Effect of Knowledge and Perception on Adherence to Iron and Folate Supplementation during Pregnancy in Kathmandu, Nepal

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Background: *Adherence to iron and folate supplementation during pregnancy is considered key to prevention and control of iron deficiency anemia. Nepal-like other developing countries-faces problems with adherence vis-a-vis iron/folate supplementation.*
Objective: *This descriptive survey aimed to assess the effect of knowledge and perception of pregnant women on adherence to iron/folate supplementation in Kathmandu, Nepal.*
Material and Method: *The present study was conducted in Paropakar Maternity and Women's Hospital in Kathmandu. Systematic random sampling was used to select 406 persons who were either given a self-administered questionnaire or interviewed.*
Results: *73.2% of the respondents showed good adherence. Bivariate analysis revealed significant associations between adherence and both knowledge and perception ($p<0.05$), but through multiple linear regression analysis only perception was found to be statistically associated with adherence ($p<0.05$). Further multivariate analysis demonstrated that the most important predictors of adherence were: perception of side effects, availability, forgetfulness and reminders from family.*
Conclusion: *Adherence to iron/folate supplementation among women during pregnancy needs continuous improvement by minimizing the perception of constraints (viz., side-effects and forgetfulness) and, enhancing availability and family support.*

Keywords: *Adherence, Anemia, Iron/folate supplementation, Nepal, Pregnancy*

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Iron Deficiency Anemia (IDA) is one of the most prevalent diseases affecting pregnant women in developing countries with more than half of pregnant women suffering from it[1-4]. It is also one of the top contributing factors to the global burden of diseases and is considered a major global public health challenge[3,5].

Adherence to iron and folate (IFA) supplementation during pregnancy is considered key to prevention and control of iron deficiency anemia[6,7]; however, adherence to IFA supplementation is a major challenge in developing countries[3,4,6,7]. Studies around the world show that knowledge and perception among pregnant women-regarding anemia, iron deficiency and IFA supplementation-is significantly associated with adherence to IFA supplementation and is one of the major determining factors to adherence[4,8-10].

In Nepal, anemia is also a major public health problem among pregnant women (prevalence 48%)[11]. In 2003, the Nepalese government introduced an IFA supplementation program to address the most common cause of anemia-inadequate intake of iron and other nutrients[11,12]. Notwithstanding, the 2011 Nepal Demographic Health Survey (NDHS) reported that only

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38% of pregnant women took the complete course of IFA for the duration of the pregnancy, indicating a problem with adherence[11]. Nepal's capital city Kathmandu is reported to have a higher maternal anemia rate and lower IFA adherence rates than the national figures[12-14]. Few studies have been undertaken in Nepal to investigate the reasons underlying the lack of adherence to IFA supplementation. Similarly, very few studies have been conducted that assess the effect of knowledge and perceptions of women vis-a-vis adherence to the IFA supplementation during pregnancy. This study was, therefore, designed to assess what effect knowledge and perception of IFA had on adherence to supplementation regimens among pregnant women in Kathmandu, Nepal.

Material and Method

The present study was a descriptive cross-sectional study conducted between July and August 2013 in Paropakar Maternity and Women's Hospital (PMWH)-the largest obstetrics and women's reproductive health centre in Nepal. The hospital was chosen because of its large catchment area (i.e. >1.1 million people from the 1.74 million in Kathmandu), and having the highest influx of post-natal patients in the capital (>50,000 outpatients per year)[15-18].

The target population comprised post-natal women coming to hospital for post-natal OPD visits and willing to participate in the study. Using these inclusion criteria, 406 participants were selected as samples for the study. Systematic random sampling was then done to select the required number of samples.

The present study protocol was reviewed and approved by the Khon Kaen University Ethics Committee for Human Research, the Nepal Health Research Council and the Research board of Paropakar Maternity and Women's Hospital. Two registered nurses were hired as research assistants for data collection and trained on, (a) the purpose of the study, (b) procedures for data collection and (c) research ethics.

A structured self-administered questionnaire was used to collect data. Written informed consent was given by the respondents taken prior to participating in the study. The questionnaires were distributed and collected on the same day. The respondents were asked to place their questionnaire in an envelope and place it in the box provided. A face-to-face interview was conducted for those respondents unable to read and write Nepali.

The validity and reliability of the survey questionnaire were assessed prior to their use. Experts performed translation and back translation of the questionnaire between English and Nepali. For content validity, a panel of experts at the PMWH was consulted to assess the validity of the tool for which a content validity index (CVI) of 0.89 was obtained. The questionnaire's reliability was examined using Cronbach's coefficient, in which an α value of 0.80 and 0.96 were obtained for knowledge and perception respectively.

Data analyses were performed using SPSS 19.0. Double data entry was done to ensure correctness. Descriptive statistics were used to summarize the data, while the Chi-square test and multiple linear regression were used to determine the bivariate and multivariate associations between the independent variables and adherence, respectively. Correlation coefficients were used to determine the strength and direction of associations wherever applicable.

Results

Sample characteristics

Four hundred and six respondents constituted the sample. Of the respondents, 67.7% completed the self-administered questionnaire while the remainder were completed through a face-to-face interview. More than half of the respondents were between 16 and 25. Respondents were mostly Hindu (71.4%) and belonged to underprivileged ethnic groups (59.4%). More than half of the respondents were primiparous. The present study showed that the majority of respondents had attended school (80.3%) of whom 84.7% had completed Grade 10 or higher. The socio-demographic characteristics of respondents are presented in Table 1.

Adherence to IFA supplementation

The respondents were asked how many days they took IFA supplementation. Adherence was categorized into two groups: (a) good adherence-use of IFA supplement for between 90 and 180 days; or (b) poor adherence-use of IFA supplement for <90 days[4,19,20]. Among the 406 respondents, 297 (73.2%) had good adherence (i.e. took IFA supplementation for between 90 and 180 days), whereas 26.8% had poor adherence (i.e. took IFA supplement for <90 days).

Knowledge of respondents on iron deficiency anemia and IFA supplementation

Respondents were given a set of six, closed-ended questions to answer regarding knowledge about

anemia, iron deficiency and IFA supplementation. The scores ranged from 0-6 (i.e. the incorrect ones scored 0 and correct ones scored 1)[21]. The mean knowledge score for the respondents was 2.891 (95%CI 2.643, 3.139). The knowledge score was categorized as either insufficient knowledge (0-3) or sufficient knowledge (4-6)[21]. The majority of respondents (225; 56%) had insufficient knowledge, while 179 (44%) had sufficient knowledge. The responses to all 6 items in the knowledge section of the questionnaire are summarized in Table 2. Except for two questions, all of the questions in the knowledge section were answered correctly by <50% of respondents.

Table 1. Socio-demographic characteristics of 406 respondents

Variables	n	Percentage (%)
Age (year)		
16-25	263	64.8
>25	143	35.2
Ethnicity		
Privileged	165	40.6
Unprivileged	241	59.4
Religion		
Hindu	290	71.4
Others	116	28.6
Parity		
1	238	58.6
>1	168	41.4
Attended school		
Yes	326	80.3
No	80	19.7
Level of education		
<10 grade	62	15.3
>10 grade	344	84.7
Occupation		
Housewife	256	63.1
Service	150	36.9

Perception of respondents on iron deficiency anemia and IFA supplementation

The respondents were asked to answer a 10 closed-ended questions, which were used to assess perceptions vis-a-vis IFA. All of these items were scored on a 5-point Likert scale (1 "Strongly agree", 2 "Agree", 3 "Not sure", 4 "Disagree" and 5 "Strongly disagree"). The distribution of responses to each item given by the respondents is presented in Table 3. A composite score-based on the mean of the 10 items was calculated. The composite score was then categorized into four levels: 1.00-1.99 = extremely positive; 2.00-2.99 = positive; 3.00-3.99 = negative; and, 4.00-5.00 = extremely negative[22]. The results indicate that the largest group (40.7%) of respondents had a positive perception regarding IDA and IFA supplementation, followed by 39% who had an extremely positive perception. Only 12% and 8.2% had a negative and extremely negative perception, respectively.

Association between adherence and independent variables

Bivariate analysis of adherence to IFA supplementation was performed among all of the independent variables, including socio-demographics, knowledge and perception (Table 4). Only four variables showed any statistically significant association with adherence ($p<0.05$). The socio-demographic factors significantly associated with adherence were ethnicity and attended school. Knowledge and perception were both significantly associated with adherence ($p<0.05$). The results show that even among the respondents with insufficient knowledge a majority (64%) had good adherence while, as hypothesized, respondents with sufficient knowledge reported good adherence (84.9%). Respondents who had an extremely positive perception reported the highest adherence (90.6%).

The four variables that had a significant association with adherence were entered into a multiple

Table 2. Correct response to the items in the knowledge section

Items	Total	Correct answer	
	n	n	%
Have you ever heard of anemia?	405	239	58.9
Can you get anemia by deficiency of iron?	405	173	42.6
Can inadequate iron in diet lead to anemia in pregnancy?	405	178	43.8
Can anemia caused by iron deficiency during pregnancy be prevented?	405	190	46.8
Can IFA supplementation during pregnancy prevent IDA?	405	185	45.6
Do you know how many IFA tablets to take during pregnancy?	406	204	50.2

Table 3. Distribution of response to the items in the perception section

Items	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
	n (%)	n (%)	n (%)	n (%)	n (%)
Developing IDA is a serious issue	140 (34.6)	180 (44.4)	85 (21.0)	0 (0.0)	0 (0.0)
Developing IDA is detrimental to both mother and child	155 (38.3)	167 (41.2)	82 (20.2)	1 (0.2)	0 (0.0)
Taking IFA can cause side effects	72 (17.7)	63 (15.5)	14 (3.4)	164 (40.4)	93 (22.9)
IFA regimen is costly	45 (11.1)	75 (18.5)	9 (2.2)	171 (42.1)	106 (26.1)
IFA is not easily available	21 (5.2)	12 (3.0)	10 (2.5)	200 (49.3)	163 (40.1)
I often forget to take IFA	80 (19.8)	148 (36.5)	6 (1.5)	110 (27.2)	61 (15.1)
Taking IFA is beneficial and can help prevent anemia	181 (44.7)	170 (42.0)	53 (13.1)	1 (0.2)	0 (0.0)
My family thinks that it is important for me to take IFA	225 (55.6)	127 (31.4)	53 (13.1)	0 (0.0)	0 (0.0)
My family members remind me to take IFA	265 (65.4)	110 (27.2)	15 (3.7)	9 (2.2)	6 (1.5)
My doctor reminds me to take IFA	278 (68.6)	116 (28.6)	8 (2.0)	3 (0.7)	0 (0.0)

linear regression analysis; after which only perception of IFA was statistically associated with adherence ($p<0.05$) (Table 4). For a more in-depth exploration of the effect of perception on adherence, each of the 10 items of the perception section was treated as an independent variable and further analyzed using multiple linear regression. Only four variables showed statistical significance with adherence ($p<0.05$); viz, (a) "taking IFA can cause side effects"; (b) "IFA is not easily available"; (c) "I often forget to take IFA"; and, (d) "My family reminds me to take IFA" (Table 5). Good adherence was reported by 80.5% and 91.3% of respondents who disagreed that (a) IFA can cause side-effects and (b) IFA is not easily available, respectively. The majority of the respondents (75%) who agreed "I often forget to take IFA" exhibited poor adherence. By contrast, 97% of respondents who agreed to getting reminders to take IFA from family showed good adherence.

Discussion

Our study among pregnant women in Kathmandu, Nepal, showed that the most important predictors of adherence to IFA supplementation were: (a) the perception of side effects, (b) availability, (c) forgetfulness and (d) reminders from family. The study also revealed that 73.2% of women showed good adherence during pregnancy, which is much higher than the 2011 national NDHS survey, in which 56% of pregnant women took iron tablets daily for 90 days or more[11]. This may be because of the higher literacy rate and urban setting of the study, which ensured both better healthcare facilities and accessibility.

More than half of our respondents were between 16 and 25 years of age, with 11% being in the high risk age group for pregnancy (i.e. under 20)[23]. The majority of the respondents were of privileged ethnicity (viz, Brahmins and Chettris, suggesting urbanites) consistent with the results of the Nepal Population Report[24]. The current study revealed that 19.7% of respondents had not gone to school, which could be the reason why they scored poorly in the knowledge section; even though the level of education had no statistically significant association with adherence. Our observation is in sharp contrast with the results of the 2011 NDHS survey and a study by Jasti et al in which level of education was a major determinant of adherence to IFA supplementation[11,25]. In general, however, socio-demographic variables were found to be poor predictors of adherence.

In the current study, knowledge was not found to be a significant predictor of adherence (as per the MLR); even though there was a significant bivariate association between knowledge and adherence. This is in contrast to other studies in which knowledge was identified as a major determinant of adherence[4,6]. The current study also showed that although 56% of respondents had insufficient knowledge, adherence was good, which agrees with the results of a similar study conducted in Northwest Iran[26].

Perception of IDA and IFA supplementation was a primary predictor of adherence to IFA supplementation as shown by both the bivariate and multivariate analyses; corroborating similar results

Table 4. Bivariate and multivariate associations between adherence and independent variables

Variables	Total	Adherence				Bivariate analysis[a]	Multivariate analysis[b]
		Good		Poor			
	$n = n_1+n_2$	n_1	%	n_2	%	*p*-value	*p*-value
Age (year)							
16-25	263	190	72.2	73	27.8	0.575	
>25	143	107	74.8	36	25.2		
Ethnicity							
Privileged	165	131	79.4	34	20.6	0.019[c]	0.435
Unprivileged	241	166	68.9	75	31.1		
Religion							
Hindu	290	219	75.5	71	24.5	0.089	
Others	116	78	67.2	38	32.8		
Parity							
0-1	238	180	75.6	58	24.4	0.180	
>1	168	117	69.6	51	30.4		
Attended school							
Yes	326	261	80.1	65	19.9	<0.001[c]	0.565
No	80	36	45.0	44	55.0		
Level of education							
<10	62	44	71.0	18	29.0	0.673	
>10	344	253	73.5	91	26.5		
Knowledge							
Insufficient	225	144	64.0	81	36.0	<0.001[c]	0.085
Sufficient	179	152	84.9	27	15.1		
Perception							
Extremely positive	192	174	90.6	18	9.4	<0.001[c]	<0.001[c]
Positive	194	121	62.4	73	37.6		
Negative	18	1	5.6	17	94.4		
Extremely negative	2	1	50.0	1	50.0		

[a] Chi-square test; [b] Multiple linear regression, $R^2 = 0.277$; [c] Statistical significance at $p<0.05$

Table 5. Multiple linear regression analysis to predict the independent variables of perception associated with adherence

Variable	Coefficient (β)	95% CI	*p*-value
Taking IFA can cause side effects	-0.468	3.22, 3.50	<0.001[a]
IFA is not easily available	0.115	4.07, 4.26	0.008[a]
I often forget to take IFA	-0.080	2.67, 2.95	0.045[a]
My family reminds me to take IFA	0.261	1.40, 1.55	<0.001[a]

$R^2 = 0.415$; [a] Significant at $p<0.05$

obtained in research conducted in Lao PDR and Cambodia, in which health behavior model constructs incorporating perceptions of pregnant women were used[4,8]. Further analyses of the independent variables of perception showed that perceptions of side-effects, availability, forgetfulness and family reminders regarding IFA supplementation were major determinants of adherence.

In the current study, women who were perceived there might be negative side-effects of IFA had poor adherence, while those who did not, had good adherence. Similar research conducted in the Philippines[19], Nigeria[27] and Malaysia[28] indicated that perceived side-effects were the main barriers to

adherence. By contrast, women in the current study who perceived easy availability of IFA supplements had good adherence, which is consistent with findings from other studies[6].

Forgetting to take the supplements was another main predictor of adherence. In a study conducted in Saudi Arabia, concern about side-effects and forgetfulness were found to be the main factors underlying poor adherence to IFA supplementation[29]. The present study also showed that being reminded by family to take IFA supplements was a reinforcing factor and, therefore, a determinant of adherence. Similar results were obtained in studies conducted in India and Vietnam in which support from family improved adherence among pregnant women[30,31].

The main limitation of the current study was the inability to include hematologic and anthropometric data, which might have yielded a more comprehensive synthesis of the results. The strengths of the present study included: (a) an elaborate exploration of effects of knowledge and perception on adherence to IFA supplementation, which previous studies lacked; (b) a high response rate which obviated any non-response bias; (c) the t-test analysis of the self-administered questionnaire and face-to-face interviews indicated no significant difference between the two groups ($p>0.05$), thus eliminating any response bias arising from the face-to-face interview; and, (d) the cross-sectional study design ensured an inexpensive, practicable, less time-consuming procedure.

Conclusion

The authors assessed the effect of knowledge and perception of IFA on adherence to supplementation during pregnancy in Kathmandu, Nepal. Despite a majority of women demonstrating good adherence to IFA supplementation, a significant number had poor adherence. Notwithstanding a high rate of literacy among respondents, more than half had insufficient knowledge regarding anemia, iron deficiency and IFA supplementation, suggesting the need for better dissemination of information on anemia, iron deficiency and IFA supplementation.

The perception of IDA and IFA among pregnant women was the only significant predictor of adherence to IFA supplementation. Perceptions of constraints-specifically side-effects, availability and forgetfulness-were the main determinants of poor adherence. Perception of support from family members in the form of reminders to take IFA supplements was moreover the main reinforcing factor for good adherence. Respondents had better adherence when (a) they were unconcerned about any potential side-effects; (b) were assured of being reminded by family to take the supplements; and (c) ease of availability.

Adherence to IFA supplementation might be improved by (a) minimizing the perception of constraints (viz, side-effects and forgetfulness); (b) enhancing availability; and, (c) ensuring family support cum reminders regarding IFA supplementation during pregnancy.

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Potential conflicts of interest

None.

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ผลกระทบจากความรู้และความเข้าใจต่อการยินยอมในการบริโภคธาตุเหล็กและกรดโฟลิคระหว่างตั้งครรภ์ ในเมืองกาฐมาณฑุ, ประเทศเนปาล

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ภูมิหลัง: *การยินยอมต่อการบริโภคธาตุเหล็กและกรดโฟลิคในระหว่างการตั้งครรภ์ถือเป็นหนึ่งในปัจจัยสำคัญของการป้องกันและควบคุมของโรคโลหิตจางจากภาวะการขาดธาตุเหล็ก โดยเนปาลกำลังเผชิญกับปัญหาการยินยอมต่อการบริโภคธาตุเหล็กและกรดโฟลิค เช่นเดียวกันกับประเทศอื่น ๆ ที่กำลังพัฒนา*

วัตถุประสงค์: *การวิจัยครั้งนี้เป็นการวิจัยเชิงพรรณนา โดยมีวัตถุประสงค์เพื่อสำรวจผลกระทบจากความรู้และความเข้าใจของสตรีตั้งครรภ์ต่อการยินยอมบริโภคธาตุเหล็กและกรดโฟลิค ในเมืองกาฐมาณฑุ ประเทศเนปาล*

วัสดุและวิธีการ: *ศึกษาผู้ป่วยในโรงพยาบาลพาโรพาคาร์สำหรับมารดาและสตรี เมืองกาฐมาณฑุ โดยสุ่มตัวอย่างแบบเป็นระบบ ได้กลุ่มตัวอย่างจำนวน 406 ราย ใช้การสัมภาษณ์หรือตอบแบบสอบถามด้วยตัวเอง*

ผลการศึกษา: *พบว่า 73.2% ของกลุ่มเป้าหมายปฏิบัติตามคำแนะนำ จากการวิเคราะห์ตัวแปรครั้งละสองตัวแปรได้พบว่ามีความเกี่ยวข้องกันอย่างมีนัยสำคัญระหว่าง การยินยอมต่อการบริโภคและความรู้ความเข้าใจต่อการบริโภค ($p<0.05$) เว้นเสียแต่ว่าการเข้าใจต่อการบริโภค มีนัยสำคัญเชิงสถิติต่อการยินยอมบริโภค ($p<0.05$) โดยใช้การวิเคราะห์การถดถอยเชิงเส้นแบบพหุ การวิเคราะห์พหุตัวแปรยังแสดงให้เห็นว่า ความเข้าใจต่อผลข้างเคียงการจัดหามาได้ อาการหลงลืมและการเตือนความจำจากครอบครัว ถือเป็นปัจจัยต่อการปฏิบัติตามคำแนะนำ*

สรุป: *มีความจำเป็นที่จะต้องปรับปรุงการยินยอมต่อการบริโภคธาตุเหล็กและกรดโฟลิคอย่างต่อเนื่องโดยการลดแนวคิดเกี่ยวกับผลข้างเคียงและอาการหลงลืม และควรเพิ่มการหาจัดหาได้ง่ายของธาตุเหล็กและกรดโฟลิค อีกทั้งควรมีการสนับสนุนให้สตรีตั้งครรภ์บริโภคธาตุเหล็กและกรดโฟลิคจากสมาชิกในครอบครัว เมื่อมีสตรีตั้งครรภ์*