1997

Iron supplementation: Knowledge, perceptions, and usage among pregnant women in rural India

Jayanti Tuladhar

John Townsend
Population Council

Nazir Haider

Leila Caleb-Varkey
Population Council

IRON SUPPLEMENTATION: KNOWLEDGE, PERCEPTIONS, AND USAGE AMONG PREGNANT WOMEN IN RURAL INDIA

Jayanti M. Tuladhar
John W. Townsend
Nazir Haider
Leila E. Caleb

Technical Paper 9

Population Council

Asia & Near East
Operations Research and Technical Assistance Project
New Delhi, India

May 1997

Abstract

Severe anaemia has been one of the causes of high maternal mortality and the death of newborns and infants due to low birth-weight in India. The prevalence of anaemia among women of ages between 15 - 44 is extremely high, and ranges between 34 percent to 99 percent in rural India. Government of India has provide iron and folic acid tablets (IFA) as a prophylaxis against nutritional anaemia among pregnant women as an integral part of the Child Survival and Safe Motherhood program will continue to do so in the Reproductive and Child Health package. The 1992-93 National Family Health Survey of India indicates that only fifty percent of births were to mothers who had received IFA tablets, suggesting the coverage and the intake was very inadequate. This paper presents findings of both qualitative and quantitative research conducted among pregnant women to investigate the extent of distribution and use, information provision and their knowledge and perceptions regarding IFA tablets and reasons for non-use of IFA tablets. The study shows that the consumption rate of the IFA tablets is high if women are knowledgeable and have positive perceived experiences after taking the tablets. Findings suggest that more accurate and complete information should be provided to pregnant women while distributing the IFA tablets along with health and nutrition education messages. At the same time, follow-up visits and counselling to the women are essential to address symptoms that are not related to IFA.

IRON SUPPLEMENTATION: KNOWLEDGE, PERCEPTIONS, AND USAGE AMONG PREGNANT WOMEN IN RURAL INDIA

Jayanti M. Tuladhar, Ph.D., John W. Townsend, Ph.D., Nazir Haider, M.Phil. and Leila E. Caleb, Sc.D.

Introduction

Anaemia, a result of the adverse effects of iron deficiency, is one of the main causes of maternal deaths in developing countries (WHO, 1989, and Mathai, 1987). Iron deficiency may be due to inadequate diet or poor absorption of iron due to morbidity. While prevalence rates in developed countries for iron deficiency anaemia range from 10 to 20 percent (Scrimshaw, 1984), two-thirds of women in developing countries are estimated to be anaemic (WHO, 1989). In rural India, prevalence of anaemia among women of ages between 15 - 44 ranges between 34 percent to 99 percent according to a study conducted in Hyderabad, Calcutta, and New Delhi (GOI, 1981). The 1992-93 National Family Health Survey of India indicates that only fifty percent of births were to mothers who had received IFA tablets, suggesting the intake was very inadequate (IIPS, 1995). This figure is even lower (30 percent) in Uttar Pradesh.

The prevalence rates of anaemia are even higher among pregnant women. The estimated haemoglobin levels of pregnant women were less than 11 g/dl according to studies conducted in various parts of India (Rao, 1980). In Bihar and Uttar Pradesh, the mean haemoglobin levels among pregnant women were as low as 9.2 g/dl.d (Agarwal, et al. 1987). During pregnancy, growth of the fetus and of the uterus, and other changes taking place, lead to an increase in the demand for many nutrients, especially iron and folic acid. Hence, pregnant women require iron to replace basal losses, to allow for the expansion of the red cell mass, and to provide for the needs of the foetus and placenta. In communities where parasitic infections are common, there is further loss of dietary iron. In such circumstances, dietary iron take should be increased in proportion to the degree of blood loss and anti helmentics are also prescribed.

At the onset of pregnancy, about 20 percent of women are anaemic and it increases to over 60 percent by the last trimester. At the same time, up to 20 percent of pregnant women are deficient in folic acid too. (Agarwal, 1984 and Raman, 1980).

Various studies (Scrimshaw, 1984; Viteri 1981; GOI, 1981) have indicated that iron deficiency anaemia impairs resistance to infection, cognitive performance, physical capacity, and work output which eventually is likely to effect economic development and social welfare. Studies showed that workers became more willing, intelligent, and effective workers reflecting overall increase in work capacity with iron supplementation (Scrimshaw, 1984, GOI, 1981 and Rahamathullah, 1983). Additionally, severe anaemia

with folate deficiency also increases the chances of delivering low birth-weight babies (Mathai, 1987), an important underlying cause of death in newborns and infants in India. Newborn babies with low birth-weight constitute about 30 percent of newborns in India (GOI, 1991).

Government of India's National Child Survival and Safe Motherhood (CSSM) Programme (GOI, 1994) outlines that distribution of Iron Folic Acid (IFA) Tablets to pregnant women is a part of essential care that should be provided to all pregnant women. IFA tablet contains 60 mg of elemental iron and 0.5 mg of acid. Recently, it has been included as a component of Reproductive and Child Health package of the National Family Welfare Program. While pregnant women are having three antenatal checkups, health workers distribute IFA tablets to all pregnant women (1 tablet a day for 100 days and to those clinical anaemia 2 tablets a day for 100 days). The paleness seen in the nails, tongue, inside of lower eyelids and complaints of weakness or dizziness are visible signs of anaemia. Anaemia is also confirmed by checking haemoglobin level. Those found having below 11 gms% are considered clinical anaemic and are recommended to take 2 tablets daily for at least three months and continued till delivery (GOI, 1994). When the haemoglobin level is below 7 gm% or less, woman is considered suffering from severe anaemia. This article investigates the extent of distribution and use of IFA tablets, information provision to pregnant women and their knowledge and perceptions regarding IFA tablets.

Method

Data for this study was collected from three blocks (Achhnera, Akola, and Fatehpur Sikri) of Agra district in Uttar Pradesh. These blocks have been chosen because an Operations Research (OR) program to improve family welfare services is undergoing since April 1995. OR program includes activities which aim to improve access and quality of family welfare services, including services to pregnant women.

A total of 153 pregnant women, randomly selected from the CSSM register maintained by Auxiliary Nurse Midwives (ANMs) were contacted and interviewed. Within each block, seven ANMs were randomly selected and from each ANM's CSSM register, 10 pregnant women registered during April 1995 to March 1996, were selected randomly. While providing services to pregnant women, the ANM registers the names of pregnant women who had received antenatal services including IFA tablets.

A two-page questionnaire was administered to all respondents. Each respondent was asked whether they had received IFA tablets and information; if they were informed about IFA tablets, and what information was provided. Following these questions, they were asked whether they consumed the IFA tablets, their perceptions about IFA tablets, whether it helped to improve their health and experience of side effects, if any. For those who did not consume the IFA tablets or consumed only some of them, an attempt was made to understand reasons for not taking the IFA tablets. Information was also

supplemented by conducting qualitative interviews with an additional 63 pregnant women who received antenatal services. Qualitative interviews were conducted at the client's home over a three-month period.

In the analysis, the sample of pregnant women are categorized into four groups according to the current use status of the IFA. The categories are: 1) Used all- women who consumed all IFA tablets given to them; 2) Used partially - women who consumed only some the tablets given to them; 3) Not used at all - women who did not consume any IFA tablets given to them; and 4) Still continuing - women who are still continuing to take IFA tablets. Later in the analysis to study relationship with selected variables, they were further categorized into three groups: used all, partial used, and not used.

Results

Characteristics

Table 1 presents the characteristics of pregnant women receiving IFA tablets. A little over one-third (36 percent) of the respondents are under the age of 25 years, two-fifths (42 percent) within the age-group 25-29 years and one-fifth (22 percent) 30 years and above. The mean age of sample pregnant women receiving IFA tablets was 26.5 years (Table 1). About one-third of the sample respondents were pregnant for the first and second times, 45 percent were pregnant for the third and the fourth times. About one-fifth were on the fifth pregnancy or even higher.

Table 1: Characteristics of the pregnant women receiving IFA tablets (N=153)

Characteristics	Number of cases	Percentage
Age of respondent		
Less than 25 years	53	36
25 - 29 years	62	42
30 or more	23	22
Mean age = 26.5 years		
Pregnancy		
1 - 2	48	31
3 - 4	69	45
5 or more	36	24
Mean pregnancies= 3.5		

Note: Total number of cases may not add up to 153 because of 'not ascertained' cases.

Table 2 provides information on the total number of IFA tablets distributed to pregnant women. Recently, this has been remedied by providing sealed packets of 25 tablets. While the majority of the women received less than 76 tablets, two-fifths were given 100 or more tablets. About five percent were provided with 25 tablets and very small proportion (less than two percent) got 125 tablets or more (not shown in table). The

normal practice as recommended by the GOI is to provide 100 tablets over three visits (50 in the first visit and 25 in each second and third visit) during the antenatal period. In contrast to what GOI has directed health workers to distribute IFA tablets for 100 days (one per day), the workers' registers indicate that they had been distributing between 25 and 175 tablets to each pregnant women. When the women were asked how many they received, the study found discrepancies between the number of IFA tablets given as recorded in the register and number actually received according to the women. As we observed from our field visits, the pregnant women neither counted the number of the IFA tablets given to them nor were they told how many were there in the packet by the female health worker. Similarly, some women revealed during informal discussion that they refused the IFA tablets because they did not like them. All these reasons would lead to discrepancies between the two figures.

Table 2: Distribution of the pregnant women receiving IFA tablets according to selected variables (N=153)

Characteristics	Number of cases	Percentage
Number of IFA tablets given to a woman		
25 -50 tablets	61	40
51 -75 tablets	25	16
76 -99 tablets	-	-
100 tablets or more	67	44
Whether knew of effects of IFA tablets at time of receiving		
Yes	81	53
No	72	47
Current Use Status of IFA tablets		
Used all	62	41
Used partially	45	29
Not used at all	22	14
Still continuing	24	16
Whether IFA tablets should be consumed		
Yes	121	79
No	32	21

Note: Total number of cases may not add up to 153 because of 'not ascertained' cases.

Table 2 indicates that a little over one-half of the pregnant women knew about the effects of IFA tablets on their bodies. The sample of pregnant women includes approximately one-fifth (41 percent) who used or consumed all the tablets given to them, while less than one third (29 percent) partially used the tablets and 14 percent did not use them at all. About 16 percent of them still continue to take the IFA tablets told. Of the 153 sampled pregnant women who received the IFA tablets, the majority of them were supposed to have finished the given IFA tablets at the time of study, while one-fifth (21 percent) had still time left to finish the supplied tablets.

Perceived Knowledge and Provision of Information

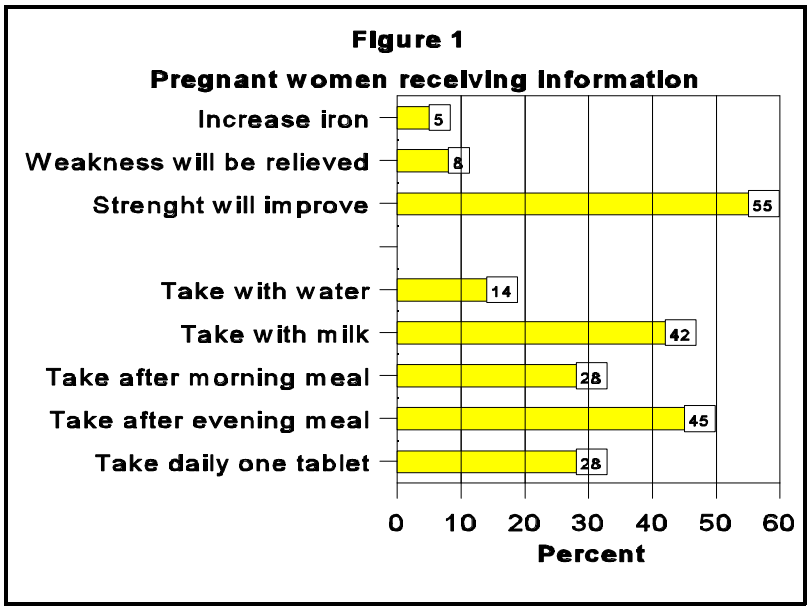
Among the women who claimed to know what IFA tablets are for, about three-fourths perceived that it would provide strength to them. Sixteen percent thought that it increased iron in the blood and 9 percent felt that it helped bowel movements. About 6 - 7 percent felt that either it helped to relieve their own sense of weakness or improve their baby's health. Few women thought that it helped to improve calcium deficiency, relieve pain, provide more milk for the baby, and ease problems during delivery.

The knowledge of pregnant women about what IFA tablets do to women and children was closely related to what the health workers told them. For example, among those who were told that by taking the IFA tablets the women would gain strength, more than 80 percent of them said that the benefit of taking the IFA tablets was to improve their strength.

The following messages should be provided to the pregnant women while distributing the IFA tablets:

1. Must be taken daily for at least three months and continued till delivery.
2. Best if taken after meal.
3. Must take one tablet daily or 2 tablets daily if the woman is clinically anaemic.
4. After the use of tablets, colour of the stools is black but it is nothing to worry about.
5. Some women may get nausea or constipation after starting IFA tablets but it lasts only for a few days.
6. Must be continued as they are life saving.

The study findings indicate that the above information was not given to the women. Six different pieces of information were provided to the pregnant women on the procedure of how to take and when to take the IFA tablets. These messages were: take one tablet daily, take after evening meal, take after morning meal, take after meal, take with milk, and take with water.



Few women received complete information on how to take and when to take these tablets (three percent in case of "take daily one tablet after evening meal with milk" and one percent in case of "take daily one tablet after evening meal with water"). Twenty-eight percent of the women were told "take one tablet daily" by the health workers, while 45 percent were told "take after evening meal", 28 percent "take after morning meal", 42 percent "take with milk", and only 14 percent "take with water"(Figure 1). Among the pregnant women who were given information on its benefit, the majority of them (55 percent) were told that they would gain their strength by taking the IFA tablets. Less than 8 percent were informed that babies' health could improve, increase in blood, improve bowel movements, increase appetite, improve digestive power, improve calcium, gain in weight, or relieve dizziness or pain. Importantly, however, none were informed of possible side-effects after taking the tablets.

In general, health workers provided women with limited information on the procedure to take IFA tablets and how it helps the woman's health. Only 45 percent of the pregnant women received two or more directions on the procedure to take the IFA tablets (Table 3).Those receiving two or more directives on the benefits of taking the IFA tablets were only 12 percent. According to the sampled women, more than 50 percent got only one piece of information or no information at all on the procedure. More than one-third (36 percent) did not receive any information on its benefits.

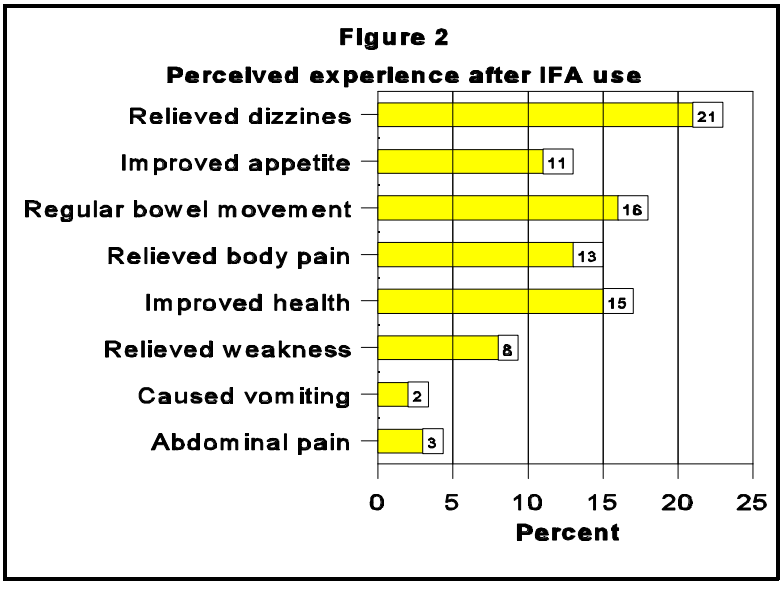
Table 3: Percentage Distribution of Pregnant Women according to Number of Pieces of Information given by Health Worker

	Number	Percentage
Number of messages given by HW on how to take IFA		
0	32	21
1	51	33
2	38	25
3+	32	21
Number of messages given by HW on benefits of IFA		
0	55	36
1	79	52
2+	19	12

Perceived Experienced

More than 80 percent of the pregnant women who received the IFA tablets actually used them. Information on experiences after taking the IFA tablets were only asked to those who took the IFA tablets.

Figure 2 presents information on the perceived experiences after taking the IFA tablets. About 21 percent of the pregnant women reported that they did not experience dizziness after taking the IFA tablets. Eleven percent reported that their appetite had improved and about 16 percent stated having regular bowel movements. About 13 percent felt that the pain in their hands and body had disappeared. Contrary to what the health workers had said to the women, none reported having gained strength by taking the IFA tablets. Only 8 percent reported that it helped relieve some weakness. Fifteen percent were found to have experienced improvement in their health status after taking the IFA tablets.



There was a small proportion of women who experienced side-effects after taking the IFA tablets. To reiterate, no woman was informed of any possible side-effects by taking the IFA tablets by the health workers. The perceived side-effects by women taking the medicine were “vomiting” (2 percent) and “abdominal pain” (3 percent). Women also reported their negative feelings regarding the colour of the stool, leading to discontinuation of use. However, when asked about their perception of IFA tablets, more than two-thirds of the women said that the IFA tablets were good for their health.

Current use status

Of these 153 sampled pregnant women who received the IFA tablets, the majority of them were supposed to have finished the given IFA tablets by the time of the study. One-fifth (21 percent) had still time left to finish the supplied tablets. The current use status of the sampled women was based on 121 currently pregnant women who finished all the IFA tablets supplied to them.The current use status has been divided into three categories: used all, partial used, and not used. Of those who were due to finish the IFA tablets, a little over two-fifths (44 percent) consumed all the tablets given to them, while about the same proportion consumed only some, and about 14 percent did not use them at all. The following results indicate the current IFA use status of women, whether use was affected by severity of anaemia, knowledge about IFA, and type of information given.

Table 4: Current Use Status of the Pregnant Women who Received the IFA Tablets by Selected Characteristics

Characteristics	Current Use Status			Number of cases
	Used all	Partially used	Not used at all	
Age				
Less than 25 years	36	49	15	39
25-29 years	52	39	10	52
30 + years	39	42	19	26
Pregnancy				
1	39	49	12	33
2 +	46	40	15	88
Number of IFA supplied*				
25 - 50 tablets	24	56	20	41
51 - 75 tablets	45	55	-	20
100 + tablets	57	28	15	60
Knew benefits about IFA*				
Yes	62	37	2	63
No	24	48	28	58

Notes: * indicates significant at 1 percent level. ** indicates significant at 5 percent level. N.A= not applicable. ‘-’ no case in the cell. Numbers refer to row percentages.

Table 4 shows that demographic variables, such as age of pregnant women and parity did not have significant effect on the current use status. However, the first panel of Table

5 suggests that those who were likely to have used all the supplied IFA tablets were women 25-29 years of age (52 percent).

Table 5: Current Use Status of the Pregnant Women who Received the IFA Tablets by Different Types of Advice Received and Perceived Experience

Characteristics	Current Use Status			Number of cases
	Used all	Partially used	Not used at all	
Advised to take daily one tablet with milk				
Yes	55	41	4	49
No	43	43	13	60
Advised to take daily one tablet after morning meal				
Yes	52	48	-	31
No	48	39	13	77
Advised to take daily one tablet after evening meal**				
Yes	57	41	2	51
No	42	42	16	57
Advised to take daily one tablet				
Yes	23	53	23	30
No	59	37	4	78
Advised to take because it provides strength				
Yes	55	41	4	49
No	43	43	13	60
Perceived experience of having some positive change				
Yes	57	43	N.A.	86
No	28	72		43

Notes: * indicates significant at 1 percent level. ** indicates significant at 5 percent level. N.A= not applicable. '-' no case in the cell. Numbers refer to row percentages.

Depending upon the severity of anaemia, health workers are advised to distribute IFA tablets to all pregnant women (1 tablet a day for 100 days and to those with clinical anaemia 2 tablets a day for 100 days). Those receiving more than 100 IFA tablets constituted about 50 percent of users. Among this group of pregnant women, data indicate that more than half (57 percent) consumed all the tablets supplied to them. The percentage of those using all the tablets significantly decreased as the number of IFA tablets provided decreased (45 percent in case of the group receiving 75 tablets and 24 percent in case of 25-50 tablets). Whether the pregnant woman used all the supplied IFA tablets is also dependent upon her knowledge about the IFA tablets. Data indicate that the percentage of pregnant women who used all the IFA tablets is two and half times

more among those who knew about the benefits of the IFA tablets than those who did not know. Also those not knowledgeable about the benefits are also highly likely not to use at all as compared to those who knew.

Availability of information on howto take IFA tablets and when to take them has shown to have a different relationship with current use status. If the pregnant women were told to take one IFA tablet daily with milk, 55 percent of them were likely to have used all the tablets, otherwise only 43 percent used all. Among those informed to take one tablet daily after evening meal, 57 percent used all the tablets supplied, while only 42 did so among those not informed. If the pregnant women were told to take "daily one tablet", the proportion of those using all the tablets is very low. In fact, there is a negative impact if they were given this instruction.This implies that ambiguous information without clear directions leads women to discontinue use.

Pregnant women who felt better after taking the IFA tablets also were more likely to finish all the tablets supplied to them compared to those who did not perceive such a positive effect. Fifty-seven percent of the pregnant women who used all the tablets felt better with the IFA tablets, while only 28 percent of those who did not feel better took all the tablets.

Reasons for not using IFA tablets

Lack of knowledge regarding the importance of IFA supplementation has been one of the most frequently given reasons for not taking the IFA tablets in the qualitative studies. Provision of information by a health worker is an important activity as a woman's husband mentioned to the researcher. Some pointed out that they disliked the taste and hence, they discontinued using the IFA tablets. The following provides some quotations from respondents on reasons for not taking the IFA tablets by pregnant women.

> "The remaining tablets I did not take because I did not know advantages of the IFA tablets and therefore, I did not pay much attention to taking the tablets."

> "My wife should be motivated by a female health worker to take the IFA tablets regularly by telling the importance of the IFA tablets during the entire pregnancy period."

> "I did not take a single tablet because I did not like the colour and taste".

Table 6 shows the percentage of the pregnant women who did not use IFA at all or used partially according to their reasons. There were 58 pregnant women in this category. Almost one-third (31 percent) said that they did not know the reason(s) for not taking the tablets. About 12 percent stopped taking them because it caused vomiting after taking the IFA tablets. Some women did not have good feelings while taking them. These figures

suggest that many of these reasons could be unrelated to the IFA tablets and could have avoided by providing counselling, follow-up and information on a regular basis.

Table 6: Percentage of The Pregnant Women Who did not Use or Use Partially IFA Supplied to Them by Reasons for not Using

Reason	Percentage
Pain	3
Uneasy feeling within abdomen	5
Did not feel good taking them	17
Bleeding	2
Vomiting	12
Dizziness	9
Afraid	2
No advantage	5
Constipation	3
Fever	10
Abdomen filled with gas	3
Don't know	31
Forget to take regularly	10
No milk to take	3

Note: Percentages will not add up to 100 because of multiple responses.

When the pregnant women were asked whether they would recommend the IFA tablets to others, four-fifths said they would recommend them. Their responses were largely based on the perceived knowledge that the IFA tablets would provide strength to these women.

At present, IFA is available only in packets containing 25 tablets. When asked one-fifth expressed their intention to use the IFA, if the IFA was in an attractive packing or a different form other than tablet, possibly in the syrup form. The majority said they would not accept it if presented in a different form or package. Among those who expressed their intention to use it, if presented in the different form or package, 22 out of 31 belong to the category "used partially" or "not used " indicating that the use rate might go up if available in more than one form or package.

Discussion

The study found that the health workers were distributing fewer IFA tablets than they are supposed to as prescribed by the GOI (1 tablet a day for 100 days for all pregnant women and 2 tablets a day for 100 days to those clinical anaemic). In addition, many women reported receiving less quantity than the health workers actually reported in their registers. This suggests that health workers need to improve their recording system as well as adhere to the GOI's rule by making a regular supervision.

With regards to the use status of the IFA tablets among women who should have consumed all the IFA tablets, only 44 percent took all supplied to them. The consumption rates of the IFA tablets were high among women aged between 25-29 years and those receiving a large quantity of the IFA tablets (100 tablets or more). Whether a woman had any knowledge about the IFA tablets at the time of receiving has much to do with the use status. Those who knew about it are two times more likely to consume all the tablets compared to those who did not know. Most pregnant women perceived that it helped to build their strength.

A majority of the women were not even informed of the effects of IFA tablets, neither benefit nor drawbacks. Information given by health workers on how and when to take the tablets was fragmented, diverse, and inconsistent. Provision of accurate and complete information to the women is important to increase the consumption rate of the IFA tablets. We have found that a combination of information, such as "take after **evening meal** with milk or "take after **evening or morning meal** " improved the chances of taking all the supplied tablets. Also the health workers should avoid giving incomplete information, such as "take daily one tablet" because it will leave many other questions, such as when and how to take it, unanswered. More importantly, an element of the quality care, such asthe personal contact of friendly nature would improve taking of IFA tablets by women.

Perceived experience is another factor that determines the use status of the IFA tablets. As we found from the above analysis that women who felt good or benefited from the IFA tablets were more likely to consume all the tablets given to them. Women's experiences are important when they are not sure the medicine is doing good for their health. It is essential that the health workers not only provide information at the beginning but also make follow-up visits and provide more information while they are taking the IFA tablets, contacting before they discontinue the medicine.

Integrated Child Development Services (ICDS), a multi-sectoral program of the government of India covers a wide range of services including pregnant women. ICDS clearly identifies the need for supplementary nutrition program for the rural pregnant women and nursing mothers to decrease maternal morbidity and mortality. Certain health education messages on supplementary nutrition, such as "...should eat more than she eats normally...", ...should eat plenty of green leafy vegetables" should be more widely communicated through health network. ●

References

Agarwal, K.N., 1984. "*The effects of maternal iron deficiency on the placenta and foetus"*. Advances in International Maternal Child Health, IV Issue, 1984, Ed.: Jellife and Jellife.

Agarwal, D.K., Agarwal, K.N. and Tripathi, A.M.,1987. " *Nutritional status in rural pregnant women of Bihar and Uttar Pradesh, India"* Paediatrics, 24: Feb. 1987.

Department of Women and Child Development, 1994. "*Monitoring, Motivation, Continuing Education Evaluation Research nd Training System in ICDS*". Ministry of Human Resource Development, New Delhi.

Government of India, MOHFW, 1991. *Child Survival and Safe Motherhood Programme - India*, New Delhi.

Government of India, MOHFW, 1994. *National Child Survival and Safe Motherhood Programme: Plan and Implement,* New Delhi.

Government of India, MOHFW, 1994. *National Child Survival and Safe Motherhood Programme: Programme Interventions - Safe Motherhood Newborn Care,* New Delhi.

Government of India (GOI), Food and Nutrition Board and UNICEF, 1981. *Regional report on collaborative studies*, New Delhi.

International Institute for Population Sciences (IIPS). 1995. *National Family Health Survey (MCH and Family Planning*), India 1992-93. Bombay: IIPS.

Mathai, Saramma Thomas,1987. "*Women And the Health System" in Women and Nutrition in India* (edited by C. Gopalan and Suminder Kaur), Nutrition Foundation of India, Special Publication Series 5.

Nutrition Foundation of India,1988. "*Maternal nutrition, lactation and infant growth in urban slums*", Scientific Report 9, 1988.

Rahamathullah, V., 1983. "*Anaemia and productivity among tea plantation workers in South India*". Symposium on "Nutritional anaemia and its prevention", Nutrtion Society of India. 1983.

Raman, L.,1980. "*Anaemia in pregnancy, in Postgraduate obstetrics and gynaecology".* Ed:M.K. Krishna Menon, P.K. Devi and Bhasker Rao, 1980.

Rao, B.K. , 1980. "*Maternal Mortality in India*". AFOGSI study. Proceedings of the third international seminar on maternal and perinatal mortality, pregnancy termination and sterilization, New Delhi, Oct 1980.

Scrimshaw, Nevin S.,1984. "*Functional Consequences of Iron Deficiency in Human Population*" in J. Nutr. Sci. Vitaminol., 30, 47-63, 1984.

UNICEF Regional Office for South Central Asia, *Birth Weight, a major determinant of child survival*, Future, 1985-86, Winter 17.

Viteri, Fernando E., 1981."*Primary Protein-Energy Malnutrition: Clinical, Biochemical, and Metabolic Changes*", Textbook of Pediatric Nutrition, edited by Robert M. Suskind, Raven Press, New York, 1981.

Viteri, F.E., 1976. *Nutrition and Agricultural Development. Significance and Potential for the Tropics*, edited by N.S. Scrimshaw and M. Behar, pp.87-98. Plenum Press, New York.)

Viteri, F.E.1971. *Amino Acid Fortification of Protein Foods*, edited by N.S. Scrimshaw and Altschul, p.350-375. MIT Press, Cambridge, Massachusetts.

WHO, 1989. *Preventing Maternal Death*. Geneva.