# Compliance and its Determinants Regarding Iron and Folic Acid Supplementation during Pregnancy in Kathmandu, Nepal

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## ABSTRACT

**Background**

Iron deficiency anemia is one of the major public health problems mostly affecting pregnant women of developing countries like Nepal. Kathmandu, the capital city of Nepal, has considerably high prevalence of anemia, which is attributed to inadequate dietary iron and problems of compliance to iron and folic acid supplementation.

**Objective**

This descriptive study aimed to identify the levels of and determinants associated with compliance regarding Iron and folic acid supplementation among pregnant women in Kathmandu, Nepal.

**Method**

The study was conducted in Paropakar Maternity and Women's Hospital in Kathmandu. Systematic random sampling was done to select a total of 406 samples that were either handed questionnaire for self-administration or interviewed. The $\chi^2$ test and multiple linear regressions were used for statistical analysis.

**Result**

The findings showed 73.2% of the respondents had high compliance, 12.8% moderate compliance, and 14% low compliance to iron and folic acid supplementation. More than half of the respondents had insufficient knowledge regarding anemia, iron deficiency and iron and folic acid supplementation. Multiple linear regression revealed that perceived severity, perceived barriers and social support were determinants of compliance to iron and folic acid supplementation (p<0.05).

**Conclusion**

This study infers that there is a lack of knowledge and awareness regarding anemia, iron deficiency, and iron and folic acid supplementation among pregnant women, and improvement in social support and perception of severity of the disease, and minimization of associated barriers may lead to better outcome in terms of compliance to iron and folic acid supplementation among pregnant women.

## KEY WORDS

*Anemia, compliance, iron, pregnant women, supplementation*

## INTRODUCTION

Iron deficiency anemia is one of the major global public health problems,[1,2] and one of the leading causes of maternal morbidity and mortality around the world.[3-6] Studies show that prevention of anemia in pregnant women is possible through routine iron and folic acid (IFA) supplementation.[7-9] But even after implementation of such programs, prevalence of iron deficiency anemia in many developing countries have not significantly declined due to problems with compliance to IFA supplementation.[9-13]

Like other developing countries, prevalence of anemia among pregnant women in Nepal is considerably high at 48%.[14,15] The most common cause of maternal anemia in Nepal is inadequate intake of iron and other nutrients.[16] Nepalese government therefore introduced the IFA supplementation program in 2003.[17] However, according to the Nepal Demographic Health Survey (NDHS) 2011, percentage of women who took full dose of IFA tablets was just 38% out of the 80% covered, which indicates a major problem with compliance.[15]

Among the major cities in Nepal, Kathmandu "the capital city", has the most problem of anemia and compliance to IFA supplementation.[18] Studies show that Kathmandu has higher prevalence of anemia among pregnant women (54% to 62.2%) and also higher percentage of non-compliers (23.4%) and the lowest percentage of good-compliers (49.9%) to IFA supplementation as compared to the national average of 20% and 56% respectively.[15,19,20] Furthermore, no comprehensive studies have been undertaken to identify the determinants of compliance to IFA supplementation in Kathmandu. This study therefore aimed to identify the levels of and factors associated with compliance regarding IFA supplementation among pregnant women in Kathmandu.

## METHODS

This was a descriptive cross-sectional study based on the Precede-Proceed model of health behavior developed by Green and Kreuter.[21] Data collection was undertaken in Paropakar Maternity and Women's Hospital, the biggest hospital in Nepal specializing in obstetrics and women's reproductive health, between July and August 2013. With a total catchment area of more than 1.1 million people, this hospital has the highest influx of antenatal and postnatal patients in Kathmandu (28920 admissions and 41590 Out patients in year 2011).[22-25]

The study included postnatal women who came to the hospital for obstetric/postnatal care OPD visits, willing to participate in this study , and able to speak and understand Nepali. Systematic random sampling techniques were used to approach eligible women for interview. After obtaining informed consent, 406 participants were selected for the study.

Data was collected by using a structured self-administered questionnaire in Nepali. The questionnaire was based on Nepal Demographic Health Survey (NDHS) 2011 to assess the level of compliance and Precede-Proceed construct of health behavior comprising of three main domains viz. predisposing (socio-demography and knowledge), enabling (perceived severity, susceptibility, barriers and benefits), and reinforcing (social support) factors, to assess the determinants of compliance.[15,21-26] For language validity, translation and back translation of the questionnaire from English to Nepali was undertaken by language experts. For content validity, a panel of experts at the Paropakar Maternity and Women's Hospital was consulted to assess the validity of the tool in which a content validity index (CVI) of 0.89 was obtained. The questionnaire's reliability was examined through Cronbach's coefficient, in which the values of main items varied from 0.80 to 0.96.

For the purpose of data collection two registered nurses were hired as research assistants, and were given systematic training wherein the objective of the study, data collection tools and procedure, and ethical consideration were highlighted. A written, informed consent from the participants were taken prior to the study. The questionnaires were handed and collected on the same day, and the participants were asked to place their questionnaire in an envelope and put in the box provided to them. However, for those respondents who were illiterate, face-to-face interview were conducted.

All study procedures were approved by the Khon Kaen University Ethics Committee for Human Research, Nepal Health Research Council and Research board of Paropakar Maternity and Women's Hospital.

Statistical software package SPSS 16.0 was used for data analysis. Data double entry was done to ensure correctness. Descriptive statistics were used to summarize the data, while $\chi^2$ test was used to determine the association between the level of compliance and factors determining compliance. Correlation coefficients were used to determine the strength and direction of association wherever applicable. Multiple linear regression model was developed to identify and assess the relationships between correlated determinants and level of compliance.

## RESULTS

**Socio-demographic Characteristics and Level of Knowledge of respondents**

Among the 406 respondents, 67.7% filled out the questionnaire on their own, while the rest faced interviews. The respondents' age ranged from 16 to 43 years, with the mean age of 24.57 years (SD=4.622, 95%CI 24.12, 25.02). Majority of the respondents were of Brahmin and Chettri ethnicities (21.4% and 19.2% respectively). Similarly, the majority of the respondents were Hindu (71.4%) followed

by Buddhists (21.4%). All the respondents were married and a higher proportion of them were primiparous (58.6%). Overall, the proportion of women who had attended school was higher (80.3%) compared to those who did not (19.7%). Out of the total respondents who attended school, 58.3% had studied up to primary school, 26.7% studied up to high school level, and 15% had college education. Distribution of the level of knowledge of respondents on anemia, iron deficiency and IFA supplementation, showed that more than half (56%) of the respondents had insufficient knowledge on the topics (Table 1).

**Table 1.** Respondents' profile of Predisposing factors (Socio-demography and Level of Knowledge).

| Predisposing Factors | | |
|---|---|---|
| **Age** | | |
| 16-25 | 263 | 64.9 |
| 26-35 | 134 | 33.1 |
| >35 | 9 | 2 |
| **Mean age=24.57, SD=4.622, 95%CI (24.12,25.02)** | | |
| **Ethnicity** | | |
| Brahmin | 87 | 21.4 |
| Chettri | 78 | 19.2 |
| Newar | 65 | 16 |
| Magar | 53 | 13.1 |
| Kirat | 32 | 7.9 |
| Tamang | 40 | 9.85 |
| Others | 51 | 12.6 |
| **Religion** | | |
| Hindu | 290 | 71.4 |
| Buddhist | 87 | 21.4 |
| Christian | 14 | 3.4 |
| Muslim | 9 | 2.2 |
| Others | 6 | 1.5 |
| **Parity** | | |
| 0-1 | 238 | 58.6 |
| 2-3 | 156 | 38.4 |
| >3 | 11 | 2.7 |
| **Mean parity=1.56; SD=0.77; 95%CI (1.48,1.63)** | | |
| **Education** | | |
| Yes | 326 | 80.3 |
| No | 80 | 19.7 |
| **Level of Education** | | |
| Primary | 190 | 58.3 |
| High School | 87 | 26.7 |
| College | 49 | 15.0 |
| **Level of Knowledge** | | |
| Insufficient (0-3) | 225 | 56 |
| Sufficient (4-6) | 179 | 44 |
| **Mean = 2.891; SD = 2.536; 95%CI (2.643, 3.139)** | | |

## Level of Compliance to IFA Supplementation

Among the total respondents, 297(73.2%) were found to have high compliance to IFA supplementation, while 52(12.8%) and 57(14%) respondents were found to have moderate and low compliance to IFA supplementation respectively. Table 2 presents the level of compliance of the respondents to IFA supplementation.

**Table 2.** Level of Compliance to IFA Supplementation among respondents.

| Level of Compliance | n | % |
|---|---|---|
| High Compliance (90-180) | 297 | 73.2 |
| Moderate Compliance (60-89) | 52 | 12.8 |
| Low Compliance (59-0) | 57 | 14 |
| **Total** | **406** | **100** |

**Table 3.** Perceptions of respondents to Enabling (severity, susceptibility, barriers and benefits) and Reinforcing factors (social support).

| Enabling and Reinforcing Factors | n | % |
|---|---|---|
| **Perceived Severity** | | |
| Extremely | 158 | 39 |
| Moderately | 165 | 40.7 |
| Somewhat | 82 | 20.2 |
| **Perceived Susceptibility** | | |
| Extremely | 156 | 38.5 |
| Moderately | 149 | 36.8 |
| Somewhat | 99 | 24.4 |
| Not | 1 | 0.2 |
| **Perceived Barriers** | | |
| Extreme | 8 | 2 |
| Moderate | 79 | 19.5 |
| Somewhat | 181 | 44.7 |
| Not | 137 | 33.8 |
| **Perceived Benefits** | | |
| Extremely | 204 | 50.4 |
| Moderately | 148 | 36.5 |
| Somewhat | 53 | 13.1 |
| **Social Support** | | |
| Extreme | 278 | 68.6 |
| Moderate | 108 | 26.4 |
| Somewhat | 18 | 4.4 |
| No | 1 | 0.2 |

## Perceptions of respondents to Enabling and Reinforcing factors

Distribution of responses to the perception of enabling factors (Table 3) shows that the majority of respondents (79.7%) perceived anemia and non-compliance to IFA supplementation as severe problems. Likewise, the majority (38.5%) of respondents felt extremely susceptible to anemia in absence of compliance to IFA supplementation, while 36.8% felt moderately susceptible.

**Table 4.** Bivariate associations between level of compliance and independent variables.

| Variables | Level of Compliance | | | | | | |
|---|---|---|---|---|---|---|---|
| | | High | | Moderate | | Low | |
| **Age** | Total | n | % | n | % | n | % |
| 16-25 | 263 | 190 | 72.2 | 36 | 13.7 | 37 | 14.1 |
| 26-35 | 134 | 99 | 73.9 | 15 | 11.2 | 20 | 14.9 |
| >35 | 9 | 8 | 88.9 | 1 | 11.1 | 0 | 0 |
| **Parity** | | | | | | | |
| 0-1 | 238 | 180 | 75.6 | 26 | 10.9 | 32 | 13.4 |
| 2-3 | 156 | 109 | 130.7 | 23 | 32.3 | 24 | 36.9 |
| >3 | 11 | 7 | 63.6 | 3 | 27.3 | 1 | 9.1 |
| **Education** | | | | | | | |
| Yes | 326 | 261 | 80.1 | 34 | 10.4 | 31 | 9.5 |
| No | 80 | 36 | 45 | 18 | 22.5 | 26 | 32.5 |
| **Level of Education** | | | | | | | |
| Primary Education | 190 | 150 | 79.0 | 16 | 8.4 | 24 | 12.6 |
| High School | 87 | 73 | 83.9 | 10 | 11.5 | 4 | 4.6 |
| College | 49 | 38 | 77.5 | 8 | 16.5 | 3 | 6.0 |
| Level of Knowledge | | | | | | | |
| Sufficient | 225 | 144 | 64 | 33 | 14.7 | 48 | 21.3 |
| Insufficient | 179 | 152 | 84.9 | 18 | 10.1 | 9 | 5 |
| **Perceived Severity** | | | | | | | |
| Extremely | 158 | 144 | 91.1 | 8 | 5.1 | 6 | 3.8 |
| Moderately | 165 | 115 | 69.7 | 36 | 21.8 | 14 | 8.5 |
| Somewhat | 82 | 37 | 45.1 | 8 | 9.8 | 37 | 45.1 |
| **Perceived susceptibility** | | | | | | | |
| Extremely | 156 | 138 | 88.5 | 12 | 7.7 | 6 | 3.8 |
| Moderately | 149 | 108 | 72.5 | 27 | 18.1 | 14 | 9.4 |
| Somewhat | 99 | 49 | 49.5 | 13 | 13.1 | 37 | 37.4 |
| Not | 1 | 1 | 100 | 0 | 0 | 0 | 0 |
| **Perceived barriers** | | | | | | | |
| Extreme | 8 | 7 | 87.5 | 0 | 0 | 1 | 12.5 |
| Moderate | 79 | 35 | 44.3 | 18 | 22.8 | 26 | 32.9 |
| Somewhat | 181 | 129 | 71.3 | 24 | 13.3 | 28 | 15.5 |
| Not | 137 | 126 | 92 | 9 | 6.6 | 2 | 1.5 |
| **Perceived benefits** | | | | | | | |
| Extremely | 204 | 172 | 84.3 | 16 | 7.8 | 16 | 7.8 |
| Moderately | 148 | 99 | 66.9 | 33 | 22.3 | 16 | 10.8 |
| Somewhat | 53 | 25 | 47.2 | 3 | 5.7 | 25 | 47.2 |
| **Social Support** | | | | | | | |
| Extremely | 278 | 225 | 80.9 | 30 | 10.8 | 23 | 8.3 |
| Moderately | 108 | 67 | 62 | 21 | 19.4 | 20 | 18.5 |
| Somewhat | 18 | 4 | 22.2 | 1 | 5.6 | 13 | 72.2 |
| Not | 1 | 0 | 0 | 0 | 0 | 1 | 100 |

*The association of variables with the level of compliance was assessed using the $\chi^2$ test; all P<0.05 except 'Age' and 'Parity', where P>0.05

Among the respondents, 78.5% did not perceive any significant barriers to IFA supplementation, while 86.9% thought of IFA supplementation to be beneficial. Similarly, the responses to the perception of reinforcing factor or social support shows that 95% of the respondents agreed to have received significant support from family members and healthcare providers during pregnancy, specifically in terms of IFA supplementation.

**Factors affecting Compliance to IFA Supplementation**

Bivariate analysis of the level of compliance was performed among the variables of the three domains; predisposing, enabling and reinforcing factors (Table 4). $\chi^2$ test was used to determine the association between the variables and level of compliance. It was found that 'Age', 'Ethnicity', 'Religion', and 'Parity' had no significant association with level of compliance (p>0.05). 'Education' had a significant association with the level of compliance (p<0.05), whereas "Level of education" did not have any significant association. Similarly, It was found that "level of knowledge" had a significant association with level of compliance (p<0.05). Surprisingly, respondents with insufficient knowledge showed higher compliance compared to respondents with sufficient knowledge. Likewise, among the enabling factors, all variables, viz. 'perceived severity', 'perceived susceptibility', 'perceived barriers', and 'perceived benefits' were found to have significant association with level of compliance (p<0.05). Furthermore, respondents who showed strong agreement with "perceived benefits" showed the highest compliance among the other groups. However, these factors, 'perceived severity', 'perceived susceptibility' and 'perceived barriers' showed stronger correlation to level of compliance compared to 'perceived benefits'. The 'social support' variable of the reinforcing factor domain also showed significant association and strong correlation with level of compliance (r=0.36, p<0.05). Furthermore, respondents who showed stronger agreement to "social support" exhibited higher compliance than others.

Multiple linear regression was used to control potential confounders and to further explore the determinants of compliance to IFA supplementation. Out of all the significantly associated variables, only the ones which showed stronger correlations with the dependent variable 'level of compliance' were chosen and included in the model. The model contained four independent variables "perceived severity", "perceived susceptibility", "perceived barriers", and "social support". As shown in Table 5, all variables except "perceived susceptibility" made statistically significant contribution to the model (p<0.05). The model indicated that those who perceived anemia and non-compliance to IFA supplementation as a very serious/severe issue (β=0.262, p<0.05), received stronger social support from family and healthcare providers (β=0.172, p<0.05) and did not feel any barriers to IFA supplementation (β=0.285, p<0.05) showed higher compliance.

**Table 5.** Multiple linear regression analysis to predict the determinants associated with the level of compliance.

| Variable | Coefficient (β) | 95% CI | P-value |
|---|---|---|---|
| Perceived Severity | 0.285 | 0.12,0.39 | 0.000 |
| Perceived Susceptibility | 0.015 | -0.10,0.13 | 0.820 |
| Perceived Barriers | 0.262 | 0.18,0.34 | 0.000 |
| Social Support | 0.172 | 0.08,0.34 | 0.002 |

$R^2$=0.277, *Significant at p<0.05: All variables entered into the model showed association with level of compliance except 'Perceived Susceptibility'.

## DISCUSSION

The study revealed that more than half of the respondents were of the younger age group 16 to 25, which is consistent with the report published by NDHS 2011.[15] Out of the total respondents, 11% were under 20 years of age, which is considered a high risk age group for pregnancy and maternal/neonatal/child mortality.[27] Of the total respondents, a majority of the population were Brahmins and Chettris, which is consistent with the results from the Nepal Population Report and NDHS.[15,18] Among them, 71.4% were Hindus, which is quite likely, considering it is the major religion in the country.

Out of all the respondents, 19.7% had received no education and were illiterate, which could have been the reason why they scored very low in knowledge section, and also showed moderate to low compliance to IFA supplementation. The formal education system in Nepal spans up to secondary school, also known as School Leaving Certificate (SLC). 41.7% out of the total who attended school, had education up to or over high school, which is indicative of the higher literacy rate in a city like Kathmandu. The results from this study identify "Education" and not "Level of Education" to be significantly associated to compliance in the socio-demographic section, which does not coincide with the results from NDHS 2011, in which the major determinants of compliance were identified as age, level of education, and wealth quintile.[15]

Although 56% of the total respondents had insufficient knowledge regarding anemia, iron deficiency and IFA supplementation, the compliance was found to be surprisingly high. The result of the study is also consistent with another study undertaken in Urmia, Northwest Iran in urban care setting, in which even though the knowledge of women on anemia was poor, compliance was still high (87%).[28]

Compliance to IFA supplementation in this study showed good prospects with 73.2% high compliers 12.8% moderate and 14% low compliers. This was much higher than the national results published by NDHS in 2011, in which it was found that a majority (56%) of women took iron tablets daily for 90 days or more (high compliance), 5% for 60 to 89 days (moderate compliance), 19 % for fewer than 60 days (low compliance) and 20% did not take iron supplements at all.[15]

Perceived severity had the strongest association with the level of compliance among all other factors. All respondents identified perceived severity to be one of the strongest factors to ensure high level of compliance with 79% affirming to developing iron deficiency anemia as a serious issue and 79.5% affirming to developing iron deficiency anemia being detrimental to both mother and child. The results are similar to the results obtained from similar research conducted in Laos and Cambodia, in which health behavior model constructs incorporating perceived severity were used.[6,29] Similarly, perceived barriers were also found to have a direct association with the level of compliance. Respondents who thought iron and folic acid supplement could cause side effects, were costly or were not easily available, showed moderate to low compliance, while the ones who differed showed better compliance. This is in agreement with similar studies conducted in Philippines, Nigeria, and Malaysia.[30-32] The study results also showed that social support was one of the determinants of level of compliance. All respondents identified social support to be the strongest factor to ensure high level of compliance with 80.9% respondents with high compliance agreeing to it. The result is in concurrence with a study which was conducted in India in which it was found that support through either family members or health workers helped improve adherence to iron supplementation (79.13%) as compared to the control group (53.87%).[13]

The strengths of this study include an elaborate exploration of the determinants of compliance to IFA supplementation in context of Nepal, which previous studies lacked. Also, the cross-sectional study design ensured inexpensive, easy and less time consuming procedure. The response rate was high which avoided non-response bias. Limitations of this study include inability to incorporate other comprehensive means of obtaining additional data like hematologic outcomes and anthropometric data. Also, many of the respondents who participated in the study either did not know how to read and write, or were not very confident with reading and writing. Hence, face-to-face interview was the only mode of questionnaire administration. This could have resulted in response bias as certain questions were related to the respondent's personal preferences and perceptions.

## CONCLUSION

This study set out to identify the level of compliance and the associated determinants/factors among pregnant women in Kathmandu, Nepal. Even though a majority of women showed high compliance to iron and folic acid supplementation, there were still many women who showed poor compliance. Regardless of the high literacy rate, more than half of the women had insufficient knowledge

regarding anemia, iron deficiency and IFA supplementation. This indicates lack of proper and effective knowledge and awareness dissemination regarding anemia, iron deficiency and IFA supplementation.

None of the predisposing factors, viz. socio-demographic factors and knowledge, showed a strong correlation to the level of compliance, while some of the enabling factors (perceived severity and perceived barriers) and reinforcing factors (social support) showed strong correlation and association with compliance. Respondents responded better to compliance in terms of perceived severity of the consequences of not complying with IFA supplementation, perceived barriers which impede easy compliance to IFA supplementation, and social support from family and health care providers. The study infers that enabling factors and reinforcing factors have a much bigger role to play in terms of compliance than predisposing factors, and a need to continuously improve compliance by highlighting the severity of the issue, minimizing the barriers and enhancing family and healthcare provider's support is imperative.

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