FACTORS INFLUENCING COMPLIANCE WITH IRON SUPPLEMENTATION AMONG PREGNANT WOMEN

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Abstract

Poor compliance with iron supplementation has been reported as one cause for the continuing increase in prevalence of iron deficiency anemia among pregnant women. This study was conducted to determine the influence of selected factors on the compliance of pregnant women with iron supplementation. A cohort of 105 pregnant women from the City of Muntinlupa were followed up for three months of iron supplementation. Compliance with the intervention was measured through self-reporting of the number of iron capsules missed to have taken and by actual pill counting. From these two compliance indicators, a compliance index was formulated to differentiate good compliers from not good compliers. Findings showed that 54% (57) of the participants were considered good compliers. Of the 14 socio-demographic factors investigated, educational attainment (p=.003) and the number of instructions received by the pregnant women on iron supplementation (p=.050) were found to be significantly associated with the participants' compliance index.

Keywords: iron deficiency anemia, iron supplementation compliance, hemoglobin, ferrous sulfate, pregnant woman

Introduction

The most prevalent nutritional deficiency which affects populations in various parts of the world is iron deficiency anemia (WHO, 1992). According to the World Health Organization, a total of 2,150 million people worldwide are anemic or iron deficient with the pregnant women as the most affected group at a prevalence of 53% in developing countries and 18% in industrialized countries (WHO, 2001).

The problem on high prevalence of iron deficiency anemia, its causes and consequences on the person's health have been addressed through the promotion of long term programs and immediate interventions (WHO, 1968). Among the measures recommended by WHO, particular attention is given to the implementation of iron supplementation programs, with priority given to pregnant women, which is the most high-risk group, for the provision of iron supplements. This group is particularly singled out because the iron requirement of the pregnant women cannot be met by diet alone (US NRC, 1989). Iron supplementation has the advantage of producing rapid improvements in iron status within a short time (DeMaeyer, 1989).

The implementation of iron supplementation has reduced the prevalence of iron deficiency anemia in many countries. Yip (1996) pointed out, however, that its efficacy is contingent on adequate follow up and supervision as demonstrated by the Mother Care Project in 1993. It has been observed that implementation coverage of iron supplementation among pregnant women with medicinal iron in large-scale health programs is often low (Yip, 1996), and that sustained efficacy in applied programmes is uncommon (Cook, 1990). In their studies, Charoenlarp (1988) and Thorand (1995) reported that ineffectiveness was also due to low service utilization, inadequate tablet supply, ineffective health staff motivation and low patient compliance.

In the Philippines, universal micronutrient supplementation was initiated by the Department of Health in 1993. Despite the ongoing universal provision of iron supplements among pregnant women, the IDA prevalence remains high. The latest National Nutrition Survey conducted by the FNRI-DOST (1998) showed a high (50.3%) prevalence among pregnant women. The high rate in maternal anemia has been related to the family's low consumption of dietary iron with 45% taken mostly from rice, corn and cereal products (FNRI-DOST, 1993). In addition to the problem of dietary iron inadequacy, low coverage and low compliance with iron supplementation among pregnant women in remote areas (Solon, 1989) has also been associated with the increasing prevalence of iron deficiency anemia.

The problem of low compliance has posed a challenge to many nutrition program implementors and health practitioners. Studies have been conducted to experiment on new formulations of medicinal iron (Cook, 1990) or modification of the regimen from daily to weekly dosage (Ridwan, 1996; Cook, 1995) in order to increase adherence to iron supplementation. Yip (1996) commented that the "issue at hand is not whether a weekly iron dose is beneficial or not, but whether pregnant women are able to receive and take iron tablets as prescribed".

The lack of cooperation among pregnant women with their adherence to iron supplementation is an important consideration in the treatment and prevention of iron deficiency anemia. This study was undertaken to address the following questions:

1. What is the rate of compliance by the pregnant women receiving iron supplements in the locality of Muntinlupa?
2. What factors are related with compliance of the pregnant women to take iron supplementation?

Significance of the Study

The implementation of the iron supplementation has been deemed the most appropriate and short-term intervention for improving the iron status of pregnant women. The Department of Health in collaboration with other funding agencies has been complementing resources of the local governments in an effort to provide iron supplements to population groups at risk to Iron deficiency anemia (IDA). Reduction in IDA prevalence among pregnant women hinges largely on their compliance with iron supplementation.

The findings of this study is expected to:

1. provide bases for the development of relevant information to motivate women to take iron supplements,
2. assist program managers in planning appropriate strategies directed towards improving compliance of pregnant women with iron supplementation,
3. serve as the basis for enhancing the training of the health providers in delivering better health services, and
4. advocate for continuing logistical support for the iron supplementation program and other health strategies by local government units that will help improve compliance of pregnant women with iron supplementation.

Studies on Compliance

While many of the diseases can be prevented and/or treated, successful treatment often depends on the patient's compliance with the medical regimen. Sackett et. al. (1985) cited Haynes' (1980) definition of compliance as "the extent to which the patient's behaviour, in terms of medications, following diets, or executing lifestyle changes, coincides with the clinical prescription".

The problem on compliance with a treatment regimen has been a perennial problem faced by health care providers for many years now. Based on medical literature, non-compliant patients may range from 15 to 90 percent (Brand, et. al. 1977). On the average, 50% of the patients do not follow the prescribed regimen for the full period as ordered by the physician. This was notably observed in areas where medical treatment involved marked changes in the patient's lifestyle or for those who were taking relatively simple medication not requiring alteration of the individual's lifestyle (Rosenstock, 1975).

This inability of a patient to adhere to prophylactic or treatment regimen presents a major problem in reducing the proportion of cases with various illnesses or diseases. Defaulting from treatment has been observed to be common at any stage of the treatment because once alone, the patient in his full capacity may choose to take all, part or none of the treatment prescribed (Cramer, 1991).

Various studies have been conducted to determine factors that may affect compliance of patients with the prescribed medical regimen. Characteristics of the patient, social and behavioral factors have been looked into, and findings showed inconsistent results on compliance of patients with medication.

Age has been found to significantly relate with compliance. Arnsten, et. al. (1997) reported that older men were better compliant with anticoagulant therapy, while the younger patients felt that the therapy was unduly burdensome. A study on pharmacologic compliance on long term prophylaxis treatment, on the other hand revealed no difference with respect to age between compliant and noncompliant patients (Frank, 1992).

Some studies showed that the educational, economic and ethnic factors can affect the patient's compliance to medication. Brand (1997) observed that poor compliance were more often reported in those who are less well educated. Beaulieu and group (1996), observed that level of education has no effect on the compliance rate of women on screening mammography examination. Likewise cost of drugs, which has an effect on the financial status of the patient, has also been noted to have a pronounced effect on compliance of patient with the medication. Beaussart-Defaye et al.'s (1997) study on epilepsy regimen showed that the working and the economically better off epileptic patients were more compliant with medication.

A strong health provider or doctor–patient relationship can very well influence the patient's adherence to the prescribed medication. The physician, at the initial prescription of medication, should consider the opportunity of

enhancing the patient's functional knowledge. This involves explaining the treatment, the disease, and the consequence of each (Hulka, 1979). Addington (1979) noted a good correlation between compliance with prescribed medication and the level of perceived severity of illness. He added that the presence of physical symptoms may help stress the severity of the illness. Thus, through this awareness, patients are more inclined to comply with the medication prescribed. In a study done in Jeneponto, Sulawesi, Indonesia, Thorand et. al. (1995) observed that the lack of benefit awareness from iron supplementation by the pregnant women resulted in low compliance and low service utilization of the health units .

The instructions received by the patient on medication regimen, such as the name and purpose of the drug(s), number of times in a day it/these should be taken, the purpose and possible side effects, and how one should respond, are essential. This information can improve the extent of the patient's understanding of instructions and is important if compliance is to take place (Wartman, 1983).

The most common factor that discourages compliance with any medication regimen is the occurrence of side effects. For example, patients taking para-aminosalicylic acid in the treatment of tuberculosis, or patients taking psychotropic drugs, usually experience gastrointestinal upset. As such, side effects often become a reason for stopping treatment. In a study by Woods et. al. (1992) on compliance of adolescent patients with contraceptive pill, nausea was reported as a significant predictor ($p=0.008$) for non-compliance after 12 months of follow-up.

A study in Jakarta, Indonesia, by Schultink et al. (1993) noted that prevalence of anemia did not decline after supplementation due to poor compliance of the women, however, side effects may not be related to this since only 2 women complained of nausea and vomiting. Side effects to iron supplements prompted the development of iron preparations that produce fewer side effects. Ekstrom et al. (1996) studied adherence of pregnant women to two forms of iron preparations: a) the GDS (gastric delivery system) and b) conventional iron tablets. Results showed a better adherence with GDS supplements, because of fewer side effects and improved hematologic response of participants, than the conventional iron tablets.

The involvement of family members or other persons has been found to be important in creating and even ensuring adherence to medication. Haynes et. al. (1979), as cited by Levy (1983) in his review of studies on compliance, emphasized the role of social support variables on compliance which may include

'influence of family', 'influence of friends', 'family stability', 'good social environment', 'interpersonal relations' and 'social participation or integration'.

Solon (Terminal Report, unpublished) based on a study conducted by the Nutrition Center of the Philippines, in collaboration with the Department of Health, tried to identify factors affecting compliance. The study showed that compliance rate as high as 70% can be obtained in unsupervised scheme provided that follow-up of recipients is done by the health worker. The study also suggested that motivation or follow up of target groups is an important factor to assure compliance. Additionally, constant communication between target and health provider can minimize side effects.

In a study on juvenile obesity, mothers of obese children were asked about their perceptions or threats specific to obesity. The study showed a substantial correlation between compliance and the mother's concern for the overweight condition of the child and the extent of agreement on the statement "being overweight could cause serious illness" (Becker et al., 1977).

Measurement of Compliance

Seven methods that may be employed to diagnose low compliance were presented by Sackett *et. al.* (1985) and included: (1) clinical judgment, (2) monitoring attendance at scheduled appointments, (3) monitoring achievement of the treatment goal, (4) searching for the therapeutic results or side effects, (5) pill counts, (6) drug levels, and (7) patient interviews.

Pill counting is an indirect but most commonly used measurement for determination of compliance. The method relies on the assumption that the tablets taken from the container are ingested by the patient (Pullar and Tindall, 1989). The drawback however is that the tablet taken out from the bottle may not necessarily mean that the patient actually consumed the medicine. This method is open to manipulation by the patient, since medicines may be discarded before counting to indicate compliance with the regimen (Cramer, *et al.* 1989). However, in a study by Cromer *et al.* (1989), the home pill count for iron therapy among adolescents was found to be significantly related to post treatment ferritin levels and urinary assay.

Sackett *et al.* (1985) recommends that for pill counts to be accurate, the method would require: keeping track of how many pills were dispensed with each prescription, the dates each prescription or refill was begun, whether the patient has left behind 'caches' of medication in other places, whether pills are shared with a relative and so on.

An indirect but easiest measurement of assessing compliance is by asking or interviewing the patient or by self-reporting (Fletcher, 1979). Patients are asked if they have missed to take their pills and further asked to estimate the average number of pills they missed in a day, week or month (Sackett, et al. 1985). The limitation of this method however is that patients may tend to lie or state what they think the physicians want to hear (Cramer, 1991). Despite this reality, Fletcher et. al. (1985) found that interview or asking the patient is the most useful method of measuring compliance when done together with pill counting and measuring serum digoxin concentration (SDC). The mean SDC correlated with the level of stated compliance while no relation was indicated between pill count and SDC.

Conceptual Framework

Although numerous factors may influence compliance of a pregnant woman with iron supplementation, this study focused only on some selected factors which could be assessed objectively. The conceptual framework (Figure 1) presents the factors assumed critical to compliance.

In the diagram, compliance of pregnant women with iron supplementation is the dependent variable. Compliance in this study was defined as the adherence of pregnant women to the practice of daily intake of iron tablets for 90 consecutive days. Compliance with iron supplementation was measured by, first, counting the total iron capsules consumed based on the remaining iron capsules in the container at the end of the treatment period. The compliance rate was computed as:

$$\text{Compliance Rate} = \frac{\text{Total no. of iron capsules} - \text{Total iron capsules in bottle}}{\text{Total no. of iron capsules prescribed}} \times 100$$

The second method was self-reporting by patient, measured through a response to an interview on whether the pregnant woman had "missed" or "not missed" to take iron capsules during the observation period. In the present study, a compliance index was adopted based on two criteria: (1) compliance rate and, (2) no. of iron capsules missed: A pregnant women with $\geq$ 90% compliance rate and $\geq$ 10 capsules missed was classified to have good compliance index.

Compliance was assumed to be affected by the following factors, namely: a) characteristics of pregnant women, b) awareness of pregnant women on result of iron status, c) actual iron status of the pregnant women based on

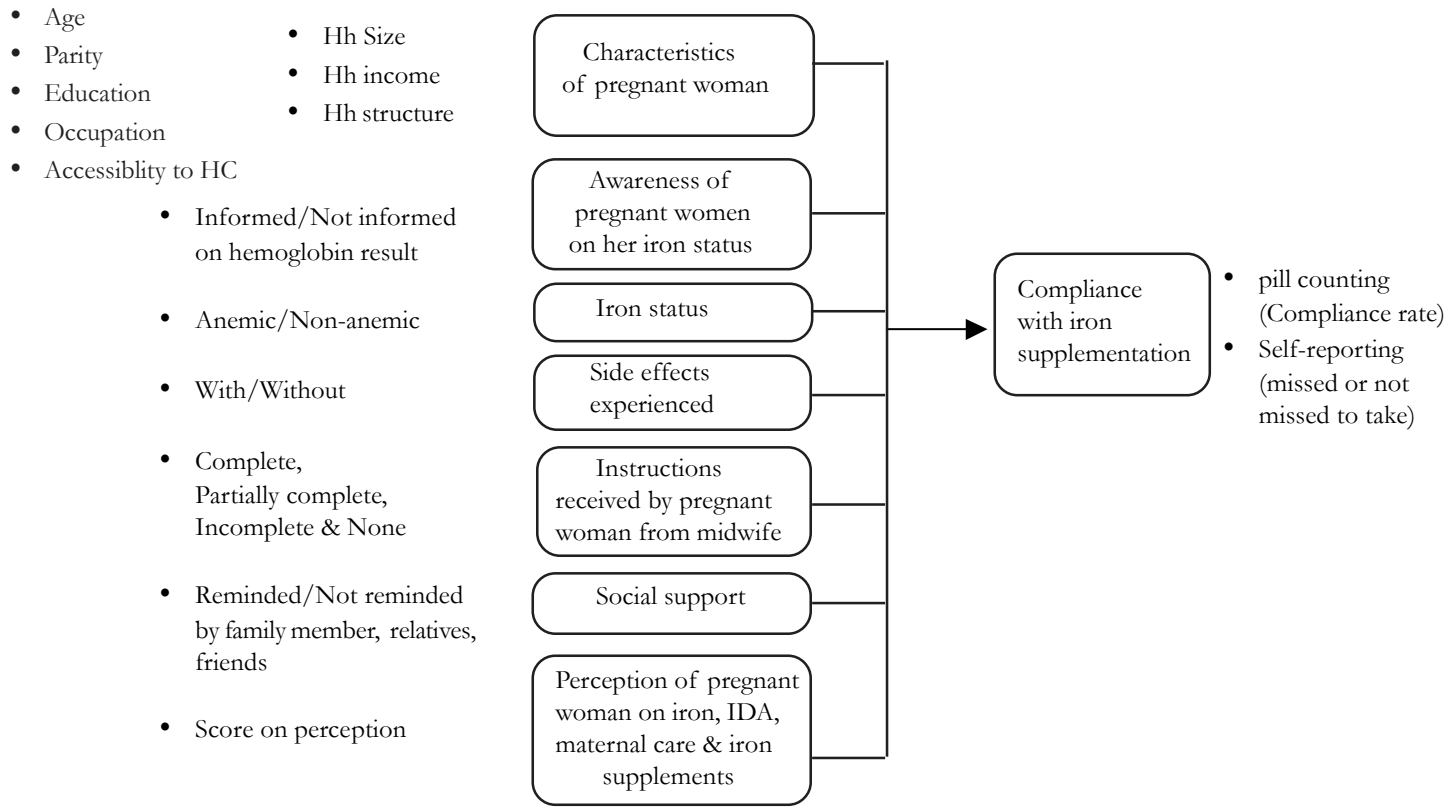

Figure 1. Factors Influencing Compliance with Iron Supplementation

hemoglobin analysis, d) side effects experienced from taking iron tablets, e) the instructions received by the pregnant women, f) the perception of pregnant women about iron, iron deficiency anemia, maternal care and the importance of iron supplements, and, g) social support. These factors were treated as independent variables in the analysis.

Methodology

The study was conducted in the City of Muntinlupa covering the 12 health centers in 9 barangays. A cohort of 145 pregnant women was enrolled in the observational study on compliance. The sample size was calculated at 2% margin of error and 5% level of significance including margin of probable dropouts. The approximation of the ideal number of participants for inclusion in the study was based on the average number of pregnant women who availed of the prenatal services of the health centers. Towards the middle part of the data collection period, some 27% of the women dropped out from the study bringing the number of active participants to 105.

Participants in this study included pregnant women who utilized the pre-natal service of the health centers accessible to their place of residence. The inclusion criteria for enrollment of participants in the study were the following:

a) in the 16^{th} – 23^{rd} week of gestation,
b) not heavily infected with parasites (less than 25 ova/slide),
c) no chronic infection/inflammation,
d) with hemoglobin count of more than 8 gm/dl and
e) willingness to participate in the study as indicated in the letter of conforme.

The study employed the questionnaire-interview method and focus group discussion. The data collection instruments consisted of four sections:

1) Basic Information Questionnaire

To obtain baseline data about the participants such as age, educational attainment, age of gestation, parity, household income, occupation, household size, household structure, and accessibility of participant to the health center, a basic information sheet was filled out by the women. A standard health information sheet was used by the health center physician to record the medical history of

the pregnant women concerning chronic infections and inflammation as well as the result of participant's hemoglobin test and stool examination for parasites.

2) Interview Schedule

A follow-up interview of participants was accomplished in their homes 2-3 weeks after receiving the iron supplements. The information gathered addressed the following concerns: a) awareness of pregnant women about their iron status, b) instructions received by the pregnant women on the dosage and regimen, and c) side effects experienced by the subjects. The second part of the interview schedule was done after completion of iron intervention, and collected information about: a) family support received by the participants, b) compliance of participants through self-reporting, whether or not iron capsules were missed within the observation period and the number of iron supplements not taken, c) reasons for missing or not missing to take iron capsules, and d) side effects experienced during the iron intervention.

3) Perception Test

A 15-item perception test designed specifically for this study assessed the participant's understanding and view about the functions of the iron nutrient, iron deficiency anemia, maternal care, and iron supplementation.

Responses of the participants on the interview schedule and perception test were validated through the conduct of a focus group discussion (FGD). Eleven participants were randomly selected for this activity.

4) Compliance Monitoring Form

The monitoring of subjects' compliance were done monthly through an inventory of the remaining iron tablets left in the container. The bottles returned by the participants during the pre-natal check-up were collected by the researcher for the counting and recording of any remaining iron tablets in the container. Data entered in the compliance monitoring form consisted of the following:

a) date when iron supplements were given,
b) date when iron supplements were to be taken,
c) schedule for next prenatal check-up visit,
d) actual visit made for prenatal consultation, and
e) date when iron supplement was last consumed.

Iron Supplementation Scheme. Each participant was provided with 35 Ferrous Fumarate capsules (each capsule contained 60 mg elemental iron and 250 ug folic acid) in amber-colored bottle with desiccant. The bottle received was labeled with the participant's name, name of health center and the dose of Ferrous Fumarate and Folic Acid. The participants were not told about the number of iron capsules that they were receiving each month. The excess number of iron capsules was a safety net in case the women failed to report to the health centers for the pre-natal visit and to check on the expected remaining capsules based on the given period of taking the supplements. This concept was adapted from Rudd et. al's (1989) study on compliance. Participants were specifically instructed by the midwives to return the bottle, whether empty or not, on their monthly pre-natal check-up. Upon return of bottles, fresh iron supplements in new sets of bottles were issued to the pregnant women.

Data Processing and Data Analyses. The data gathered were analyzed using the SPSS 10.0 for Windows (Standard Version, Copyright SPSS Inc. 1989-1999). Descriptive data such as subjects' age, parity, age of gestation, interval of last pregnancy, and hemoglobin level were analyzed for mean values and standard deviation. Chi-square test was used to assess compliance (self-report and compliance rate) and to determine association of selected factors with the compliance index.

Results

A total of 193 pregnant women were screened and enrolled in the study between October 2002 – February 2003. Of the 193 pregnant women screened, 145 participants met the criteria and were initially included in the study. Forty women were not able to finish the activities required, thus, were excluded in the data analysis. The reasons for the big number (40) of dropouts were:

a) unexpected early birth delivery due to error of the mothers in estimating the last menstrual period as reported to the midwives (14),
b) pregnant women lost interest to continue with the study (8),
c) transfer of residence (6),
d) decision of parents/husbands to have pregnant women give birth in the province (7),
e) miscarriage (4), and
f) ectopic pregnancy (1).

Characteristics of the Participants

One hundred five (105) pregnant women completed the 3-month iron supplementation and responded to the questionnaire-interview conducted by the researcher. The mean age of the participants was 24.7 ± 5.3 years, the youngest being 16 years old while the oldest was 41 (Table 1). More than half (55%) of the participants or 58 women were young with age less than 25 years old. Mean height was 153.3 ± 5.2 cm. while mean weight was 50.9 ± 7.3 kg. The participants had a mean gestation age of 18.6 ± 2.1 weeks with 20% of the participants at their 16th week of pregnancy upon enrolment to the study. The mean parity was 1.9 ± 1.1, with median at 2. Forty-eight percent of the pregnant women were primigravid while 32 women (30%) were on their 2nd pregnancy. The mean interval from last pregnancy was 1.5 ± 1.9. The mean hemoglobin level of participants at the start of the study was 11.9 g/dl ± 1.2.

Compliance of Participants with Iron Supplementation

The mean number of days the participants completed their iron supplementation was 91 days or 3 months. The participants were visited in their homes and were asked if they were able to follow the daily intake of iron supplements. Eighty-six women (82%) admitted that there were times when they missed to take the iron capsules, while the remaining 19 participants claimed that they did not miss any iron supplement. Through self-reporting, response to the question about "how many iron capsules were missed" were obtained from 86 participants. Table 2 presents the distribution of participants according to the number of capsules missed. Sixty-five percent of the participants reported that they missed 1-10 capsules throughout the duration of the study while 5 women admitted to having not taken more than 30 iron capsules for the 90-day period.

Participants who missed to take iron capsules were asked for the reasons why they missed to take their supplements. Sixty-two percent of these women said they forgot to take the iron supplements. Some participants forgot to bring their iron capsules when they left home to visit their relatives (19%) or when they went to the province (6%) (See Table 3).

Self-reporting by participants on iron capsules missed or not missed to take was further probed and validated through participants' compliance rate. Compliance rate was based on counting the iron supplements remaining in the bottles that were returned by the participants to the midwives during visits to

the health center. Table 4 presents the distribution of participants according to compliance rate. Mean compliance rate of participants was 87.5%, with a range of 40.7 - 100%.

From the compliance rate and self-reporting of iron capsules missed or not missed to take, a compliance index was derived. Those who reported having missed ≤10 iron capsules and a compliance rate of ≥90% were adjudged as good compliers. Based on these criteria, 57 (54%) participants were considered good compliers while the rest of the participants were not good compliers (See Table 5). Chi-square test showed a significant association ($p = .001$) between compliance rate and the self-reported number of iron capsules missed.

Socio-demographic Factors and Compliance

Analyses of the association of the different socio-demographic factors and the compliance index are presented in Table 6. Chi-square test showed significant association between the educational attainment of the participants and compliance index ($X^2 = 9.136$, $p = .003$). It was noted that 88% of the good compliers (50 participants) have at least finished the secondary level of education with 18 participants (36%) having had college education.

The number of instructions received by participants from the health provider also showed a significant association with the compliance index ($X^2 = 3.843$, $p = .050$). Eighty nine percent (89%) of the good compliers received ≥2 instructions while only 11% participants received 1 instruction from the health provider, and this was on the manner of taking iron supplements.

Discussion

Compliance with iron supplementation plays a major role in the prevention and treatment of iron deficiency anemia particularly among pregnant women whose iron requirement starts at the second trimester and progresses until the third trimester. One hundred five pregnant women in the City of Muntinlupa participated in the present study to determine compliance with iron supplementation as well as factors that may have influenced compliance.

The compliance with iron supplementation by the participants in the present study was determined through the employment of two indirect measurements, self-reporting and pill counting. Self-reporting was used to determine the number of iron capsules missed and to obtain reasons why iron supplements were missed. Of the 105 participants, 86 women admitted having missed to take iron capsules some of the time. However, since the interview

was done only after they completed the period of iron intervention, recalling the exact number missed was undoubtedly impossible. For this reason, mothers were only able to give the approximate number of supplements not taken for the whole duration of iron supplementation. It should be noted that iron supplementation in this study was unsupervised and self-reporting was not conducted weekly or monthly. This was purposely done to assess compliance behavior of mothers in a normal condition as is the usual practice of the midwives, and to avoid the feeling by mothers that they were being monitored.

Despite the limitation of self-reporting, additional information on reasons why women missed to take iron capsules were elicited which had been useful in further understanding compliance behavior of the participants. The mothers gave varied reasons; however, the most common one (62%) given on why intake of iron capsules were not completed was forgetfulness. Other responses included stopping to take iron capsules because of their effect on blood pressure or the belief that daily intake of supplements might harm the baby. Given the number of patients that have to be attended to plus other routine activities, health providers may not have time to explore these misconceptions of pregnant women about iron supplements. Possibly some health workers also have this pervading notion about blood pressure being related to the intake of iron supplements. This wrong perception should be looked into and corrected through proper training or health education of the health workers.

Compared to self-reporting, the pill counting used in the present study provided a close estimate of the participants' compliance with iron supplementation. That it has its limitation cannot be discounted. For example, one is not assured that the iron capsules removed from the bottle was indeed taken in by the participant. In the Focus Group Discussion (FGD), some participants admitted to occasionally retaining some of the excess iron capsules before returning the bottles. Thus, pill counting may have created a bias toward high compliance rate among participants.

Another limitation of pill counting was that, one is not assured that the pregnant women actually started taking the iron supplement on the day they were specifically advised to do so by the midwife. This problem also introduces an error in computation of true compliance rate as reported by Lee (1999) in his study.

A woman who missed $\leq$10 iron capsules based on self reporting and with a compliance rate of $\geq$90% was classified as a good complier; while those who missed >10 iron capsules and had a compliance rate of <90% were classified

as poor compliers. Thus, in the present study it was noted that 54% (57) of the participants were good compliers and the remaining 46% (48 participants) were not. These findings support Rosenstock's (1975) observation that on the average, 50% of patients are not able to follow the regimen prescribed by the health provider for the whole period of medication.

Compliance with a certain regimen may be influenced by a number of factors. One characteristic shown to have a significant association with the compliance index was the participants' educational attainment ($X^2 = 9.136$, $p = .003$). Education enables patients to appreciate the benefits that can be gained from complying with a medical regimen and can influence the overall health-seeking behavior of women. In the present study 88% (50) of the good compliers have at least completed high school education with some 11 participants also having earned a college degree.

According to Bloom and Weston (2003), mothers with education use the knowledge they have acquired to improve their personal health and those of other family members. Their knowledge of health risks motivates them to protect their families against illnesses and further promote good health seeking behavior. In Southeast Asia and sub-Saharan Africa, mothers who have obtained secondary schooling were those who brought their children for immunization, while mothers who had not been in school did not avail themselves of this benefit.

Kalichman and associates (1999) also reported a significant association between educational attainment and adherence to treatment among HIV/AIDS patients. Those with lower education and low literacy failed to adhere to the treatment. Confusion about the medication was reported to result from poor literacy since materials used generally relied on reading and writing. Comprehension of verbal treatment instructions was also a problem among those who had poor literacy.

In Catalonia, Spain, the importance of monitoring one's health such as availing of mammography and Pap test were also observed among women who have high educational level (Borras, et al. 1999). Wright et al. (1999) also reported that literacy was associated with improved compliance with primary pill pak (PPP) contraceptives. Literacy had an impact on compliance because a fair amount of instruction and health education messages was printed on the PPP.

The number of instructions received by the participants was also shown to have a significant association with the participants' compliance index. Of the 57 good compliers, 51 (89%) participants received ≥ 2 instructions regarding

how many and when to take iron capsules, as well as the purpose for taking iron supplements. Two participants received additional instructions about the side effects that may be experienced from taking iron supplements, while 2 women were also told what they could do if they experienced these side effects. Cromer et. al. (1989) argued that side effects were related with noncompliance but believed that initial instructions to patients such as the warning on adverse reactions to medication can minimize noncompliance and even increase adherence behavior.

The instructions received by the participants in the present study had not only helped them understand the benefits of taking iron capsules but also served to remove or minimize anxiety over possible side effects that may be felt or observed. As emphasized by Sackett et. al. (1975), patients cannot comply with a regimen unless they understand the instruction. The author added that health providers have the ethical obligation to inform the patients about their therapeutic regimen. In the present study, the training provided to the health staff on the importance of instructions and what instructions should be provided have been useful in making pregnant women aware of and appreciate the iron supplements prescribed to them.

The perception of an individual, generally, can guide behavioral conduct. In the present study, scores obtained by the participants in the perception test on anemia and maternal care failed to show a significant association with the compliance index. In a study on maternal compliance with the expanded program on immunization, Lim (1993) likewise found that perceived benefits from immunization by mothers was not significantly associated with their compliance to children's immunization. Cameron (1996) cited Andreoli's study among hypertensive patients where no difference was observed in the patient's self concept and health beliefs among those who complied and did not comply with the prescribed therapy.

However, it should not be discounted that there was nearly an association ($p = .078$) of the compliance index and the scores on perception. Thirty-nine women (68%) who got ≥ 8 scores on perception test were good compliers indicating that these participants have fair perception on anemia, iron supplementation and maternal anemia. Though majority of the participants have fairly good knowledge of the basics of health, nutrition, and maternal care, some perceptions of these participants (e.g. the blood pressure as a measurement to determine one's iron status, bottle gourd and eggplant as good sources of iron, and stopping to take iron supplements because of the side effects) must be looked into and be clarified through health and nutrition education.

Summary and Conclusions

The continuing problem on iron deficiency anemia among pregnant women has given impetus for the adoption of the universal supplementation with oral iron. Despite the usefulness of this health program to combat iron deficiency anemia, low compliance with iron supplementation remains to be a problem in reducing IDA prevalence. In the present study, after a 3-month iron intervention, results revealed that 46% (48) of the participants were poor compliers while the remaining 54% (57 participants) were good compliers. Failure to take iron capsules regularly was attributed to forgetfulness, according to more than 50% of the participants. Forgetfulness in taking medication is a reality. Taking medication immediately after meals is one way by which pregnant women may not forget the prescribed regimen. However, if the desire is to achieve a more improved hemoglobin level, pregnant women should be motivated well on the optimal effect of iron if it is taken between meals.

Of the 14 socio-demographic factors investigated, which may have influenced compliance with iron supplementation, educational attainment of and instructions received by the participants were the only factors found to be significantly associated with the compliance index. Those who have obtained at least secondary level of education and those who received at least 2 instructions on when/how many to take iron and an explanation of purpose for iron supplements were reported to be good compliers. The evidently homogenous characteristics of the participants and the small number of participants may explain the non-significant effect of other socio-economic factors.

Recommendations

To further increase compliance of pregnant women with iron supplementation, health workers should establish a good health provider-patient relationship that can help in motivating pregnant women to regularly take their iron supplements. Complete instructions, such as the dosage and manner of taking the iron supplements, the benefits of iron supplements, the side effects that may be experienced from taking the supplements, and what women should do when experiencing side effects, should always be communicated to pregnant women.

Program planners are encouraged to come up with effective strategies on the monitoring of compliance of pregnant women with iron supplementation. In the case of the local government, logistical support for the provision of medicinal iron should be continued and be enhanced among economically disadvantaged women as this can contribute considerably to the

reduction and control of iron deficiency anemia among this vulnerable group. For future research studies, association of factors influencing compliance with iron supplementation may further be investigated by including pregnant women from different socio-economic status. A bigger sample size should also be considered for better representation of subjects being studied. A pilot study for developing and testing the effectiveness of various tools/aids for motivating compliance with iron supplementation may be conducted among health workers and pregnant women.

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Table 1. Baseline characteristics of the pregnant women (N=105)

	Mean, SD	*Minimum*	*Maximum*
Age (years)	24.7 ± 5.3	16.0	41.0
Height (cm)	153.3 ± 5.2	140.5	165.4
Weight (kg)	50.9 ± 7.3	39.0	75.7
Age of gestation (weeks)	18.6 ± 2.1	16.0	23.0
Parity	1.9 ± 1.1	1.0	7.0
Interval of pregnancy (years)	1.5 ± 1.9	0.0	8.0
Hemoglobin level (g/dl)	11.9 ± 1.2	9.3	16.3

Table 2. Distribution of participants according to number of iron capsules missed or not missed to take based on self-reporting (N=105)

Number of capsules missed or not missed	No.	%
Missed (N=86)		
> 30 iron capsules	5	4.8
21-30 iron capsules	3	2.9
11-20 iron capsules	10	9.5
1-10 iron capsules	68	64.7
Not missed (N=19)	19	18.1
Total	105	100

Table 3. Reasons for missing to take iron supplements (n=86)

Reasons (Multiple responses)	*No.*	*%*
Forgot to take	53	62
Forgot to bring iron capsules during visit to relative	16	19
Experienced/Observed side effects	14	16
Forgot to bring iron capsules during travel to province	8	9
Iron capsules not received on time	5	6
Busy with household chores/children	3	3
Advised by sister-in-law to stop because of high blood pressure	1	1
Fed up of taking iron capsules	1	1
Felt that her condition is ok (not anemic)	1	1
Felt taking iron capsules daily may be harmful to the baby	1	1
Advised by midwife to take supplements every other day if blood pressure is high	1	1

Table 4. Distribution of participants according to compliance rate (N=105)

Compliance Rate	No.	%
≥ 90.0%	61	58.1
80-89.9%	19	18.1
70-79.9%	13	12.4
60-69.9%	7	6.7
<60.0%	5	4.8
Mean: 87.5%		
Total	105	100

Table 5. Distribution of participants' according to compliance rate and number of iron capsules missed by participants (N=105)

Number of iron capsules missed to take	Compliance Rate ≥ 90%	< 90%	Total
≤ 10 iron capsules	57 (54%)	30 (29%)	87 (83%)
> 10 iron capsules	4 (4%)	14 (13%)	18 (17%)
Total	61 (58%)	44 (42%)	105 (100%)

$X^2 = 11.484$, $p = .001$

Table 6. Results of Chi-square Tests between socio-demographic factors and compliance index among pregnant women

Socio–demographic Factors			≥ 90% + missed >10 iron capsules (N=57)	<90% + missed >10 iron capsules (N=48)	X^2	P value
Age	:	≤ 20 years old	15 (26%)	14 (29%)	.106	.745
	:	≥ 21 years old	42 (74%)	34 (71%)		
Parity	:	1 pregnancy	27 (47%)	23 (48%)	.003	.995
	:	≥ 2 pregnancies	30 (53%)	25 (52%)		
Educational	:	< High school level	7 (12%)	18 (38%)	9.136	.003
Attainment		≥ High school graduate	50 (88%)	30 (62%)		
Occupation	:	Unemployed	49 (86%)	36 (75%)	2.032	.154
		Employed	8 (14%)	12 (25%)		
Accessibility To	:	≤ 10 minute walk	17 (30%)	17 (35%)	.372	.542
Health Center		> 10 minute walk	40 (70%)	31 (65%)		
Household Size	:	≤ 5 members	42 (74%)	41 (85%)	2.166	.141
		≥ 6 members	15 (26%)	7 (15%)		
Household Income	:	≤ 10,000/month	47 (82%)	37 (77%)	.470	.493
		≥ 10,001/month	10 (18%)	11 (23%)		
Household Structure	:	Solo parent & nuclear family	30 (53%)	23 (48%)	.232	.630
		Extended family	27 (47%)	25 (52%)		
Informed or	:	No	16 (28%)	14 (29%)	.015	.901
Not Informed on Hemoglobin Result		Yes	41 (72%)	34 (71%)		
Participant's	:	Anemic	15 (26%)	7 (15%)	2.166	.141
Iron Status		Not anemic	42 (74%)	41 (85%)		
Number of	:	1 instruction	6 (11%)	12 (25%)	3.843	.050
Instructions Received		≥ 2 instructions	51 (89%)	36 (75%)		
Participant's	:	<8 scores	18 (32%)	8 (17%)	3.110	.078
Perception Score		≥8 scores	39 (68%)	40 (83%)		
Side Effects	:	No	52 (91%)	39 (81%)	2.245	.134
Experienced		Yes	5 (9%)	9 (19%)		
Social Support	:	No	11 (19%)	14 (29%)	1.399	.237
		Yes	46 (81%)	34 (71%)		