects in this study had anaemia (Fig. 2). There was no significant difference in the incidence of anaemia between subjects in the urban areas (46.8%) and rural areas (37.5%), p = 0.169. Only 1.6% subjects from the urban area had moderate anaemia while the rest 45.2% had mild anaemia. In the rural area, 37.5% had mild anaemia. Percentage of subjects without anaemia was 53.2 and 62.5% in urban and rural areas respectively.

Incidence of anaemia during pregnancy according to compliance level: Most of the subjects who complied with the supplementation had a normal haemoglobin concentration (65.5%) compared to the non-compliant (50.0%) (p = 0.088). Incidence of anaemia among subjects who were compliant was 34.5% and 50.0% among non-compliant. Majority of subjects who were anaemic in both compliant (37.9%) and non-compliant group (54.5%) were from urban area. On the other hand, majority of the subjects who had normal haemoglobin level in both compliant (69.0%) and non-compliant (55.6%) groups were from rural area.

Factors influencing compliance with the supplementation: The major factors reported as barriers for not complying with the supplementation were forgetfulness (33.9%), side effects (11.9%), worry to have big baby (5.1%), taking supplements other than prescribed in antenatal clinics (5.1%) and lack of knowledge (3.4%) (Table 2). Side effects of the supplements reported by the subjects were nausea (9.3%), constipation (9.3%), unpleasant taste/smell of tablets (7.6%) and vomiting (5.1%). It was found that only side effects, worry to have big baby, nausea and vomiting were significant contributing factors to poor compliance level among all subjects in this study. Nevertheless, forgetfulness was a significant contributing factor for both urban and rural subjects. Among the subjects from rural areas, working status was a significant contributing factor to non compliance (p = 0.025).

Comparison of blood haemoglobin concentration and compliance level: This study found that non-compliant pregnant women had a significantly lower blood haemoglobin concentration F (1,116) = 6.79, p<0.05), than compliant pregnant women. The mean±SD of haemoglobin concentration for non compliant pregnant women was 11.0±1.0 g/dL while for compliant pregnant women was at 11.5±1.2 g/dL.

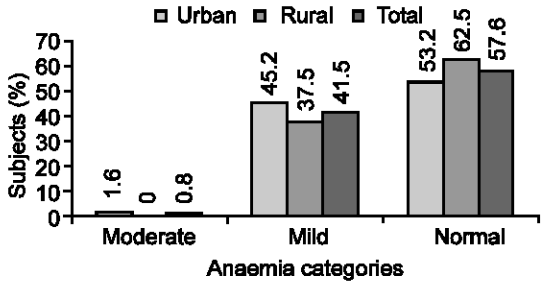

Fig. 2: Incidence of anaemia during pregnancy according to areas

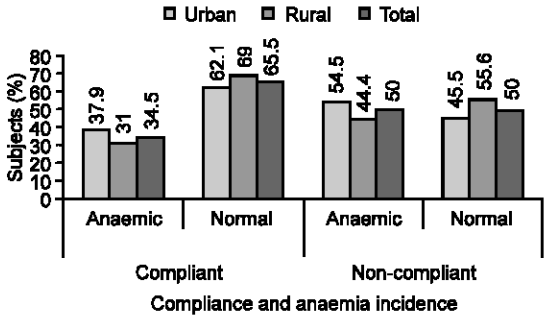

Fig. 3: Incidence of anaemia according with compliance to supplementation

Table 2: Factors influencing compliance level according to area

	Urban n = 62		Rural n = 56		Total n = 118	
Factors	n	%	n	%	n	%
Lack of knowledge on supplement intake	3	4.8	1	1.8	4	3.4
Side effects like nausea, vomiting, constipation etc.	9	14.5	5	8.9	14	11.9
Health problems	1	1.6	1	1.8	2	1.7
Unwanted pregnancy	-	-	1	1.8	1	0.8
Worry to have big baby	4	6.5	2	3.6	6	5.1
Supplements given insufficient	-	-	1	1.8	1	0.8
Taking other supplements	1	1.6	5	8.9	6	5.1
Forgetfulness	29	46.8	11	19.6	40	33.9

Table 3: Socio-demography and antenatal factors influencing compliance level according to areas

	Chi square, p value		
Factors	Urban n = 62	Rural n = 56	Total n = 118
Age	-	-	0.422
Occupation	0.025	0.640	0.190
Income	-	-	0.140
Education	0.498	-	-
Trimester	-	0.447	0.201
Parity	0.445	0.698	0.685

Table 4: Factors influencing compliance level with supplementation according to areas

	Chi square, p value		
Factors	Urban n = 62	Rural n = 56	Total n = 118
Lack of knowledge on supplements intake	-	-	0.045
Side effects	-	-	0.005
Nausea	-	-	0.031
Vomiting	-	-	0.013
Constipation	-	-	0.373
Worry regarding the size of baby	-	-	0.027
Forgetfulness	0.020	0.002	<0.001

DISCUSSION

This study aims to identify the compliance level with vitamin and mineral supplementation among pregnant women. This study has found that about 50% pregnant women did not comply with the supplementations. The result of the present study is higher than the earlier report by Saerah (1998) who reported that 26% of pregnant women did not comply with the supplements prescribed in Perak, northern Malaysia. This can be due to the higher percentage of working pregnant women in this study and working status was a significant contributor to the compliance level in urban areas.

The overall incidence of anaemia in this study was 42.3% and this value is higher compared to previous studies conducted in Malaysia (Jamaiyah *et al*., 2007; Rosline *et al*., 2005). Jamaiyah *et al*. (2007) conducted a study on maternal anaemia in Kelantan, east coast of Malaysia and reported that prevalence was 35.0%. Earlier, Rosline *et al*. (2005) reported 34.6% of anaemia incidence at the same area. The incidence of maternal anaemia among the subjects in this study is comparable with the finding published in an earlier study by Zulkifli *et al*. (1997). They reported that maternal anaemia was 47.5% among pregnant women attending health clinics in rural Kelantan.

The result of this study shows that there was no significant difference in incident of anaemia in urban and rural areas. This may be because the socioeconomic and educational characteristics of the subjects were almost similar despite the subjects lived in different areas. Previous study showed that low educational status and socioeconomic status were associated with anaemia during pregnancy (Okwu and Ukoha, 2008). Munasinghe and Van Den Broek (2006), also reported a higher prevalence of anaemia among pregnant women attending antenatal care in the rural area (72%) compared to in the urban area (57.1%).

The present study also shows that there was no significant difference between the percentage of compliance between subjects in urban (46.8%) and rural (51.8%) areas. This could partly explain why the incidence of anaemia between the two areas was not statistically significant. To our knowledge, no other studies compared the compliance with supplementations among pregnant women in urban and rural areas.

This study shows that the incidence of anaemia among subjects who did not comply with the supplementation was significantly higher compared to the compliant group and 50% of pregnant women who did not comply with the supplementation were having anaemia. This finding provides further support that compliance with supplementation do increase haemoglobin concentration during pregnancy. Zulkifli *et al*. (1997) found that only 50% of those mothers who were anaemic during their first visit to antenatal clinics, had improved haemoglobin levels by their last visit in spite of routine prophylactic oral iron supplementation for all pregnant women. The authors speculated that poor improvement in haemoglobin levels could be due to poor compliance among the subjects.

Overall, the subjects of this study reported that side effects including nausea and vomiting, worry to have big size baby and forgetfulness were the reasons for poor compliance. Other studies have produced similar results. A study by Kalimbira *et al*. (2009) in Malawi also found that 20.7% of their respondents have problems with their supplements with 43.6% of them reporting had experienced nausea. Another study in Vietnam, the respondents reported that they wrap the iron tablets in

pumpkin leaves or eat them with other food to disguise their bad smell and taste (Aikawa *et al*., 2006). It was reported that experiencing side effects was a risk factor for taking iron tablets. Different forms of iron have reduced side effects and newer forms of iron such as sprinkle, candies and beverages have the potential to reduce side effects and thus increase the compliance level accordingly (Aikawa *et al*., 2006). However, Malaysia has not embarked on the strategy of providing these newer forms of iron. According to WHO (2001) side-effects of iron tablets generally increase with higher dosages. These side-effects can be reduced if supplements are taken with meals, however the absorption is reduced by about 40%. If the supplement prescribed in the form of a single tablet, it is best ingested at bedtime. Compliance usually diminishes due to intolerance when more than one iron tablet is required. In such cases, prescribing one daily tablet instead of two is better for subjects who experience intolerance. One tablet taken consistently is preferable to the risk of total rejection or non-acceptance of supplements.

This study found that compliance level with the supplementation was not influenced by any socio-demography characteristics except for working status of urban pregnant women. Perhaps they forgot to take their supplements during working hours and some may have left their supplements at home. Saerah (1998) also reported that working mothers were more likely to be the non-compliant group. A study on iron tablets intake among adult women in Vietnam showed that majority of the respondents made efforts not to forget to take iron tablets by placing their pill within easy access or by asking their spouse to remind them (Aikawa *et al*., 2006).

A few limitations of this study should be addressed. First, the subjects of this study were recruited only from two states, Selangor and Johor. Thus, the findings may not represent the compliance level with vitamin and mineral supplementation among all pregnant women in Malaysia. Clearly, there is a need to carry out further research with a larger sample size and covering more areas throughout the nation. Second, information on compliance level with vitamin and mineral supplementation was obtained from a self-report questionnaire. Therefore, we could not reject the possibility of some subjects who did not report the actual ingestion. Methods of pill counts or microchip system to predict compliance level could be used in future studies.

Conclusion: This study has highlighted a number of important findings. First, the compliance level with vitamin and mineral supplementation among pregnant women in both urban and rural areas are found to be low and majority of them addressing side effects and forgetfulness as the main contributing factor towards non-compliance. With low compliance level, the prevalence of anaemia during pregnancy is still high among pregnant women in both urban and rural areas. The haemoglobin concentration of pregnant women who complied with the supplementation is significantly higher than the non-compliant pregnant women. The findings from this study highlight that antenatal health and nutrition intervention programmes for pregnant women is needed. A comprehensive nutrition education and health promotion program should highlight the importance of compliance with vitamin and mineral supplementation for both urban and rural pregnant women. Compliance level can be increased by focusing on disseminating the knowledge of anaemia among pregnant women and the importance of taking vitamin and mineral supplementation during pregnancy. Focus can be given to working women and to counter forgetfulness.

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