

Original Research Article

Socio-demographic and economic determinants of adherence to iron intake among pregnant women in selected low and lower middle income countries in Asia: insights from a cross-country analyses of global demographic and health surveys

Kirti Warvadekar¹, J. C. Reddy¹, Sona Sharma², Kirk A. Dearden³, Manoj Kumar Raut^{1*}

¹Research and Evaluation, Asia, Nutrition International, Asia Regional Office, New Delhi, India

²Population Foundation of India, New Delhi, India

³Research and Quality Assurance, IMA World Health, Tanzania

Received: 29 January 2018

Revised: 11 March 2018

Accepted: 12 March 2018

*Correspondence:

Dr. Manoj Kumar Raut,

E-mail: rautmanojkumar@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Anaemia is a global public health problem affecting around 800 million children and women worldwide. Anaemia, defined as a reduced haemoglobin concentration, is associated with increased peri-natal mortality, increased child morbidity and mortality, impaired mental development, impaired immune competence, increased susceptibility to lead poisoning, and decreased performance at work.

Methods: This paper attempts to understand the determinants underlying iron intake in select countries in Asia using multivariate regression analyses of recent data from the Demographic and Health Surveys of eight countries of Afghanistan, Cambodia, India, Indonesia, Myanmar, Nepal, Pakistan, and the Philippines. The individual level data was analysed, using Predictive Analytics Software for Windows (PASW) 18.0 release.

Results: After adjusting for standard co-variables, exposure to newspaper was found to be associated with increased adherence to iron tablets or syrup, in five of the eight countries (India, Indonesia, Nepal, Pakistan, and the Philippines). Exposure to television was significantly associated with coverage and adherence to iron tablets or syrup in Afghanistan, India, Indonesia and Myanmar. Those who received at least three antenatal care visits were much more likely to adhere to at least 90 days of iron tablet or syrup or iron and folic acid tablets supplementation.

Conclusions: Based on insights from eight demographic and health surveys, mass media (including print and TV), as well as antenatal care-seeking visits seem to be a particularly effective ways of reaching women and in increasing the likelihood of uptake of iron only or iron and folic acid supplements.

Keywords: Antenatal care, Mass media, Iron and folic acid tablets/syrup supplementation, Anaemia

INTRODUCTION

Anaemia is a global public health problem affecting 800 million women and children worldwide (2011 estimates).¹ Anaemia is defined as reduced haemoglobin concentration. Among children, it has a known association

with increased peri-natal mortality, increased child morbidity and mortality, impaired mental development, impaired immune competence, increased susceptibility to lead poisoning, and decreased performance at work. Anaemia is a problem affecting both developing and developed countries with major consequences for human

health as well as social and economic development. It occurs at all stages of the life cycle but is more prevalent in pregnant women and young children. Globally, it is estimated that 32 million (95% CI: 28–36) pregnant women, 496 million non-pregnant women (95% CI: 409–595) and 273 million (95% Credibility Interval [CI]: 241–303) children are anaemic¹. Anaemia prevention programs through iron folic acid (IFA) supplementation have been implemented across many countries, but levels of anaemia are still high. Levels of iron supplementation are also quite low with low adherence to IFA. This paper attempts to understand the determinants underlying iron intake in selected countries in Asia using multivariate statistical analyses of the most recent data from the Demographic and Health Surveys in Afghanistan, Cambodia, India, Indonesia, Myanmar, Nepal, Pakistan, Philippines.

There are number of studies discussing about the clinical aspect of supplementation of IFA on anaemia levels as well as birth weight and other factors. In a hospital based study conducted among pregnant women in India including 190 women attending antenatal clinics it was found that the compliance was higher among the participants of lower socio economic class. Moreover, subjects who received IFA supplementations free of cost had significantly higher compliance as compared to those who spent money to buy them. Women were also asked about the reason for non-compliance and major reasons reported were side effects, forgetfulness and travel. Inadequate counselling and distribution of IFA were also factors affecting the adherence to IFA. Among women, Iron deficiency anaemia can result in preterm birth and increased risk of maternal death, either during delivery or during the postpartum period. Folate helps form building blocks of DNA, the body's genetic information, and building blocks of RNA, needed for protein synthesis in all cells. Folate is needed for rapidly growing tissue such as foetal tissue, as well as rapidly regenerating cells such as red blood cells. Immune cells also have a large need for folate. A maternal deficiency of folate has been shown to cause neural tube defects in the foetus. Because both types of nutritional deficiencies can be prevented and treated, supplementation of the two micronutrients is often prescribed for pregnant mothers. Some programs also promote dietary diversification and modification, and/or provide information, education and communication about these deficiencies. However, direct supplementation of the two micronutrients has been shown to have the greatest impact in preventing and reducing the serious consequences of iron and folate deficiency (Gathigi, Omolo, Wanzala, Lindan and Makokha).² In settings where the prevalence of anaemia among pregnant women is lower than 20%, intermittent use of iron and folic acid supplements by non-anaemic pregnant women is recommended to prevent anaemia and improve gestational outcomes.³ Iron and folic acid supplementation should be provided to women for at least three months after delivery.⁴ Anaemia has significant adverse health consequences as well as negative impact on social and

economic development. It may result from a number of causes, with the most significant contributor being iron deficiency. A major proportion of cases of anaemia are considered to be due to iron deficiency, but the proportion probably varies among population groups and in different areas, according to local conditions.^{5,6} Other causes of anaemia include other micronutrient deficiencies (e.g. folate, riboflavin, vitamins A and B12), acute and chronic infections (e.g. malaria, cancer, tuberculosis and HIV), and inherited or acquired disorders that affect haemoglobin synthesis, red blood cell production or red blood cell survival (e.g. haemoglobinopathies).^{7,8} Awareness of anaemia and its consequences for the health and development of women and children has increased in the past few decades.

In 2012, the 65th World Health Assembly approved an action plan and global targets for maternal, infant, and child nutrition, with a commitment to halve anaemia prevalence in women of reproductive age by 2025, from 2011 levels. A systematic review by Bhutta et al including an assessment of 30 studies showed that supplementation of iron along with folic acid or without folic acid showed a significant difference in anaemia levels among pregnant women of intervention areas relative to comparison areas. Combined results from twelve studies from the same review showed that iron supplementation during pregnancy has a significant effect on incidence of low birth weight (RR 0.80 (95% CI 0.71, 0.90)).⁹ Results from a multivariate analysis of a study conducted on 296 pregnant women in community setting in south of Ethiopia shows that pregnant mothers whose ages were ≥ 25 years 2.9 times more likely complied with iron-folate supplement than those pregnant mothers who were < 25 years old (AOR=2.985, 95% CI= (1.069, 8.340)).¹⁰ Pregnant mothers who had good knowledge of iron-folate supplement were 3.5 times more likely to be compliant with iron-folate supplement as compared to those who had poor knowledge about iron-folate supplement (AOR = 3.509, 95% CI = (1.442, 8.537)). Pregnant mothers who had good knowledge of anaemia were 4.4 times more likely compliant with iron-folate supplementation as compared to those who had poor knowledge (AOR=4.451, 95% CI=(2.027, 9.777)). Similarly, mothers who had visited ANC four times and above were 3.5 times more likely compliant with IFA supplement as compared to mothers who visited ANC less than four times (AOR=3.558, 95% CI=(1.189, 10.653)). Pregnant mothers who were counselled on iron-folate supplement during pregnancy were 4 times more likely compliant than those who were not counselled on intake of IFA supplement (AOR=4.093, 95% CI (2.002, 8.368)). A study on factors influencing consumption of iron and folic acid supplementations in high focus states of India revealed that factors including maternal age, education, wealth index, birth order, type of caste/tribe, husband present during ANC visit, mass media exposure and religion were significantly associated with IFA supplementation.¹¹ The knowledge on complications during pregnancy and

childbirth were also found to influence utilization of iron/folic acid supplements. The odds for not using iron/folic acid supplements increased significantly when mothers did not know about complications during pregnancy (aOR=1.52, $p<0.001$) or delivery (aOR=1.44, $p<0.001$). Studies around community based distribution (CBD) of IFA supplements and nutrition education and counselling (NEC) have shown these to be effective strategies in increasing consumption of IFA tablets among pregnant women.^{12,13} A systematic review of the literature observed that NEC during pregnancy result in improvements in health outcomes, which are due in part to the improvements in antecedent behaviours such as improved dietary intake and uptake of micronutrient supplementation. CBD of IFA supplementation is a strategy to provide IFA supplements to women directly through community channels such as: private pharmacies, community health centers, village health workers, community health workers, community volunteers, or community gatherings for health education sessions. In Bangladesh, India, and Senegal, women who received IFA supplementation through community channels reported that taking IFA supplementation had improved health benefits, such as increasing blood volume, leading to fetal nourishment and compensation for blood loss during delivery.¹⁴

Despite IFA supplementation being free of charge for pregnant women in most of the eight countries studied here, it is often alleged that women do not consume IFA supplements. The determinants of adherence to IFA supplementation have been identified in a few studies but

not for multiple countries. The present study analyses various determinants of adherence to iron and folic acid supplementation across multiple countries in Asia.

Socio-demographic health and nutrition profile of the countries: The projected population in the mid- year of 2017 in these eight countries Philippines vary from about 16 million in Cambodia to about 1,339 million in India. The population density of the countries vary from 49 in Cambodia, 50 in Afghanistan to 382 in India. The total fertility rate varies from 2.30 births per woman to 5.26 in Afghanistan and the crude birth rate varies from 18.7 births per thousand mid-year population to as high as 36.1 in case of Afghanistan. The life expectancy at birth varies from 62.3 years in Afghanistan to 68.9 years in Nepal. The levels of stunting among under five children varies from 29.2% in Myanmar to 44.8% in Pakistan while the levels of wasting varies from 7% in Myanmar to 15% in Indonesia and India. The levels of underweight varies from 18.9% in Myanmar to 30% in Pakistan. The levels of anaemia among children 6 to 59 months varies from 32% in Indonesia to 59% in case of India. The prevalence of anaemia among pregnant women varies from 30% in case of Indonesia to 51% in case of Cambodia. The infant mortality rate varies from 23 infant deaths per thousand live births in Philippines to as high as 74 in Pakistan. The under-five mortality rate varies from 29 under-five deaths per thousand live births in case of Cambodia to as high as 91 in Afghanistan. The maternal mortality ratio varies from 120 maternal deaths per 100,000 live births in Philippines to as high as 396 in Afghanistan.

Table 1: Socio-demographic, health and nutrition indicators in selected countries in Asia.

Indicators	Afghanistan	Cambodia	Indonesia	India	Myanmar	Nepal	Pakistan	Philippines
Projected population, 2017 (in million)	35.5	16.0	263.9	1339.2	53.4	29.3	197.0	104.9
Population density (Persons per sq. km.)	50	49	142	382	76	199	245	245
Overall sex ratio (Males / Females *100) (Country Censuses)*	106	105	105	94.3	103	107	109	106
Life expectancy at birth (in years)	62.3	67.6	68.6	67.6	66.0	68.9	65.9	68.6
Total fertility rate (lifetime births per woman)	5.26	2.70	2.45	2.44	2.30	2.32	3.72	3.05
Crude birth rate(2010-15) (no. of live births per thousand mid-year population)	36.1	24.5	20.2	20.0	18.7	20.9	29.7	24.1
Stunting (Height-for-Age) (moderate and severe) (%)	41.0	32.4	36.0	39.0	29.2	35.8	44.8	30.0
Wasting (Weight-for-Height) (moderate and severe) (%)	10.0	9.6	15.0	15.0	7.0	9.7	10.8	8.0
Underweight (Weight-for-Age) (moderate and severe) (%)	25.0	23.9	20.0	29.0	18.9	27.0	30.0	20.0
Children (6-59 months) with blood haemoglobin concentration <110 g/L (%)	44	55	32	59	40	51	61	35
Non-pregnant women (15-49 years) with blood haemoglobin concentration <120 g/L (%)	31	43	22	48	30	36	51	25

Continued.

Indicators	Afghanistan	Cambodia	Indonesia	India	Myanmar	Nepal	Pakistan	Philippines
Pregnant women (15-49 years) with blood haemoglobin concentration<110 g/L (%)	44	51	30	54	33	44	50	32
Infant mortality rate (no. of infant deaths per thousand live births)	66	25	32	37	40	36	74	23
Under five mortality rate (no. of under-five deaths per thousand live births)	91	29	40	45	51	29	87	31
Maternal mortality ratio (no. of maternal deaths per 100,000 live births)	396	161	126	167	178	258	178	120
Status of human development, UNDP, 2015 (Rank)	169	143	113	131	145	144	147	116
Level of Human Development, UNDP (2015)	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium
GDP per capita (current US\$)-2016	561.8	1,269.9	3,570.3	1,709.4	1,275.0	729.5	1,468.2	2,951.1
World Bank classification (June 2017)	Low Income	Lower Middle Income	Lower Middle Income	Lower Middle Income	Lower Middle Income	Low Income	Lower Middle Income	Lower Middle Income

The objectives of the study are to examine the association between different socio-demographic characteristics, mass media communication and iron tablets or syrup adherence in eight selected countries in the Asia region.

METHODS

This paper uses data from multiple Demographic and Health Surveys (DHSs) from Afghanistan (2015-16), Cambodia (2014), India (2005-06), Indonesia (2012), Myanmar (2015-16), Nepal (2010-11), Pakistan (2012-13) and the Philippines (2013).¹⁵⁻²² These surveys were carried out by ICF International, working in close conjunction with in-country research institutes. We used the existing weighted data of currently married women of reproductive age (15-49 years) for our analyses. Individual level datasets were analysed using PASW Statistics 18, Release 18.0 software. Binomial or binary logistic regressions was carried out to explore factors associated with adherence to iron tablets or syrup. Logistic regression can be used to predict a dependent variable on the basis of independent variables and to determine the percent of variance in the dependent variable explained by independent variables; to rank the relative importance of independents; to assess interaction effects; and to understand the impact of covariates. Logistic regression applies maximum likelihood estimation after transforming the dependent variable into a logit variable (the natural log of the odds of the dependent occurring or not). In this way, logistic regression estimates the probability of a certain event occurring. Note that logistic regression calculates changes in the log odds of the dependent, not changes in the dependent variable itself, as OLS regression does. The multiple logit model can be expressed as:

$$\ln\left(\frac{p}{1-p}\right)=\alpha+\beta_1x_1+\beta_2x_2+\dots+\beta_ix_i+e$$

- p is the probability that event Y occurs, $p(Y=1)$
- $p/(1-p)$ is the “odds ratio”
- $\ln[p/(1-p)]$ is the log odds ratio, or “logit”
- $\beta_1, \beta_2, \beta_i$ are beta coefficients.
- X_1, X_2, X_i are the independent variables.
- e is the error term
- Interpretation of b_i
 - Increase in log-odds for a one unit increase in X_i with all other X_i s held constant
 - Measures of association between X_i and log-odds adjusted for all other X_i

Weighted samples of 19,593 in Afghanistan, 5,585 in Cambodia, 36,115 in India, 14,828 in Indonesia, 3,683 in Myanmar, 4,033 in Nepal, 7,385 in Pakistan and 4,851 in Philippines were used in the analysis. In addition to bivariate analysis, multivariate analysis was performed to control for the effects of other factors. Two dependent variables were considered for the analysis. One is for coverage of Iron tablets or syrup and the other for consumption of iron tablets or syrup for at least 90 days. The first dependent variable was coded as 1 if the mother had bought or in some other way received iron tablets or syrup and 0 if she had not purchased nor received iron tablets. Separately, we ran analyses to identify factors associated with actual consumption of iron tablets or syrup once a day for at least 90 days. Binary logistic regression models were used to explore associations between the dependent variable (adherence to iron tablet/syrup regimens) and independent variables, including socio-demographic and economic covariates.

Conceptual framework

Based on an extensive literature review, the analysis of the surveys considered the following covariates:

Independent covariates

Background -community and household level covariates

- Place of residence: urban / rural
- Ownership of assets: wealth quintiles (poorest to richest)

Socio-economic covariates-individual level

- Mother's employment status: Working currently / not working currently
- Spouse's employment status: Working currently / not working currently

Demographic covariates-individual level

- Age group of woman: seven five year age groups from 15 to 49 years of age.

- Total children ever born: Have 2 or more children/ have more than 2 children

Exposure to communication

- Exposure to
 1. Newspaper
 2. Television
 3. Radio

Receipt of antenatal care visits

Received less than three antenatal care visits/ received three or more antenatal care visits

Dependent variables

- Receipt of any iron tablets/ syrup or iron and folic acid tablets/ syrup
- Adherence to 90+ days of iron tablets/ syrup or iron and folic acid tablets/ syrup

This has been presented in a diagram below:

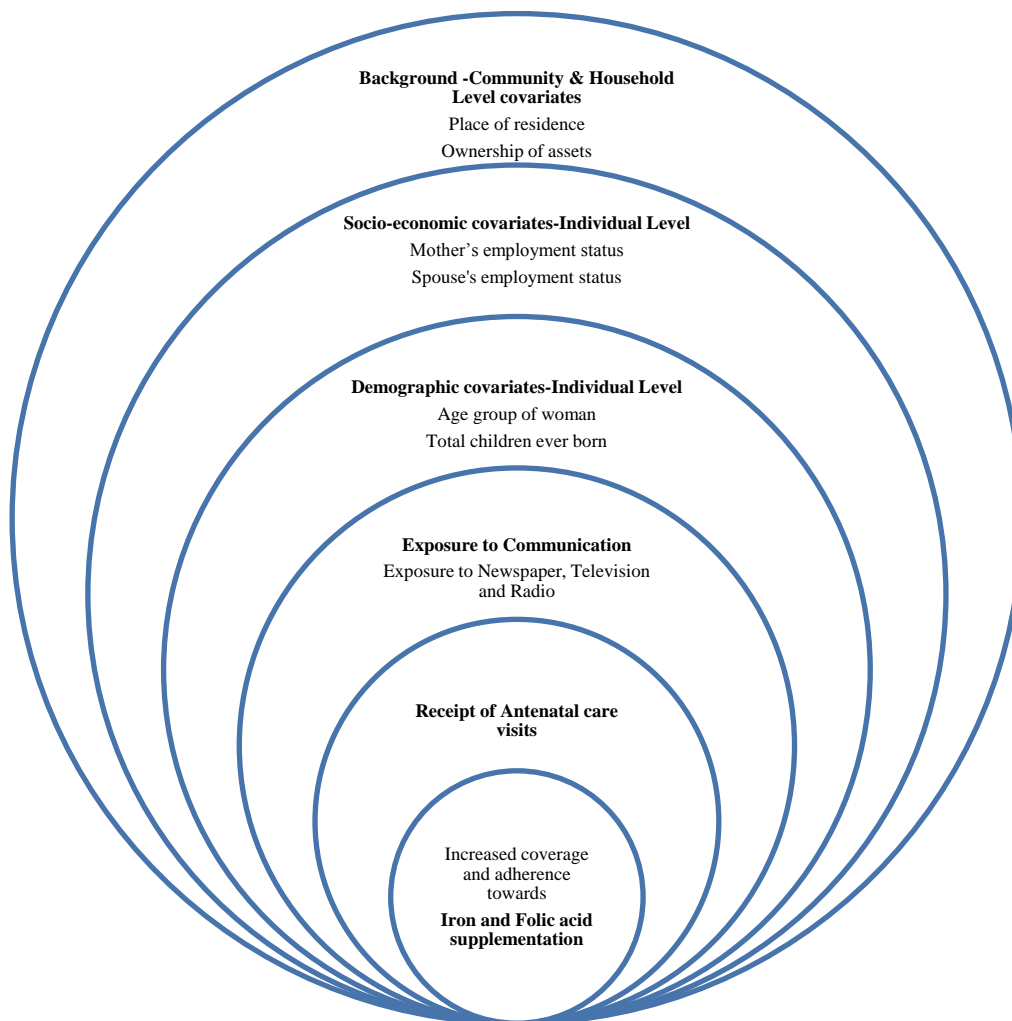


Figure 1: Conceptual framework.

RESULTS

The cross-country analyses of the eight countries reveal that the women who took iron tablets/ syrup or iron with folic acid for 90 days or more varies from 6.8% in Afghanistan to 75.9% in Cambodia, while the anaemia prevalence varied from 30% in Indonesia to 51% in Cambodia. The socio-demographic-economic variables in these countries are being described as follows: With regards to the place of residence, per cent rural sample varies from 50.3% in Indonesia to 89.9% in Nepal. The

literacy of respondents varied from 17.1% in Afghanistan to 98.6% in Philippines. The literacy of the respondent's husband varied from 42.1% in Afghanistan to 98.0% in Philippines and 98.3% in Indonesia. The percent of women who reported to have received or bought iron tablets or syrup varied from 45.2% in Pakistan to 97.7% in Myanmar. Exposure to mass media in terms of reading newspaper varied from 5.2% in Afghanistan to 60.8% in Philippines, while the proportion, who listened to radio varied from 15.4% in Pakistan to 80.3% in Philippines. Those who reported to watch television varied from 47.8% in Afghanistan to 95.7% in India.

Table 2: Socio-economic, demographic and health variables in selected eight countries in Asia, demographic and health surveys (DHS) (%).

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
N	19,593	5,585	36,115	14,828	3,683	4,033	7,385	4,851
Background – community level covariate								
Place of residence								
Rural	76.7	85.6	73.1	50.3	76.6	89.9	70.0	53.8
Urban	23.3	14.4	26.9	49.7	23.4	10.1	30.0	46.2
Background – individual level covariates								
Education of the respondent								
Non-literate	82.9	13.2	47.2	1.8	16.1	43.8	56.0	1.4
Literate	17.1	86.8	52.8	98.2	83.9	56.2	44.0	98.6
Education of the husband								
Non-literate	57.9	9.4	28.5	1.7	17.2	21.4	33.1	2.0
Literate	42.1	90.6	71.5	98.3	82.8	78.6	66.9	98.0
Demographic covariates								
Age group of the woman								
15-19 years	4.4	3.4	7.6	3.2	2.5	8.1	3.0	4.2
20-24 years	25.3	24.3	33.6	19.3	15.7	32.2	20.3	20.3
25-29 years	28.5	29.9	32.5	27.5	25.7	31.6	29.2	23.2
30-34 years	17.6	26.2	16.9	24.2	25.8	16.2	25.1	23.5
35-39 years	15.2	10.3	6.9	16.9	19.1	7.5	14.8	16.6
40-44 years	5.9	4.3	2.1	7.2	8.8	3.2	5.8	9.0
45-49 years	3.2	1.5	0.5	1.6	2.5	1.1	1.8	3.2
Total children ever born								
Have 2 or less than 2 children	31.8	65.8	55.0	69.3	59.6	59.6	38.5	51.3
Have more than 2 children	68.2	34.2	45.0	30.7	40.4	40.4	61.5	48.7
Socio-economic covariates								
Respondent's work Status								
Not working currently	89.0	34.8	70.5	52.5	42.9	44.1	75.1	60.1
Working currently	11.0	65.2	29.5	47.5	57.1	55.9	24.9	39.9
Husband's work status								
Not working currently	0.6	1.0	1.3	1.4	1.1	3.4	1.7	2.2
Working currently	99.4	99.0	98.7	98.6	98.9	96.6	98.3	97.8
Wealth quintile								
Poorest	19.8	22.9	23.9	20.3	26.9	23.5	23.5	22.8
Poorer	20.2	20.4	21.7	19.3	22.1	21.6	21.6	20.7
Middle	20.4	18.8	19.6	19.9	17.3	21.1	21.1	19.7
Richer	20.7	18.0	18.4	21.2	18.0	18.1	18.1	19.8
Richest	18.9	19.9	16.4	19.3	15.7	15.7	15.7	17.0
Communication exposure								
Mass media								
Newspaper								
Does not read newspaper	94.8	79.8	71.8	52.0	64.2	74.0	76.2	39.2
Reads newspaper	5.2	20.2	28.2	48.0	35.8	26.0	23.8	60.8
Radio								
Does not listen to radio	62.0	50.6	59.5	48.4	61.4	24.0	84.6	19.7
Listens to radio	38.0	49.4	40.5	51.6	38.6	76.0	15.4	80.3

Continued.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
Television								
Does not watch Television	52.2	29.3	43.7	4.3	29.0	34.6	34.6	9.1
Watches Television	47.8	70.7	56.3	95.7	71.0	65.4	65.4	90.9
Receipt of at least 3 ANC's								
Received less than 3 ANC's	67.9	11.5	47.3	6.6	22.0	33.5	50.9	8.8
Received 3+ ANC's	32.1	88.5	52.7	93.4	78.0	66.5	49.1	91.2
Iron receipt								
Did not receive or bought any iron supplements or syrup	55.3	4.3	34.4	23.1	12.3	20.4	54.8	7.9
Received or bought iron supplements or syrup	44.7	95.7	65.6	76.9	97.7	79.6	45.2	92.1
Iron adherence (90+ days of iron tablets or syrup or iron and folic acid tablets)								
Did not consume for 90 or more days	93.2	24.1	76.8	67.1	40.2	44.1	78.5	53.1
Consumed for 90 or more days	6.8	75.9	23.2	32.9	59.8	55.9	21.5	46.9

A bivariate analysis was conducted for receipt of iron tablets/syrup as well as for consumption of iron tablets/syrup for 90+ days. The variables considered for analysis were various background level and individual level socio-demographic and socio-economic covariates. Results indicate that a significantly higher proportion of women residing in urban areas received iron tablets or syrup as compared to rural areas across all countries similarly, adherence for 90+ days was also found to be higher among the women residing in urban areas in all the countries except Afghanistan and Cambodia.

On considering the individual level covariates like literacy status of the women, it is found that there was a significant difference between receipt and adherence (for 90+ days) of iron tablets/syrup in literate women as compared to illiterate ones across all the countries. Similarly a significant proportion of women having literate spouses consumed iron tablets/syrup for at least 90 days across all countries.

Working status of women was also found to play a significant role; as a significant proportion of working women received iron tablets/syrup as compared to non-working women except in Cambodia, Indonesia and Philippines. Consumption for at least 90+ days was also found to be significantly high among the working women in the countries except Cambodia.

On looking at the exposure to different mediums of communication, it has been found that a significant proportion of women who read newspaper and watch television received and adhered to IFA as compared to those women who do not read newspaper and does not watch television across all the countries. A significant proportion of women who received at least 3 ANC's received and adhered to iron for at least 90 days across all the countries.

Results of the multivariate binary logistic regression analyses

Predictors used in the model: Background level and individual level socio-demographic and socio-economic covariates, which are expected to influence the iron

tablets or syrup coverage and adherence behaviour have been described in Table 3. The predictors used in the model are the place of residence, age of the woman, children ever born, education of the respondent and her spouse (husband), current work status of the respondent and her husband, household assets used in the construction of wealth quintile and exposure to mass media and receipt of antenatal care.

After adjusting for different variables, exposure to newspaper was found to be a predictor of adherence to iron tablets or syrup in all countries except Afghanistan, Cambodia and Myanmar. Exposure to television seemed to be a significant predictor of coverage and adherence to iron tablets or syrup except for countries of Cambodia, Nepal, Pakistan and Philippines. Access to antenatal care seems to be the best predictor of adherence to iron tablets for at least 90 days. Those who had received at least three antenatal care visits, were 3.830 times in Afghanistan to 29.884 times in Indonesia, who were more likely to adhere to at least 90 days of iron tablets or syrup or iron and folic acid tablets supplementation.

Indonesia seems to be way ahead in the provisioning of antenatal care, as according to the Indonesia DHS, 2012, 87.8% of the women reported to have received 4+ antenatal care visits, with 73.5% receiving at least one visit in the first trimester, at least one in the second, and at least two in the third, which reflects clearly on early registration of pregnancy. Eight out of ten women had already received an ANC visit within the first four months of pregnancy during the DHS 2012, which has shown an increase from three fourths (75%) in Indonesia DHS 2007.

After adjusting for standard co-variables, exposure to newspaper was found to be associated with increased adherence to iron tablets or syrup, in five of the eight countries (India, Indonesia, Nepal, Pakistan, and the Philippines). Exposure to television was significantly associated with coverage and adherence to iron tablets or syrup in Afghanistan, India, Indonesia and Myanmar. Those who received at least three antenatal care visits were much more likely to adhere to at least 90 days of iron tablet or syrup or iron and folic acid tablets supplementation.

Table 3: Received/ bought iron by socio-economic and demographic variables in selected countries in Asia, demographic and health surveys (DHS) (%).

	Afghanistan		Cambodia		India		Indonesia		Myanmar		Nepal		Pakistan		Philippines	
Predictors used in the model	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron & folic acid users	Iron & folic acid users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users
N	10,769	8,697	244	5,434	13,437	25,589	3,322	11,086	422	3,002	837	3,267	4,025	3,325	372	4,353
Background - community level covariate																
Rural	57.4	42.6	4.7	95.3	38.4	61.6	26.9	73.1	14.5	85.5	21.4	78.6	60.3	39.7	9.2	90.8
Urban	48.5	51.5*	2.1*	97.9*	23.6	76.4*	19.1*	80.9*	5.2	94.8*	10.9	89.1*	41.9	58.1*	6.3	93.7*
Individual level covariates																
Education of the respondent																
Non-Literate	58.9	41.1	12.0	88.0	50.4	49.6	54.1	45.9	36.5	63.5	31.1	68.9	65.9	34.1	42.6	57.4
Literate	38.2	61.8*	3.1	96.9*	20.1	79.9*	22.5	77.5*	7.7	92.3*	12.1	87.9*	40.6	59.4*	7.4	92.6*
Education of the husband																
Non-Literate	60.6	39.4	10.8	89.2	50.8	49.2	46.7	53.3	29.4	70.6	34.3	65.7	67.5	32.5	26.9	73.1
Literate	48.1	51.9*	3.6	96.4*	27.9	72.1*	22.6	77.4*	8.7	91.3	16.6	83.4*	48.5	51.5*	7.5	92.5*
Demographic covariates age group of the woman																
15-19 years	61.7	38.3	4.6	95.4	34.2	65.8	29.8	70.2	15.5	84.5	14.1	85.9	52.7	47.3	6.5	93.5
20-24 years	55.9	44.1	2.8	97.2	31.8	68.2	22.0	78.0	15.4	84.6	15.6	84.4	51.9	48.1	8.2	91.8
25-29 years	55.7	44.3	3.2	96.8	31.6	68.4	21.4	78.6	12.1	97.9	16.7	83.3	54.9	45.1	7.5	92.5
30-34 years	54.0	46.0	3.6	96.4	36.4	63.6	21.5	78.5	9.0	91.0	24.8	75.2	53.1	46.9	5.8	94.2
35-39 years	52.0	48.0	7.0	93.0	47.4	52.6	24.6	75.4	10.1	89.9	32.1	67.9	56.0	44.0	8.8	91.2
40-44 years	57.0	43.0	13.4	86.6	54.4	45.6	28.3	71.7	17.3	82.7	54.5	45.5	64.3	35.7	11.6	88.4
45-49 years	58.9	41.1	17.4	82.6	69.2	30.8	33.5	66.5	24.4	75.6	66.0	34.0	71.2	28.8	10.0	90.0
Total children ever born																
Have 2 or less than 2 children	54.3	45.7	2.2	97.8	25.0	75.0	20.3	79.7	9.5	90.5	12.4	87.6	47.8	52.2	5.5	94.5
Have more than 2 children	55.8	44.2 _{n.s.}	8.2	91.8*	46.0	54.0*	29.2	70.8*	16.5	83.5*	32.2	67.8*	59.1	40.9*	10.4	89.6*
Socio-economic covariates respondents work status																
Not working currently	55.7	44.3	3.6	96.4	34.1	65.9	23.4	76.6	11.0	89.0	16.1	83.9	52.2	47.8	8.2	91.8
Working currently	52.7	47.3*	4.7	95.3	35.2	64.8*	22.7	77.3	13.3	86.7*	23.8	76.2*	62.5	37.5*	7.4	92.4

Continued.

	Afghanistan		Cambodia		India		Indonesia		Myanmar		Nepal		Pakistan		Philippines	
	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron & folic acid users	Iron & folic acid users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users
Husband's work status																
Not working currently	56.4	43.6	1.9	98.1	36.0	64.0	31.6	68.4	56.4	43.6	1.9	98.1	36.0	64.0	30.1	22.9
Working currently	55.3	44.7	4.3	95.7	34.4	65.6	12.1	87.9	55.3	44.7	4.3	95.7	34.4	65.6	22.9	77.16
Wealth quintile																
Poorest	61.6	38.4	9.0	91.0	50.6	49.4	36.3	63.7	21.0	79.0	38.4	61.6	71.1	28.9	14.8	85.2
Poorer	61.1	38.9	4.6	95.4	42.7	57.3	24.0	76.0	15.2	84.8	22.0	78.0	64.8	35.2	6.8	93.2
Middle	57.2	42.8	3.7	96.3	32.7	67.3	21.1	78.9	9.8	90.2	17.6	82.4	56.8	43.2	6.0	94.0
Richer	52.7	47.3	1.6	98.4	24.4	75.6	19.9	80.1	4.9	95.1	11.5	88.5	42.8	57.2	4.1	95.9
Richest	43.3	56.7	1.7	98.3	13.3	86.7	13.6	86.4	4.7	95.3	5.3	94.7	32.0	68.0	4.1	95.9
Communication exposure																
Mass media																
Newspaper																
Does not read	56.5	43.5	4.9	95.1	42.1	57.9	27.6	72.4	15.8	84.2	24.9	75.1	60.8	39.2	11.3	88.7
Reads	33.4	66.6*	1.8	98.2*	14.9	85.1*	18.2	81.8*	6.1	93.9*	7.4	92.6*	35.4	64.6*	5.7	94.3*
Radio																
Does not listen	55.2	44.8	4.7	95.3	38.9	61.1	25.6	74.4	15.3	84.7	27.0	23.0	56.4	43.6	13.6	86.4
Listens	55.6	44.4	3.9	96.1	27.9	72.1*	20.6	79.4*	7.5	92.5*	18.3	81.7*	45.8	54.2*	6.5	93.5*
Television																
Does not watch	65.7	34.3	8.3	91.7	9.6	50.4	40.9	59.1	21.3	78.7	31.8	68.2	65.7	34.3	22.8	77.2
Watches	44.0	56.0*	2.6	97.4*	22.7	77.3*	22.3	77.7*	8.6	91.4*	14.3	85.7*	49.0	51.0*	6.4	93.6*
Receipt of at least 3 ANC's																
Received less than 3 antenatal care visits	67.2	32.8	33.1	66.9	55.8	44.2	66.5	33.5	43.4	56.6	53.2	46.8	74.0	26.0	44.6	55.4
Received 3+ antenatal care visits	30.3	69.7*	0.6	99.4*	15.2	84.8*	20.0	80.0*	3.5	96.5*	3.9	96.1*	34.8	65.2*	4.3	95.7*

Note : *: p<0.05 : Statistically Significant at 5% level **: p<0.01 : Statistically Significant at 1% level, n.s.: Not significant.

Table 4: Adherence to iron intake by socio-economic and demographic variables in selected countries in Asia, demographic and health surveys (%).

	Afghanistan		Cambodia		India		Indonesia		Myanmar		Nepal		Pakistan		Philippines	
Predictors used in the model	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron & folic acid users	Iron & folic acid users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users
N	18,147	1,320	1,369	4,308	29,989	9,037	9,664	4,744	1,378	2,046	1,811	2,293	5,766	1,584	2,509	2,216
Background- community level covariate																
Rural	93.7	6.3	24.5	75.5	81.2	18.8	73.3	26.7	45.2	54.8	45.6	54.4	82.9	17.1	56.0	44.0
Urban	91.8	8.2	21.8	78.2	65.0	35.0	60.8	39.2*	24.2	75.8*	31.2	68.8*	68.1	31.9*	49.7	50.3*
Individual level covariates																
Education of the respondent																
Non-Literate	94.5	5.5	35.4	64.6	89.9	10.1	90.3	9.7	67.3	32.7	60.3	39.7	86.2	13.8	87.0	13.0
Literate	87.1	12.9*	22.4	77.6*	65.2	34.8*	66.7	33.3*	35.1	64.9*	31.5	68.5*	68.6	31.4*	52.6	47.4*
Education of the husband																
Non-Literate	95.1	4.9	33.7	66.3	89.2	10.8	88.5	11.5	59.9	40.1	63.9	36.1	88.5	11.5	69.9	30.1
Literate	90.6	9.4*	23.1	76.9*	71.9	28.1*	66.7	33.3*	36.2	63.8*	38.8	61.2*	73.5	26.5*	52.8	47.2*
Demographic covariates																
Age group of the woman																
15-19 years	94.2	5.8	24.2	75.8	83.0	17.0	77.2	22.8	54.2	45.8	37.2	62.8	77.8	22.2	56.0	44.0
20-24 years	93.4	6.6	24.1	75.9	76.9	23.1	67.9	32.1	46.4	53.6	38.7	61.3	79.3	20.7	54.7	45.3
25-29 years	93.4	6.6	22.5	77.5	73.6	26.4	66.	34.0	39.3	60.7	41.6	58.4	77.8	22.2	50.9	49.1
30-34 years	93.3	6.7	21.9	78.1	76.1	23.9	64.7	35.3	35.8	64.2	48.1	51.9	76.8	23.2	50.9	49.1
35-39 years	91.2	8.8	28.1	71.9	82.4	17.6	67.6	32.4	36.6	63.4	56.5	43.5	78.2	21.8	54.3	45.7
40-44 years	93.8	6.2	31.7	68.3	88.9	11.1	69.8	30.2	43.9	56.1	78.2	21.8	84.9	15.1	54.7	45.3
45-49 years	95.8	4.2	45.3	54.7	91.5	8.5	73.3	26.7	58.1	41.9	85.1	14.9	86.4	13.6	60.3	39.7
Total children ever born																
Have 2 or less than 2 children	92.6	7.4	20.7	79.3	69.5	30.5	63.9	36.1	33.9	66.1	33.7	66.3	73.6	26.4	47.4	52.6
Have more than 2 children	93.5	6.5*	30.8	69.2*	85.9	14.1*	74.2	25.8*	49.6	50.4*	59.6	40.4*	81.5	18.5*	59.1	40.9*
Socio-economic covariates																
Respondents work status																
Not working currently	93.4	6.6	24.4	75.6	75.6	24.4	68.4	34.4	38.1	61.9	41.0	59.0	77.0	23.0	54.9	45.1
Working currently	92.1	7.9*	23.9	76.1	79.7	20.3*	65.6	32.9	41.8	58.2	46.6	53.4	82.9	17.1	50.5	49.5

Continued.

	Afghanistan		Cambodia		India		Indonesia		Myanmar		Nepal		Pakistan		Philippines	
Predictors used in the model	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron & folic acid users	Iron & folic acid users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users	Non-Iron users	Iron users
Husband's work status																
Not working currently	100	0.0	14.8	85.2	79.2	20.8	77.7	22.3	68.4	31.6	55.0	45.0	82.1	17.9	52.0	48.0
Working currently	93.2	6.8*	24.2	75.8	76.8	23.2	66.9	33.1	39.9	60.1	43.8	56.2	78.4	21.6	53.1	46.9
Wealth quintile																
Poorest ^{Ref}	95.1	4.9*	35.0	65.0	90.1	9.9*	80.1	19.9*	54.7	45.3	62.6	37.4	88.5	11.5	63.8	36.2
Poorer	94.5	5.5	24.3	75.7	86.9	13.1	71.7	28.3	45.0	55.0	48.7	51.3	87.2	12.8	60.3	39.7
Middle	94.0	6.0	23.7	76.3	78.5	21.5	68.0	32.0	39.0	61.0	46.4	53.6	81.9	18.1	51.6	48.4
Richer	92.5	7.5	18.4	81.6	69.3	30.7	63.2	36.8	30.0	70.0	32.5	67.5	72.2	27.8	43.2	56.8
Richest	89.8	10.2	16.9	83.1*	50.7	49.3	52.2	47.8	21.8	78.2	20.5	79.5	57.7	42.3	37.3	62.7
Communication exposure- Mass Media																
Newspaper																
Does not read newspaper	93.7	6.3	25.3	74.7	84.6	15.4	72.5	27.5	46.4	53.6	51.3	48.7	83.2	16.8	72.5	27.5
Reads newspaper	84.7	15.3*	19.7	80.3*	57.2	42.8*	61.3	38.7*	29.2	70.8*	23.9	76.1*	63.1	36.9*	61.3	38.7*
Radio																
Does not listen to radio	93.6	6.4	26.5	73.5	79.8	20.2	71.2	28.8	43.0	57.0	52.8	47.2	79.4	20.6	61.2	38.8
Listens to radio	92.6	7.4*	21.7	78.3*	72.5	27.5*	63.2	36.8*	35.8	64.8*	41.4	58.6*	73.5	26.5*	51.1	48.9*
Television																
Does not watch Television	96.4	3.6	32.1	67.9	88.3	11.7	77.6	22.4	53.3	46.7	59.2	40.8	86.3	13.7	69.3	30.7
Watches Television	89.8	10.2*	20.8	79.2*	68.0	32.0*	66.6	33.4*	34.9	65.1*	36.2	63.8*	74.3	25.7*	51.5	48.5*
Receipt of at least 3 ANC's																
Received less than 3 antenatal care visits	96.7	3.3	73.5	26.5	93.3	6.7	98.8	1.2	81.6	18.4	84.0	16.0	93.1	6.9	92.6	7.4
Received 3+ antenatal care visits	85.9	14.1*	17.7	82.3*	62.1	37.9*	64.8	35.2*	28.6	71.4*	24.1	75.9*	63.3	36.7*	49.3	50.7*

Note: *: p<0.05 : Statistically Significant at 5% level **: p<0.01 : Statistically Significant at 1% level, n.s.: Not significant.

Table 5: Adjusted Odds Ratio (AOR) from the multivariate binary logistic regression of coverage of iron tablets or syrup or iron and folic acid or syrup in selected countries in Asia, Demographic & Health Surveys (DHS) ((95% CI) of receipt of iron supplementation or syrup) Dependent variables: Receipt of iron supplementation or syrup.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
N	19,593	5,585	36,115	14,828	3,683	4,033	7,385	4,851
Background- Community level covariate								
Place of residence								
Rural ^{Ref}								
Urban	0.643** (0.574-0.719)	1.051 (0.501-2.205)	0.840** (0.785-0.900)	1.045 (0.952-1.147)	1.045 (0.682-1.601)	0.786 (0.0518-1.192)	0.924 (0.803-1.063)	0.962 (0.732-1.265)
Individual level covariates								
Education of the respondent								
Non-literate ^{Ref}								
Literate	1.538** (1.391-1.700)	1.765** (1.211-2.573)	1.591** (1.494-1.696)	1.410* (1.050-1.893)	2.771** (2.038-3.769)	0.844 (0.658-1.083)	1.167* (1.011-1.348)	2.080* (1.055-4.102)
Education of the husband								
Non-literate ^{Ref}								
Literate	1.189** (1.113-1.272)	1.289 (0.850-1.954)	1.234** (1.166-1.306)	1.180 (0.871-1.598)	1.335 (0.989-1.802)	0.948 (0.753-1.193)	1.258** (1.113-1.421)	1.246 (0.653-2.377)
Demographic covariates								
Age of the respondent								
15-19 years ^{Ref}								
20-24 years	1.291** (1.095-1.523)	1.069 (0.460-2.480)	0.959 (0.872-1.055)	1.253 (0.993-1.582)	0.638 (0.291-1.397)	1.013 (0.669-1.553)	0.980 (0.720-1.332)	0.731 (0.372-1.435)
25-29 years	1.476** (1.242-1.754)	0.856 (0.366-1.999)	1.088 (0.983-1.205)	1.244 (0.989-1.565)	0.873 (0.401-1.903)	0.992 (0.640-1.539)	0.800 (0.588-1.090)	0.809 (0.407-1.606)
30-34 years	1.685** (1.400-2.028)	1.027 (0.420-2.512)	1.073 (0.957-1.202)	1.211 (0.957-1.532)	1.115 (0.498-2.499)	0.776 (0.478-1.259)	0.931 (0.676-1.282)	1.123 (0.549-2.297)
35-39 years	1.788** (1.481-2.160)	0.787 (0.306-2.026)	0.865* (0.758-0.987)	1.151 (0.897-1.476)	0.974 (0.423-2.243)	0.871 (0.512-1.483)	0.944 (0.674-1.321)	0.845 (0.407-1.756)
40-44 years	1.560** (1.259-1.933)	0.423 (0.157-1.144)	0.854 (0.711-1.025)	1.055 (0.802-1.388)	0.649 (0.272-1.552)	0.355** (0.190-0.662)	0.918 (0.629-1.340)	0.704 (0.328-1.514)
45-49 years	1.493** (1.170-1.905)	0.643 (0.213-1.935)	0.552** (0.393-0.766)	0.987 (0.674-1.446)	0.759 (0.279-2.065)	0.319* (0.133-0.769)	0.729 (0.438-1.214)	0.940 (0.381-2.234)

Continued.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
Total children ever born								
Have 2 or less than 2 children ^{Ref}								
Have more than 2 children	0.930 (0.854-1.014)	0.622* (0.405-0.954)	0.737** (0.693-0.783)	0.801** (0.719-0.893)	1.114 (0.810-1.533)	0.802 (0.621-1.036)	0.915 (0.805-1.041)	0.781 (0.573-1.066)
Socio-economic covariates								
Respondent's current work status								
Does not work currently ^{Ref}								
Works currently	1.017 (0.921-1.124)	0.755 (0.538-1.059)	1.337** (1.267-1.410)	1.090* (1.002-1.185)	0.895 (0.692-1.158)	0.703** (0.568-0.870)	0.932 (0.824-1.055)	0.906 (0.701-1.170)
Husband's work status								
Does not work currently ^{Ref}								
Works currently	0.963 (0.643-1.443)	1.866 (0.198-17.603)	1.053 (0.856-1.294)	1.119 (0.804-1.558)	1.753 (0.686-4.476)	1.386 (0.826-2.326)	1.309 (0.871-1.967)	1.486 (0.690-3.202)
Wealth quintile								
Poorest ^{Ref}								
Poorer	1.029 (0.933-1.135)	1.114 (0.736-1.686)	0.970 (0.907-1.037)	1.376** (1.213-1.561)	0.865 (0.631-1.186)	1.795** (1.388-2.322)	1.091 (0.925-1.285)	1.432* (1.014-2.023)
Middle	1.197** (1.086-1.320)	0.954 (0.589-1.547)	0.997 (0.925-1.075)	1.472** (1.290-1.681)	1.107 (0.753-1.628)	1.680** (1.266-2.229)	1.254* (1.050-1.499)	1.481* (1.010-2.170)
Richer	1.121 (1.013-1.240)	1.080 (0.561-2.078)	0.965 (0.882-1.056)	1.442** (1.257-1.655)	1.670* (1.038-2.687)	1.769** (1.244-2.516)	1.651** (1.350-2.019)	1.695* (1.074-2.676)
Richest	1.369** (1.187-1.578)	0.739 (0.339-1.607)	1.203** (0.882-1.056)	2.172** (1.853-2.547)	0.993 (0.560-1.763)	2.223** (1.351-3.655)	1.839** (1.439-2.350)	1.450 (0.879-2.392)
Communication exposure- Mass media								
Newspaper								
Does not read newspaper ^{Ref}								
Reads newspaper	1.058 (0.897-1.249)	1.106 (0.634-1.928)	1.311** (1.213-1.418)	1.245** (1.135-1.365)	1.019 (0.735-1.413)	1.182 (0.842-1.659)	1.221 (1.053-1.415)	1.080 (0.824-1.417)
Radio								
Does not listen to radio ^{Ref}								
Listens to radio	0.914** (0.856-0.975)	0.578** (0.414-0.805)	1.184** (1.124-1.247)	1.023 (0.937-1.117)	1.306 (0.981-1.738)	1.121 (0.894-1.405)	1.365** (1.184-1.573)	1.357* (1.007-1.829)

Continued.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
Television								
Does not watch Television ^{Ref}								
Watches Television	1.802** (1.684-1.930)	1.297 (0.900-1.870)	1.470** (1.388-1.558)	1.012 (0.831-1.233)	1.291 (0.979-1.703)	1.013 (0.809-1.270)	0.887 (0.781-1.007)	1.460* (1.007-2.117)
Receipt of at least 3 ANC's								
Received less than 3 antenatal cares visits ^{Ref}								
Received 3+ antenatal cares visits	4.008** (3.745-4.290)	71.490** (46.146-110.752)	4.505** (4.270-4.753)	5.639** (4.855-6.549)	14.056** (10.619-18.607)	22.987** (18.039-29.293)	3.887** (3.471-4.353)	13.156** (10.140-17.069)

Note: 95% CI: Confidence Interval, *: p<0.05 : Statistically Significant at 5% level **: p<0.01 : Statistically Significant at 1% level, n.s.: Not significant. ^{ref} Refers to Reference Category. Adjusted for Woman's age, place of residence and work status of woman and her spouse.

Table 6: Adjusted Odds Ratio (AOR) from the multivariate binary logistic regression of coverage and adherence of iron tablets or syrup or iron and folic acid tablets or syrup for at least 90 days in selected countries in Asia, demographic & health surveys (DHS) (95% CI) of adherence of iron supplementation or syrup for at least 90 days) Dependent variable: adherence to iron supplementation or syrup for at least 90 days.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
N	15,593	5,585	36,115	14,828	3,683	4,033	7,385	4,851
Background community level covariate								
Place of residence								
Rural ^{Ref}								
Urban	0.552** (0.452-0.674)	0.631** (0.493-0.809)	0.856** (0.802-0.914)	1.246** (1.148-1.351)	1.374** (1.090-1.731)	0.798 (0.605-1.052)	0.940 (0.802-1.103)	0.910 (0.796-1.041)
Individual level covariates								
Education of the respondent								
Non-literate ^{Ref}								
Literate	1.616** (1.377-1.895)	1.148 (0.932-1.1415)	1.575** (1.457-1.702)	1.624* (1.045-2.526)	1.673** (1.309-2.139)	1.183 (0.972-1.441)	0.963 (0.806-1.150)	2.592* (1.187-5.659)
Education of the husband								
Non-literate ^{Ref}								
Literate	1.350** (1.188-1.533)	1.053 (0.834-1.330)	1.160 (1.071-1.257)	1.766** (1.157-2.695)	1.075 (0.853-1.354)	1.027 (0.829-1.271)	1.564** (1.327-1.843)	0.933 (0.589-1.673)

Continued.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
Demographic covariates								
Age of the respondent								
15-19 years ^{Ref}								
20-24 years	1.166 (0.843-1.612)	0.787 (0.528-1.173)	1.177** (1.051-1.318)	1.336* (1.051-1.697)	1.232 (0.731-2.077)	1.020 (0.757-1.374)	0.877 (0.565-1.182)	1.021 (0.740-1.409)
25-29 years	1.411* (1.009-1.973)	0.869 (0.583-1.296)	1.477** (1.315-1.660)	1.386** (1.095-1.756)	1.812* (1.085-3.026)	0.953 (0.696-1.303)	0.848 (0.587-1.225)	1.235 (0.893-1.707)
30-34 years	1.625** (1.134-2.327)	1.026 (0.677-1.554)	1.543** (1.355-1.757)	1.484** (1.166-1.887)	2.266** (1.344-3.822)	0.960 (0.670-1.375)	0.978 (0.669-1.429)	1.247 (0.895-1.738)
35-39 years	2.167** (1.509-3.111)	0.949 (0.603-1.194)	1.445** (1.230-1.699)	1.549** (1.204-1.993)	2.333** (1.364-3.992)	1.107 (0.723-1.695)	1.036 (0.693-1.548)	1.235 (0.869-1.754)
40-44 years	1.695* (1.114-2.579)	0.956 (0.572-1.598)	1.233 (0.944-1.611)	1.591** (1.205-2.100)	2.253** (1.26-4.014)	0.481 (0.269-0.860)	0.976 (0.610-1.560)	1.366 (0.932-2.002)
45-49 years	1.116 (0.659-1.889)	0.712 (0.370-1.370)	1.291 (0.740-2.252)	1.566* (1.055-2.324)	1.966 (0.959-4.029)	0.386 (0.144-1.033)	1.005 (0.522-1.936)	1.144 (0.711-1.838)
Total children ever born								
Have 2 or less than 2 children ^{Ref}								
Have more than 2 children	0.843* (0.719-0.989)	0.759** (0.635-0.908)	0.711** (0.665-0.760)	0.658** (0.595-.0728)	0.639** (0.524-0.779)	0.747** (0.611-0.913)	0.856* (0.737-0.993)	0.724** (0.623-0.842)
Socio-economic covariates								
Respondent's current work status								
Does not work currently ^{Ref}								
Works currently	1.009 (0.845-1.204)	0.982 (0.852-1.133)	1.143** (1.072-1.213)	1.109** (1.030-1.194)	0.882 (0.751-1.036)	0.892 (0.755-1.055)	1.012 (0.866-1.182)	1.025 (0.903-1.164)
Husband's work status								
Does not work currently ^{Ref}								
Works currently	21.902 (0.616-779.203)	0.823 (0.383-1.771)	1.183** (0.931-1.502)	1.515* (1.073-2.140)	2.890** (1.313-6.361)	2.088** (1.395-3.125)	1.121 (0.672-1.868)	1.126 (0.746-1.699)
Wealth quintile								
Poorest ^{Ref}								
Poorer	1.078* (0.877-1.325)	1.400** (1.144-1.714)	0.935 (0.846-1.034)	1.247** (1.095-1.420)	1.089 (0.872-1.359)	1.276* (1.012-1.609)	0.840 (0.665-1.061)	0.931 (0.772-1.122)
Middle	1.101 (0.899-1.349)	1.237 (0.998-1.534)	1.116** (1.055-1.289)	1.325** (1.163-1.511)	1.074 (0.841-1.371)	1.012 (0.795-1.289)	0.988 (0.778-1.256)	1.286* (1.056-1.565)
Richer	1.066 (0.874-1.301)	1.462** (0.998-1.534)	1.333** (1.198-1.483)	1.471** (1.289-1.680)	1.253 (0.966-1.623)	1.354* (1.025-1.789)	1.257 (0.972-1.626)	1.626** (1.316-2.010)
Richest	1.321* (1.023-1.705)	1.881** (1.156-1.848)	1.986** (1.763-2.237)	2.138** (1.859-2.458)	1.324 (0.966-1.815)	1.642** (1.175-2.294)	1.695** (1.264-2.274)	1.902** (1.509-2.396)

Continued.

Predictors used in the model	Afghanistan	Cambodia	India	Indonesia	Myanmar	Nepal	Pakistan	Philippines
Communication exposure – Mass Media								
Newspaper								
Does not read newspaper ^{Ref}								
Reads newspaper	1.037 (0.829-1.297)	0.933 (0.772-1.126)	1.368** (1.279-1.464)	0.165** (1.075-1.262)	1.184 (0.989-1.418)	1.278* (1.028-1.588)	1.316** (1.123-1.543)	1.247** (1.089-1.430)
Radio								
Does not listen to radio ^{Ref}								
Listens to radio	1.090 (0.966-1.229)	1.078 (0.934-1.244)	1.079** (1.021-1.140)	1.169** (1.081-1.263)	0.975 (0.826-1.150)	0.955 (0.787-1.158)	1.189* (1.012-1.397)	1.128 (0.957-1.330)
Television								
Does not watch Television ^{Ref}								
Watches Television	2.052** (1.786-2.358)	1.064 (0.900-1.259)	1.160** (1.081-1.245)	0.691** (0.556-0.859)	1.245* (1.035-1.498)	1.110 (0.917-1.342)	0.892 (0.755-1.053)	1.043 (0.810-1.343)
Receipt of at least 3 ANC's								
Received less than 3 antenatal care visits ^{Ref}								
Received 3+ antenatal care visits	3.830** (3.382-4.338)	10.866** (1.418-2.496)	4.797** (4.472-5.146)	29.884** (16.593-53.822)	7.510** (6.061-9.306)	12.420** (10.358-14.893)	5.667** (4.846-6.651)	9.652** (6.643-14.025)

Note: 95% CI: Confidence Interval, *: p<0.05 : Statistically Significant at 5% level **: p<0.01 : Statistically Significant at 1% level, n.s.: Not significant. ^{ref} Refers to Reference Category. Adjusted for Woman's age, place of residence and work status of woman and her spouse.

DISCUSSION

The cross-country analyses of the eight countries reveal that the women who took iron tablets/ syrup or iron with folic acid for 90 days or more varies from 6.8% in Afghanistan to 75.9% in Cambodia, while the anaemia prevalence varied from 30% in Indonesia to 51% in Cambodia. Similar to earlier studies, like the study on factors influencing consumption of iron and folic acid supplementations in high focus states of India, which revealed that factors including maternal age, education, wealth index, birth order, type of caste/tribe, husband present during ANC visit, mass media exposure and religion were significantly associated with IFA supplementation, it is also observed in this analysis that increasing the coverage of antenatal care and increased use of mass media channels of communication could be useful in improving the coverage and adherence to IFA.¹¹

CONCLUSION

There is an urgent need to address the situation of anaemic in the Asia region and specifically in these low and middle income countries, where it is a moderate to severe public health problem. Antenatal care visits seem to be the key to increased adherence to iron and folic supplementation in all these countries, which could be one of the important strategies to combat iron deficiency anaemia in these countries. In monitoring data on anaemia prevalence at younger ages among younger mothers, who are at more risk due to teenage pregnancies, there is an urgent need to address data gaps during the 10 to 14 years age group. It could be advocated that in the Demographic and health surveys, we cover the 10 to 49 years age group for both genders or at least among women in place of 15 to 49 years age group being covered currently. This would be helpful in increasing program focussed on adolescent girls and increasing iron stores among them. Interpersonal communication and counselling questions could be included for messaging for different nutrition and health interventions. Interpersonal counselling helps in problem solving and it is based on instant feedback, even though it is more expensive. However, focusing attention to the design of messages through each channel would be critical. Mass media would need to be aimed at creating an appeal and recall among a diverse set of target audiences, whereas the interpersonal communication messages should be tailored to specific socio-cultural contexts, within the overarching key messages.

ACKNOWLEDGEMENTS

The authors acknowledge the use of the data published on the public domain by DHS program implemented by ICF International and partners Blue Raster, The Futures Institute, The Johns Hopkins Bloomberg School of Public Health Center for Communication Programs (JHUCCP), PATH, and Vysnova, and two new partner organizations in 2013—EnCompass and Kimetrica.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Procedures and questionnaires for standard DHS surveys have been reviewed and approved by ICF Institutional Review Board (IRB)

REFERENCES

1. WHO. The global prevalence of anaemia in 2011. World Health Organization. 2015. Available at: http://apps.who.int/iris/bitstream/10665/177094/1/9789241564960_eng.pdf. Accessed on 10 October 2017.
2. Maina-Gathigi L, Omolo J, Wanzala P, Lindan C, Makokha A. Utilization of folic acid and iron supplementation services by pregnant women attending an antenatal clinic at a regional referral hospital in Kenya. *Matern Child Health J*. 2013;17(7):1236-42.
3. WHO. Guideline: Intermittent iron and folic acid supplementation in non-anaemic pregnant women. WHO (2012); Geneva.
4. United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. (2017). Working Paper No. ESA/P/WP/248. Available at: https://esa.un.org/unpd/wpp/publications/Files/WPP2017_KeyFindings.pdf. Accessed on 10 October 2017.
5. Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F, et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. *The Lancet Global Health*. 2013;1(1):e16–e25.
6. WHO. Iron deficiency anaemia assessment, prevention, and control: a guide for programme managers. Geneva: WHO.2001, WHO/NHD/01.3.
7. Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian SV. Anaemia in low-income and middle-income countries. *Lancet*. 2011;378(9809):2123-35.
8. Tolentino K, Friedman JF. An update on anaemia in less developed countries. *Am J Trop Med Hyg*. 2007;77:44–51.
9. Imdad A, Bhutta ZA. Routine Iron/Folate Supplementation during Pregnancy, Paediatric Perinatal Epidemiol. 2012;26(1):168–77.
10. Arega Sadore A, Abebe Gebretsadik L, Aman Hussen M. Compliance with iron-folate supplement and associated factors among antenatal care attendant mothers in Misha District. South Ethiopia: community based cross-sectional study. *J Environ Public Health*. 2015;2015:781973.
11. Chourasia A, Pandey CM, Awasthi A. Factors influencing the consumption of iron and folic acid supplementations in high focus states of India. *Clinical Epidemiol Global Health*. 2017;5:180–4.

12. United States Agency for International Development (USAID) and PATH. Community-Based Distribution of Iron-Folic Acid Supplementation: Evidence and Program Implications, Maternal and Child Survival Program, MCSP Nutrition Brief, 2017.
13. Imhoff-Kunsch B, Martorell R. Nutrition Education and Counselling Provided during Pregnancy: Effects on Maternal, Neonatal and Child Health Outcomes. *Paediatric Perinatal Epidemiol*. 2012;(Suppl 1):1–3.
14. Alam, Ashraful, Rasheed S, Khan NUZ, Sharmin T, Huda TM, et al. How Can Formative Research Inform the Design of an Iron-Folic Acid Supplementation Intervention Starting in First Trimester of Pregnancy in Bangladesh? *BMC Public Health*. 2015;15(1):374.
15. Central Statistics Organization (CSO), Ministry of Public Health (MoPH), and ICF. Afghanistan Demographic and Health Survey 2015. Kabul, Afghanistan: Central Statistics Organization, 2017.
16. National Institute of Statistics, Directorate General for Health, and ICF International. Cambodia Demographic and Health Survey 2014. Phnom Penh, Cambodia, and Rockville, Maryland, USA: National Institute of Statistics, Directorate General for Health, and ICF International, 2015.
17. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005–06: India: Volume I. Mumbai: IIPS, 2007.
18. Statistics Indonesia (Badan Pusat Statistik—BPS), National Population and Family Planning Board (BKKBN), and Kementerian Kesehatan (Kemenkes—MOH), and ICF International. Indonesia Demographic and Health Survey 2012. Jakarta, Indonesia: BPS, BKKBN, Kemenkes, and ICF International, 2013.
19. Ministry of Health and Sports (MoHS) and ICF. Myanmar Demographic and Health Survey 2015-16. Nay Pyi Taw, Myanmar, and Rockville, Maryland USA: Ministry of Health and Sports and ICF, 2017.
20. Ministry of Health and Population (MOHP) [Nepal], New ERA, and ICF International Inc. 2012. Nepal Demographic and Health Survey 2011. Kathmandu, Nepal: Ministry of Health and Population, New ERA, and ICF International, Calverton, Maryland, 2012.
21. National Institute of Population Studies (NIPS) [Pakistan] and ICF International. Pakistan Demographic and Health Survey 2012-13. Islamabad, Pakistan, and Calverton, Maryland, USA: NIPS and ICF International, 2013.
22. Philippine Statistics Authority (PSA) [Philippines], and ICF International. Philippines National Demographic and Health Survey 2013. Manila, Philippines, and Rockville, Maryland, USA: PSA and ICF International, 2014.

Cite this article as: Warvadekar K, Reddy JC, Sharma S, Dearden KA, Raut MK. Socio-demographic and economic determinants of adherence to iron intake among pregnant women in selected low and lower middle income countries in Asia: insights from a cross-country analyses of global demographic and health surveys. *Int J Community Med Public Health* 2018;5:1552-69.