

Promotional Strategies to Increase Iron–Folic Acid Supplementation Compliance among Pregnant Women in the Philippines

Eva Felipe-Dimog^{1,5}, Fu-Wen Liang¹,
Catherine Lynn Tipton Silao^{2,3}, and Hsiu-Hung Wang^{4*}

¹Department of Public Health, College of Health Sciences, Kaohsiung Medical University
No. 100 Shih-Chuan 1st Road, Sanmin District, Kaohsiung 80708 Taiwan

²Department of Pediatrics, College of Medicine and Philippines General Hospital
University of the Philippines Manila 1000 Metro Manila, Philippines

³Institute of Human Genetics, National Institutes of Health
University of the Philippines Manila 1000 Metro Manila, Philippines

⁴College of Nursing, Kaohsiung Medical University
No. 100 Shih-Chuan 1st Road, Sanmin District, Kaohsiung 80708 Taiwan

⁵Mountain Province State Polytechnic College
2616 Bontoc, Mountain Province, Philippines

Anemia in pregnancy is a risk factor for maternal and neonatal mortality and morbidity. Iron deficiency anemia (IDA), the most common type of anemia in pregnancy, adversely affects the well-being of both the mother and the child. Iron–folic acid supplementation (IFAS), a cost-effective public health intervention of IDA in pregnancy recommended by the World Health Organization (WHO), is implemented globally with the Philippines included. However, only 19% of Filipino pregnant women take the recommended number of 180 IFAS tablets. This is considered a factor in the prevalence of anemia in pregnancy. Very low IFAS uptake was due to the behaviors and practices of both pregnant women and healthcare providers. Limited awareness on the impact of anemia in pregnancy and the significance of IFAS, late and less frequent antenatal care (ANC) visits, experience of side effects and unpleasant taste of the supplement, and not receiving or purchasing supplements were the identified factors to low IFAS compliance. Among healthcare providers, a low level of IFAS compliance was found to be related to the late reporting of pregnant women to the antenatal facility, and inability to motivate and provide appropriate counseling regarding the supplementation's use and significance. Behaviors and practices of pregnant mothers toward IFAS compliance appear to be a result of healthcare providers' inadequate healthcare services. Therefore, healthcare providers need to improve their ANC program and revisit their approaches on existing health and nutrition promotion programs, health education and counseling techniques, follow-up and monitoring strategies, and ANC visits promotion efforts. These efforts were found effective in well-informed and empowered pregnant women to IFAS compliance and other significant ANC access. Improved IFAS compliance will eventually contribute to lower the prevalence of anemia in pregnancy for better maternal and neonatal outcomes.

Keywords: anemia, anemia in pregnancy, antenatal care, iron–folic acid supplementation, promotion strategies

*Corresponding Author: hhwang@kmu.edu.tw

INTRODUCTION

The public health impact of anemia in pregnancy is often highlighted as a risk factor of mortality and morbidity of both the mother and the child. It is estimated that 40.1% of pregnant women worldwide are anemic (WHO 2020), half of which is caused by iron deficiency (WHO 2015). Anemia during pregnancy is strongly associated with maternal mortality (Brabin *et al.* 2001), perinatal mortality, neonatal morbidity, and mortality among children (WHO 2015). A pregnant mother who is anemic is at increased risk of having a low-birth-weight baby, a preterm birth, and a small for gestational age baby (Badfar *et al.* 2019; Rahmati *et al.* 2017, 2020; Ren *et al.* 2007). For the last three decades, anemia still remains a public health problem in the Philippines (FNRI-DOST 2015; Timoteo *et al.* 2019). IFAS under the micronutrient supplementation program of the government is a cost-effective public health intervention of anemia in pregnancy in the country (DOH 2003, 2010) given for free to all Filipino pregnant women. In the Philippines, the prevalence of anemia in pregnancy was classified as “severe” from 1998–2008 (43.6% in 1993, 50.7% in 1998, 43.9% in 2003, and 42.5% in 2008), and recently declined to 24.6% in 2013 and reclassified as “moderate” (FNRI-DOST 2015).

Pregnant women are particularly vulnerable to iron deficiency due to a significant increase of iron requirements during pregnancy to support the erythrocyte mass and plasma volume expansion, and for the growth of the fetus and placenta (Breymann 2015; Scholl 2005). IDA during pregnancy adversely affects the fetomaternal wellbeing and is related to increased morbidity and mortality of fetuses (Abu-Ouf and Jan 2015). Pregnant mothers with IDA experience difficulty in breathing, fainting, tiredness, palpitations, and difficulty in sleeping (Lee *et al.* 2001). They are also at increased risk of developing a perinatal infection, pre-eclampsia, and bleeding (Abu-Ouf and Jan 2015). IDA in pregnancy may also result in poor pregnancy outcomes – including a threefold increase in small for gestational age and low birth weight babies plus a twofold increased incidence of premature birth – all of which are associated with poorer neurodevelopmental outcomes (Juul *et al.* 2019). Deficiency in iron in the first trimester of pregnancy has a more adverse health impact on fetal growth than having anemia in the later part of pregnancy (Allen 2000; Gautam *et al.* 2008). Prolonged IDA lowers endurance and productivity at work, and negatively affect the quality of life, which leads to further socioeconomic problems (Abu-Ouf and Jan 2015). These poor health outcomes prompted public health experts to recommend cost-effective public health intervention through iron supplementation among women during pregnancy (Baltussen *et al.* 2004).

Guided by the WHO, the Philippines implemented the IFAS program recommending pregnant women to take a standard daily dose of 60 mg of elemental iron and 400 µg (0.4 mg) of folic acid for at least 6 mo during pregnancy (giving a total of at least 180 IFAS tablets). These tablets are readily available in all health centers nationwide (DOH 2003, 2010). Despite the accessibility of IFAS, only 19% of Filipino pregnant women were reported to take the minimum number of 180 IFAS tablets (Fiedler *et al.* 2014). Several studies and reviews were conducted related to the factors of the low level of IFAS compliance among Filipino pregnant women; however, there are limited resources to suggest promotional strategies to increase IFAS consumption. This paper aimed to suggest promotional strategies for healthcare providers to improve their healthcare services related to IFAS.

Iron–Folic Acid Supplementation Use

The use of iron and folic acid supplements was first established in 1959 and 1967, respectively, after the WHO study group on IDA in Geneva, Switzerland met and discussed the etiology, evaluation, and prevention of iron deficiency (WHO 1959, 1968). Currently, pregnant women are recommended to take a standard daily dose of 30–60 mg of elemental iron and 400 µg (0.4 mg) of folic acid to prevent anemia in pregnancy, postpartum infection, low birth weight, and premature births (WHO 2016). IFAS is recommended to be taken as soon as pregnancy is identified and be continued throughout pregnancy (WHO 2012). Folic acid, a component of the IFAS, is ideally recommended before conception and as early as possible not later than the third month of pregnancy to prevent neural tube defect (WHO 2016), as supported by several studies (Blencowe *et al.* 2010; Bukowski *et al.* 2009; De Wals *et al.* 2007; Flores *et al.* 2018; Obican *et al.* 2010).

In 1977, elemental iron containing 60 mg with 2 mg of folic acid was recommended to be taken two times per day from the fourth month of pregnancy until the breastfeeding period (Paulino *et al.* 2005). This policy was revised through the issuance of Administrative Order (AO) No. 119 in 2003 prescribing women a daily intake of 60 mg elemental iron with 400 µg folic acid immediately after pregnancy is identified, or for at least 6-mo duration for the whole pregnancy, and until three months after birth (DOH 2003). This AO in 2003 was superseded by AO 2010-0010 in support of the achievement of the 2015 Millennium Development Goal targets in reducing under-5-yr-old children and maternal death and address other population groups’ micronutrient needs (DOH 2010). This policy was further reiterated in Republic Act 11148 or “Kalusugan at Nutrisiyon ng Mag-Nanay Act” (Health and Nutrition of the Mother and Child) that was recently signed into law in 2018 ensuring the prioritization of health and nutrition

of pregnant women by a supplementation program both in the national and local government units (LGUs) through allotment of appropriate resources in its implementation (COP 2018).

Several studies found many benefits of IFAS in preventing anemia in pregnancy. In studies done in Ireland (Barton *et al.* 1994) and Sri Lanka (Atukorala *et al.* 1994), taking IFAS during pregnancy increases maternal hemoglobin and hematocrit. Some meta-analysis studies also found that intake of IFAS reduces the risk of having anemia in pregnancy (Imdad and Bhutta 2012; Peña-Rosas *et al.* 2012, 2015). In the Philippines, a community-based longitudinal intervention study found that a weekly dose of IFAS increases the serum ferritin of women of reproductive age (WRA) (Angeles-Agdeppa *et al.* 2005). This was further supported by a cross-sectional study conducted in the Bicol Region wherein adherence to the consumption of iron supplements is associated with the increase of hemoglobin concentration among pregnant women (Lutsey *et al.* 2007).

Challenges to IFAS Compliance among Filipino Pregnant Women

IFAS is among the free-of-charge health services available for Filipino pregnant women for the prevention and treatment of anemia to decrease maternal and neonatal morbidity and mortality (DOH 2003, 2010). Despite the established IFAS program, anemia in pregnancy remains prevalent in the Philippines based on the recent national survey (FNRI-DOST 2015) and remains a significant public health concern (> 5% prevalence) (DOH 2010). Inadequate consumption of the prescribed supplements contributes to the prevalence of anemia in the country (Angeles-Agdeppa *et al.* 2005; Paulino *et al.* 2005), and a barrier to attaining the goals of IFAS in the Philippines (Smitasiri and Solon 2005). A recent analysis related to the distribution and consumption of IFAS through the Philippines' ANC program in 2008 among WRA showed that only 19% of pregnant women received and took the ideal minimum of 180 IFAS tablets (Fiedler *et al.* 2014). Several studies and review articles identified some barriers to this low level of IFAS compliance. Firstly, a review paper regarding the weekly IFAS project in the Philippines cited that inadequate IFAS consumption was due to 1) healthcare provider's late pregnant women reporting in the antenatal clinics, 2) pregnant women's side effects experience resulted to low iron supplement compliance, 3) healthcare provider's inability to motivate and provide appropriate counseling as a result of inadequate awareness of the severity of low IFAS compliance, and 4) irregular IFAS supplies due to economic and logistic constraints (Paulino *et al.* 2005). Secondly, similar to some of the previous findings, experiences of side-effects and the

unpleasant taste of the supplement were also found to contribute to the low iron tablet intake among Filipino pregnant women based on a cross-sectional study conducted in Bicol Region, Philippines (Lutsey *et al.* 2007). Thirdly, irregular supply, logistic issues, and low IFAS intake were also identified barriers based on the review paper related to the experiences and results of implementing preventive IFAS among WRA from the three western Pacific countries including the Philippines (Smitasiri and Solon 2005). Lastly, a recent analysis of the low level of IFAS compliance was found to be related to late first ANC visit and less frequent ANC visits, not receiving or purchasing IFAS supplements, non-consumption of any IFAS tablet that is possibly due to limited understanding of the impacts of anemia and significance of the supplements, and non-consumption of the minimum required intake of 180 IFAS tablets, which was possibly due to late ANC visits (Fiedler *et al.* 2014).

Micronutrient supplementation such as IFAS is one of the public health interventions designed not only to improve maternal and fetal health but also to control and prevent nutritional deficiencies among Filipinos (DOH 2003, 2010). However, attaining this goal may be hampered because of complex identified barriers. Aside from irregular supplies due to financial and logistics constraints (Fiedler *et al.* 2014; Paulino *et al.* 2005; Smitasiri and Solon 2005) plus healthcare providers' and pregnant women's behaviors and practices contributed to the complex problems based on the conducted studies and reviews in the country. Healthcare providers' late reporting of pregnant women to the ANC clinics (Paulino *et al.* 2005) and the inadequate strategies in motivating and providing appropriate counseling on IFAS (Fiedler *et al.* 2014; Paulino *et al.* 2005) contributed to low IFAS compliance. Experiences on side-effects and the unpleasant taste of the supplement, late timing of ANC visits, less frequent ANC visits (< 4 ANC visits), not receiving or purchasing IFAS tablets, and having a limited understanding of the impacts of anemia and significance of IFAS were also identified factors among pregnant women to the low IFAS compliance (Fiedler *et al.* 2014; Lutsey *et al.* 2007; Paulino *et al.* 2005). Although supply and logistics constraints affect the provision of timely and sufficient IFAS services, these factors are less likely in the control of direct healthcare providers of the supplements. Therefore, this paper only focuses on promotional strategies that healthcare providers can implement and integrate into their healthcare services to improve the IFAS compliance of Filipino pregnant women.

Promotion Strategies to Increase IFAS Compliance

The low level of compliance with IFAS among Filipino pregnant women is related to complex interrelated barriers.

Health behaviors among pregnant women towards ANC visits and uptake to the supplement mainly affect the low level of compliance. However, healthcare providers also play a role in the health behaviors and experiences of pregnant women (Fiedler *et al.* 2014; Paulino *et al.* 2005). Given these factors, addressing the healthcare providers' practices to increase IFAS consumption is one of the recommendations based on a recent analysis of the low level of IFAS compliance among Filipino pregnant women (Fiedler *et al.* 2014). Improving the antenatal healthcare services related to IFAS will help Filipino pregnant women adhere to the supplementation.

Supporting the implementation of existing health and nutrition promotion programs. The country has been implementing some evidence-based strategies on the promotion of health and nutrition. First, the Early Child Care and Development for the First 1000 Days of Life (ECCD-F1K) program that covers the pregnancy period and the first two years of the child's life, a period also described as the "golden window of opportunity," is being implemented as a holistic approach in providing health, nutrition, education, and social welfare services (PNNC 2018). Providing IFAS and other significant health interventions are strategies being implemented in the ECCD-F1K program in the hope of achieving 6% anemia prevalence among WRA in 2022 as targeted in the Philippine Plan of Action for Nutrition 2017–2022 (PNNC 2017). These ECCD-F1K efforts are geared towards the increase of IFAS compliance because it ensures the provision of IFAS, promotes health and nutrition through education, and also provides social support to pregnant women through the provision of social welfare services. Second, the "Pabasa sa Nutrisyon" (reading activities related to nutrition) program offered by the Nutrition Center of the Philippines (NCP) is a 10-wk course learning activity conducted in coordination with health and nutrition workers such as rural health midwives, barangay nutrition scholars, barangay health workers, and non-government volunteers that aims to educate caregivers of the family on proper nutrition practices and healthy lifestyle to reduce malnutrition (PNFC 2020). Through this strategy, the main caregiver of the family is capacitated to promote health and nutrition behaviors and practices, which can encourage every family member to access available nutrition services in the health facility such as IFAS. In 2014, various organizations and LGUs were recognized and awarded by the Philippine Association of Nutrition for actively implementing the "Pabasa sa Nutrisyon." The recipient of these awards and recognition were the following provinces and cities for being active implementers of the "Pabasa sa Nutrisyon" program in the country: Negros Occidental (Municipality of Binalbagan), Bohol (Municipalities of Jagna, Balilihan, Carmen, Duero, Alicia, Batuan, Lila, Mabini, Pilar, Sierra

Bullones, and Trinidad), Laguna (Municipalities of Kalayaan, Pakil, Los Baños, Pangil, Pila, and Sta. Cruz), City of Taguig, Oriental Mindoro (City of Calapan), Cavite (City of Tagaytay), Bukidnon (City of Valencia), and La Union (Municipalities of Bacnotan and Naguilian) (NCP n/d). Third, the Behavioral Change Intervention (BCI) toolkit primarily designed by the Nutrition International (NI) is an effective strategy intended to motivate, inspire, and enable people to make behavior changes for personal health benefit and overall well-being of their families or the people they serve (NI 2019b). In this strategy, some of the effective behavior change intervention approaches were sending cellphone reminders to pregnant women about their ANC visits and reassurance of their baby's development, and to teachers to motivate adolescent girls at school to use IFAS and give information regarding adolescent girls' risk of anemia and benefits of the supplements on their school performance (NI 2019a). In providing multiple micronutrient supplementation such as IFAS, health facilities, and community health workers will be partners in providing the supplies to pregnant women (NI 2018). In the Philippines, BCI is yet to be implemented. Fortunately, as NI concentrates their efforts on countries with high burdens of undernutrition, the Philippines is one of the beneficiaries of the BCI program based on the NI's Nutrition International Strategic Plan 2018–2024 since the country is among the "10-high burden core countries" (Bangladesh, India, Indonesia, Pakistan, Philippines, Ethiopia, Kenya, Nigeria, Senegal, Tanzania) (NI 2018). The use of digital technologies such as mobile phones was regarded as a solution for improving access to health information and services in low- and middle-income countries including the Philippines (Anstey Watkins *et al.* 2018); thus, the BCI program will contribute to the improvement of IFAS compliance among pregnant women, including other WRA because they are always well-informed through the efforts of healthcare providers and significant others in ensuring their supplementation intake and ANC visits submission.

The ECCD-F1K, "Pabasa sa Nutrisyon" program, and BCCI have a common goal – improving the health and nutrition and prevention of malnutrition among pregnant women and other population groups through several strategies in providing healthcare and micronutrient supplementation services. These public health interventions are beneficial to all population groups especially among Filipino pregnant women for better maternal and neonatal outcomes. Therefore, scaling up the implementation of these efforts in health facilities and communities is needed at the local level.

Improving health education and counseling. Studies pointed out that low IFAS consumption among Filipino pregnant women was related to the experience of

side effects, dislike of the taste of the supplement, limited understanding of the implication of anemia and significance of IFAS, late and less frequent ANC visits, and other socio-cultural factors (Fiedler *et al.* 2014; Lutsey *et al.* 2007). These experiences and behaviors of pregnant mothers were possibly due to limited knowledge and skills of healthcare providers in motivating and providing appropriate counseling on IFAS, and late reporting of pregnant women to the ANC facility (Fiedler *et al.* 2014; Paulino *et al.* 2005). These pregnant women's health behaviors appear to be affected by the inadequate healthcare services of healthcare providers. For instance, the clinical competence of a nurse in providing care was believed as an element that would result in positive experiences of a patient (Kieft *et al.* 2014). However, it is not solely because of the healthcare provider's ineffectiveness in providing healthcare but also on the individual level of education among pregnant women. Better education of pregnant women plays a significant role in their better health information access to health information that increases the concern for their health and that of their future babies (Niang *et al.* 2017). Nevertheless, healthcare providers' capability in providing quality care is vital. Their skills and capacity can be achieved by conducting a healthcare provider's refresher training to build their ability in providing antenatal healthcare (Lama *et al.* 2020) such as providing health education and conducting counseling. In addition to capacitating the healthcare providers, the training program can also be a way to reiterate the importance of conduciveness in the ANC facility. It is suggested that health facilities avoid discouraging conditions for the clients to feel comfortable in accessing IFAS health services (Assefa *et al.* 2019). A discouraging condition in the health facility might be the long waiting time in getting the supplement that may hinder the pregnant women's consumption of IFAS tablets (Assefa *et al.* 2019). In addition to the long waiting time, the way healthcare providers approach pregnant women during the provision of IFAS might also be a factor in taking the supplements. Improving the health provider's approaches (*e.g.* being approachable, being friendly) can make pregnant women feel comfortable and encourage them to get IFAS tablets regularly.

In conducting health education and counseling, specific issues that should be tackled include the promotion of proper nutrition and prevention of anemia in pregnancy, benefits and the importance of IFAS use, benefits of early and more frequent ANC visits, and how to manage the side effects of the supplements (Assefa *et al.* 2019; Desta *et al.* 2019; Gebremariam *et al.* 2019; Getachew *et al.* 2018; Lacerte *et al.* 2011). Before prescribing IFAS, counseling on its side effect first is recommended (Kassa *et al.* 2019). Doctors and midwives are encouraged to emphasize that some minor side-effects, such as nausea

and vomiting, from taking the IFAS may possibly due to the pregnancy itself rather than the supplements and that these side-effects are mostly mild and can subside after some time (Lutsey *et al.* 2007). Community-based health education and counseling are also important for a full understanding of the significance of IFAS and a venue for clarification of some confusing issues (Birhanu *et al.* 2018; Boti *et al.* 2018). Education and counseling strengthen awareness and increase knowledge regarding IFAS (Assefa *et al.* 2019; Boti *et al.* 2018). In implementing health education, the use of standardized teaching materials across healthcare providers is needed to ensure that uniform information is disseminated (Simuyemba *et al.* 2020). Improving the knowledge of women is found to be very crucial in increasing compliance (Desta *et al.* 2019; Sendeku *et al.* 2020).

Following-up and monitoring IFAS uptake. Among Filipino pregnant women who took IFAS, 81% did not consume the ideal minimum of 180 IFA tablets – which is possibly due to late ANC visit, the difficulty of remembering of taking it, and inadequate monitoring of healthcare providers (Fiedler *et al.* 2014). Late ANC visits may result in late access to IFAs supply, worsened by forgetfulness of taking the supplements and inadequate reminder strategies of healthcare providers. These factors all contribute to the low level of compliance with the recommended IFAS uptake. To improve compliance, habit formation is one of the important strategies that should be considered in reminding and ensuring the uptake of IFAS tablets – which include the involvement of family members, and use of mobile phones for text reminders, or calendars (Harding *et al.* 2016). It is also helpful if healthcare providers will monitor the IFAS pill count during a home visit (Kassa *et al.* 2019) to ensure sufficient supply. Another technique to reinforce instruction and reminders is by providing easy-to-understand take-home materials for pregnant women (Martin *et al.* 2016). One of the take-home materials given to pregnant women in the country is the home-based mother's record (HBMR) that has been used as a record and teaching tool for pregnant mothers (Shah *et al.* 1993). Through the HBMR, the healthcare provider can check updates and monitor the given pills, and use it as a tool to explain the recommended schedule of ANC visits in the health facility. It should also be explained that the HBMR given to them is not only as a record but also an educational material where they can learn more about their pregnancy and antenatal services they need such as the significance of ANC and IFAS for their health and of their unborn child. HBMR is printed information intended to promote health, prevent pregnancy health risks, and serve as educational material on proper nutrition by reminding about appropriate pregnancy nutritional diet and intake of local doses of IFAS tablets, among others (WHO 1994).

Timely and more frequent ANC visits. ANC is an important platform for health promotion, screening, and diagnosis of health conditions, prevention of disease, and an opportunity for healthcare providers to communicate and support women, families, and communities during a critical time of a woman's pregnancy (WHO 2016). In the Philippines, only 56% of Filipino pregnant women had their first ANC visit during the first trimester (which is the highly recommended period to take IFAS); 44% had their first ANC visit during the 2nd and 3rd trimester of pregnancy, among which 19% had less than the WHO recommended four ANC visits, which contributed to inadequate time to consume 180 IFAS tablets (Fiedler *et al.* 2014). Late and less frequent ANC visits were identified as possible factors of low IFAS consumption; conversely, the first ANC visit during the first trimester of pregnancy and more frequent ANC visits result in greater consumption (Fiedler *et al.* 2014; Lutsey *et al.* 2007). This shows the importance of promoting earlier and more frequent antenatal visits in increasing IFAS compliance, as supported by other studies (Desta *et al.* 2019; Gebremariam *et al.* 2019; Getachew *et al.* 2018; Lacerte *et al.* 2011).

Marital status was found to affect ANC visits. Married Filipino women tend to have earlier ANC visits while having more children was associated with less frequent visits (Lutsey *et al.* 2007). In the same study, a single mother was found to be associated with delay of first ANC visit because of the possible feeling of embarrassment, while married women possibly find ANC visits as difficult and expensive because of multiple children, or the "been there, been that" attitude. Given these situations, healthcare providers need to be sensitive enough toward the situation of single mothers and women with more than two children. Most importantly, there is a need to address late and less frequent ANC visits. In a community-based intervention study conducted in China, it was found that involvement of trained community key persons such as clan leaders in providing ANC health education to pregnant mothers showed a 50% increase in ANC use and over 50% increase of first ANC visit during the first trimester of pregnancy among pregnant mothers (Ma *et al.* 2018). This shows that partnership with community key leaders in providing ANC to pregnant mothers is an effective way to improve antenatal healthcare behavior of pregnant women. Filipino pregnant women with high school education substantially had fewer children; thus, education is an indirect factor for a greater frequency of ANC visits (Lutsey *et al.* 2007). To foster the completion of four or more ANC visits, pregnant women with low educational levels, high birth order, and low socioeconomic status should be given special attention (Muchie 2017). Family support and the presence of men during prenatal follow-up visits were also found to increase antenatal visits, which contribute to

IFAS compliance (Desta *et al.* 2019). Positive experiences of women during ANC and childbirth can create the foundations for healthy motherhood (WHO 2016).

CONCLUSION

This paper presents several barriers to IFAS compliance, which were related to the behaviors and practices of both the healthcare providers and pregnant mothers. Healthcare providers' late reporting of pregnant women to the health facility and limitation in motivating and providing appropriate counseling regarding IFAS impacts the negative health behavior of pregnant women towards ANC and IFAS consumption. Hence, healthcare providers need to improve and revisit their healthcare programs and strategies being provided to pregnant women to improve compliance with IFAS intake. Health promotion strategies such as supporting the implementation of existing health and nutrition programs, improving health education and counseling strategies, following-up and monitoring IFAS consumption, and promoting adherence to ANC visits are needed to ensure that well-informed and empowered pregnant women adhere to the IFAS program. Adherence to the supplement will increase IFAS compliance, which in turn contributes to the decrease of anemia prevalence in pregnant women. A decline in the prevalence of anemia in pregnancy will pave the way for improving maternal and birth outcomes in the country.

ACKNOWLEDGEMENT

The authors would like to acknowledge Dr. Kuei-Min Chen for her valuable suggestions in this paper.

REFERENCES

- ABU-OUF NM, JAN MM. 2015. The impact of maternal iron deficiency and iron deficiency anemia on child's health. *Saudi Med J* 36(2): 146–149. DOI:10.15537/smj.2015.2.10289
- ALLEN LH. 2000. Anemia and iron deficiency: effects on pregnancy outcome. *Am J Clin Nutr* 71(5 Suppl): 1280s–1284s. DOI:10.1093/ajcn/71.5.1280s
- ANGELES-AGDEPPA I, PAULINO L S, RAMOS AC, ETORMA UM, CAVALLI-SFORZA T, MILANI S. 2005. Government-industry partnership in weekly iron-folic acid supplementation for women of reproductive age in the Philippines: impact on iron status. *Nutr Rev* 63(12 Pt 2): S116–125. DOI:10.1301/

- nr.2005.dec.s116-s125
- ANSTEY WATKINS JOT, GOUDGE J, GÓMEZ-OLIVÉ FX, GRIFFITHS F. 2018. Mobile phone use among patients and health workers to enhance primary healthcare: A qualitative study in rural South Africa. *Soc Sci Med* 198: 139–147. DOI:10.1016/j.socscimed.2018.01.011
- ASSEFA H, ABEBE SM, SISAY M. 2019. Magnitude and factors associated with adherence to Iron and folic acid supplementation among pregnant women in Aykel town, Northwest Ethiopia. *BMC Pregnancy Childbirth* 19(1): 296. DOI:10.1186/s12884-019-2422-4
- ATUKORALA TM, DE SILVA LD, DECHERING WH, DASSENAEIKE TS, PERERA RS. 1994. Evaluation of effectiveness of iron-folate supplementation and anthelmintic therapy against anemia in pregnancy – a study in the plantation sector of Sri Lanka. *Am J Clin Nutr*, 60(2): 286–292. DOI:10.1093/ajcn/60.2.286
- BADFAR G, SHOHANI M, SOLEYMANIA, AZAMI M. 2019. Maternal anemia during pregnancy and small for gestational age: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med* 32(10): 1728–1734. DOI:10.1080/14767058.2017.1411477
- BALTUSSEN R, KNAI C, SHARAN M. 2004. Iron fortification and iron supplementation are cost-effective interventions to reduce iron deficiency in four subregions of the world. *J Nutr* 134(10): 2678–2684. DOI:10.1093/jn/134.10.2678
- BARTON DP, JOY M T, LAPPIN TR, AFRASIABI M, MOREL JG, O'RIORDAN J, MURPHY JF, O'HERLIHY C. 1994. Maternal erythropoietin in singleton pregnancies: a randomized trial on the effect of oral hematinic supplementation. *Am J Obstet Gynecol* 170(3): 896–901. DOI:10.1016/s0002-9378(94)70305-1
- BIRHANU Z, CHAPLEAU GM, ORTOLANO SE, MAMO G, MARTIN SL, DICKIN KL. 2018. Ethiopian women's perspectives on antenatal care and iron-folic acid supplementation: insights for translating global antenatal calcium guidelines into practice. *Matern Child Nutr* 14 Suppl 1(Suppl 1). DOI:10.1111/mcn.12424
- BLENCOWE H, COUSENS S, MODELL B, LAWN J. 2010. Folic acid to reduce neonatal mortality from neural tube disorders. *Int J Epidemiol* 39(Suppl 1): i110–121. DOI:10.1093/ije/dyq028
- BOTI N, BEKELE T, GODANA W, GETAHUN E, GEBREMESKEL F, TSEGAYE B, OUMER B. 2018. Adherence to Iron-Folate Supplementation and Associated Factors among Pastoralist's Pregnant Women in Burji Districts, Segen Area People's Zone, Southern Ethiopia: Community-based Cross-sectional Study. *Int J Reprod Med* 2018: 2365362. DOI:10.1155/2018/2365362
- BRABIN BJ, HAKIMI M, PELLETIER D. 2001. An analysis of anemia and pregnancy-related maternal mortality. *J Nutr* 131(2s–2): 604S–614S; discussion 614S–615S. DOI:10.1093/jn/131.2.604S
- BREYMANN C. 2015. Iron Deficiency Anemia in Pregnancy. *Semin Hematol* 52(4): 339–347. DOI:10.1053/j.seminhematol.2015.07.003
- BUKOWSKI R, MALONE FD, PORTER FT, NYBERG DA, COMSTOCK CH, HANKINS GD, EDDLEMAN K, GROSS SJ, DUGOFF L, CRAIGO SD, TIMOR-TRITSCH IE, CARR SR, WOLFE HM, D'ALTON ME. 2009. Preconceptional folate supplementation and the risk of spontaneous preterm birth: a cohort study. *PLoS Med* 6(5): e1000061. DOI:10.1371/journal.pmed.1000061
- [COP] Congress of the Philippines. 2018. Republic Act No. 11148: an act scaling up the national and local health and nutrition programs through a strengthened integrated strategy for maternal, neonatal, child health and nutrition in the first one thousand (1000) days of life, appropriating funds therefor and other purposes. *Official Gazette, Metro Manila, Philippines*. Retrieved on 06 Nov 2020 from <https://www.officialgazette.gov.ph/2018/11/29/republic-act-no-11148/>
- DE WALS P, TAIROU F, VAN ALLEN MI, UH SH, LOWRY RB, SIBBALD B, EVANS JA, VAN DEN HOF MC, ZIMMER P, CROWLEY M, FERNANDEZ B, LEE NS, NIYONSENGA T. 2007. Reduction in neural-tube defects after folic acid fortification in Canada. *N Engl J Med* 357(2): 135–142. DOI:10.1056/NEJMoa067103
- [DOH] Philippine Department of Health Philippines. 2003. Administrative Order 119 s. 2003: Updated Guidelines on Micronutrient Supplementation (Vitamin A, Iron, and Iodine). Department of Health, Manila, Philippines. Retrieved on 06 Nov 2020 from [https://www2.fda.gov.ph/attachments/article/156562/AO119%20Update%20Guidelines%20on%20Micronutrient%20Supplementation%20\(Vitamin%20A,%20Iron,%20and%20Iodine%7D.pdf](https://www2.fda.gov.ph/attachments/article/156562/AO119%20Update%20Guidelines%20on%20Micronutrient%20Supplementation%20(Vitamin%20A,%20Iron,%20and%20Iodine%7D.pdf)
- [DOH] Philippine Department of Health Philippines. 2010. Administrative Order 2010-0010: Revised Policy on Micronutrient Supplementation to Support Achievement of 2015 MDG Targets to Reduce Under-five and Maternal Deaths and Address Micronutrient needs of Other Population Groups. Department of Health, Manila, Philippines. Retrieved on 06 Nov 2020 from

- <https://www.doh.gov.ph/micronutrient-program>
- DESTA M, KASSIE B, CHANIE H, MULUGETA H, YIRGA T, TEMESGEN H, LESHARGIE CT, MERKEB Y. 2019. Adherence of iron and folic acid supplementation and determinants among pregnant women in Ethiopia: a systematic review and meta-analysis. *Reprod Health* 16(1): 182. DOI:10.1186/s12978-019-0848-9
- FIEDLER J, D'AGOSTINO A, SUNUNTNASUK C. 2014. Nutrition Technical Brief: A Rapid Initial Assessment of the Distribution and Consumption of Iron–Folic Acid Tablets through Antenatal Care in the Philippines. Retrieved on 06 Nov 2020 from <https://www.spring-nutrition.org/publications/briefs/iron-folic-acid-assessment-philippines>
- FLORES AL, CORDERO AM, DUNN M, SNIEZEK JE, ARCE MA, CRIDER KS, TINKER S, PELLEGRINI C, CARREÓN R, ESTRADA J, STRUWE S, BOYLE C. 2018. Adding folic acid to corn Masa flour: partnering to improve pregnancy outcomes and reduce health disparities. *Prev Med* 106: 26–30. DOI:10.1016/j.ypmed.2017.11.003
- [FNRI-DOST] Food and Nutrition Research Institute–Department of Science and Technology. 2015. Philippine Nutrition Facts and Figures 2013: Biochemical Survey. Metro Manila, Philippines. Retrieved on 06 Nov 2020 from http://enutrition.fnri.dost.gov.ph/site/uploads/2013_FaF_Biochemical_Survey.pdf
- GAUTAM CS, SAHA L, SEKHRI K, SAHA PK. 2008. Iron deficiency in pregnancy and the rationality of iron supplements prescribed during pregnancy. *Medscape J Med* 10(12): 283.
- GEBREMARIAM AD, TIRUNEH SA, ABATE BA, ENGIDAW MT, ASNAKEW DT. 2019. Adherence to iron with folic acid supplementation and its associated factors among pregnant women attending antenatal care follow up at Debre Tabor General Hospital, Ethiopia, 2017. *PLoS One* 14(1): e0210086. DOI:10.1371/journal.pone.0210086
- GETACHEW M, ABAY M, ZELALEM H, GEBREMEDHIN T, GRUM T, BAYRAY A. 2018. Magnitude and factors associated with adherence to iron–folic acid supplementation among pregnant women in Eritrean refugee camps, northern Ethiopia. *BMC Pregnancy Childbirth* 18(1): 83. DOI:10.1186/s12884-018-1716-2
- HARDING KL, MATIAS SL, MRIDHA MK, MONIRUZZAMAN M, VOSTI SA, HUSSAIN S, DEWEY KG, STEWART CP. 2016. Adherence to recommendations on lipid-based nutrient supplement and iron and folic acid tablet consumption among pregnant and lactating women participating in a community health programme in northwest Bangladesh. *Matern Child Nutrition* 13(1). DOI:10.1111/mcn.12252
- IMDAD A, BHUTTA ZA. 2012. Routine iron/folate supplementation during pregnancy: effect on maternal anaemia and birth outcomes. *Paediatr Perinat Epidemiol* 26 Suppl 1: 168–177. DOI:10.1111/j.1365-3016.2012.01312.x
- JUUL SE, DERMAN RJ, AUERBACH M. 2019. Perinatal Iron Deficiency: Implications for Mothers and Infants. *Neonatology* 115(3): 269–274. DOI:10.1159/000495978
- KASSA ZY, AWRARIS T, DABA AK, TENAW Z. 2019. Compliance with iron folic acid and associated factors among pregnant women through pill count in Hawassa city, South Ethiopia: a community based cross-sectional study. *Reprod Health* 16(1): 14. DOI:10.1186/s12978-019-0679-8
- KIEFT RA, DE BROUWER BB, FRANCKE AL, DELNOIJ DM. 2014. How nurses and their work environment affect patient experiences of the quality of care: a qualitative study. *BMC Health Serv Res* 14: 249. DOI:10.1186/1472-6963-14-249
- LACERTE P, PRADIPASEN M, TEMCHAROEN P, IMAMEE N, VORAPONGSATHORN T. 2011. Determinants of adherence to iron/folate supplementation during pregnancy in two provinces in Cambodia. *Asia Pac J Public Health* 23(3): 315–323. DOI:10.1177/1010539511403133
- LAMA TP, MUNOS MK, KATZ J, KHATRY SK, LECLERQ SC, MULLANY LC. 2020. Assessment of facility and health worker readiness to provide quality antenatal, intrapartum and postpartum care in rural Southern Nepal. *BMC Health Serv Res* 20(1): 16. DOI:10.1186/s12913-019-4871-x
- LEE KA, ZAFFKE ME, BARATTE-BEEBE K. 2001. Restless legs syndrome and sleep disturbance during pregnancy: the role of folate and iron. *J Womens Health Gend Based Med* 10(4): 335–341. DOI:10.1089/152460901750269652
- LUTSEY PL, DAWE D, VILLATE E, VALENCIA S, LOPEZ O. 2007. Iron supplementation compliance among pregnant women in Bicol, Philippines. *Public Health Nutrition* 11(1): 76–82. DOI:10.1017/s1368980007000237
- MA W, LIU B, NAN L, PORTELA A, YIN B, WEI C, ROLLINS N, WANG S, EMU A, ZHOU H. 2018. Clan-involved approaches to increasing antenatal care use in a rural minority area of China: implementation

- research. *Acta Paediatr* 107(Suppl 471): 7–16. DOI:10.1111/apa.14357
- MARTIN SL, SEIM GL, WAWIRE S, CHAPLEAU GM, YOUNG SL, DICKIN KL. 2016. Translating formative research findings into a behaviour change strategy to promote antenatal calcium and iron and folic acid supplementation in western Kenya. *Matern & Child Nutrition* 13(1). DOI:10.1111/mcn.12233
- MUCHIE KF. 2017. Quality of antenatal care services and completion of four or more antenatal care visits in Ethiopia: a finding based on a demographic and health survey. *BMC Pregnancy Childbirth* 17(1): 300. DOI:10.1186/s12884-017-1488-0
- NIANG K, FAYE A, TINE JAD, DIONGUE FB, NDIAYE B, NDIAYE MB, NDIAYE P, TAL-DIA A. 2017. Determinants of Iron Consumption among Pregnant Women in Southern Senegal. *Open Journal of Obstetrics and Gynecology* 7: 41–50. DOI:10.4236/ojog.2017.71005
- [NCP] Nutrition Center of the Philippines. n/d. Pabasa sa Nutrisyon: Pabasa Awardees. Retrieved on 06 Nov 2020 from <http://www.ncp.org.ph/nutrition-education-pabasa.html>
- [NI] Nutrition International. 2018. Nutrition International: Strategy 2018–2024. Retrieved on 06 Nov 2020 from <https://www.nutritionintl.org/strategy/pdf/NI-strategic-plan-2018-2024.pdf>
- [NI] Nutrition International. 2019a. Behavior Change International Toolkit. Retrieved on 06 Nov 2020 from https://www.nutritionintl.org/content/user_files/2019/02/BCI_Tool-kit_Digital_NI_2019.pdf
- [NI] Nutrition International. 2019b (February). Behaviour Change Intervention Toolkit. Retrieved on 06 Nov 2020 from <https://www.nutritionintl.org/resources/behaviour-change-intervention-toolkit/>
- OBICAN SG, FINNELL RH, MILLS JL, SHAW GM, SCIALLI AR. 2010. Folic acid in early pregnancy: a public health success story. *Faseb J* 24(11): 4167–4174. DOI:10.1096/fj.10-165084
- PAULINO LS, ANGELES-AGDEPPA I, ETORMA UM, RAMOS AC, CAVALLI-SFORZA T. 2005. Weekly iron-folic acid supplementation to improve iron status and prevent pregnancy anemia in Filipino women of reproductive age: the Philippine experience through government and private partnership. *Nutr Rev* 63(12 Pt 2): S109–115. DOI:10.1301/nr.2005.dec.s109-s115
- PEÑA-ROSAS JP, DE-REGIL LM, DOWSWELL T, VITERI FE. 2012. Daily oral iron supplementation during pregnancy. *Cochrane Database Syst Rev* 12: Cd004736. DOI:10.1002/14651858.CD004736.pub4
- PEÑA-ROSAS JP, DE-REGIL LM, GARCIA-CASAL MN, DOWSWELL T. 2015. Daily oral iron supplementation during pregnancy. *Cochrane Database Syst Rev*(7): Cd004736. DOI:10.1002/14651858.CD004736.pub5
- [PNNC] Philippine National Nutrition Council. 2017. Philippine Plan of Action for Nutrition 2017–2022: a call to urgent action for Filipinos and its leadership: Executive Summary. Retrieved on 06 Nov 2020 from https://www.nutritionintl.org/content/user_files/2017/10/final_PPAN2017_2022Executive-Summary-3.pdf
- [PNNC] Philippine National Nutrition Council. 2018 (26 June). Thousands of Families benefit from ECCD FIK Program in Camarines Sur. Retrieved on 06 Nov 2020 from <https://nnc.gov.ph/index.php/regional-offices/luzon/region-v-bicol-region/2535-thousands-of-families-benefit-from-eccd-fik-program-in-camarines-sur.html>
- [PNFC] Philippine Nutri-Foods Corporation. 2020 (26 May). Pabasa sa Nutrisyon Program. Retrieved on 06 Nov 2020 from <https://nutrifoods.com.ph/programs/pabasa-sa-nutrisyon-program/>
- RAHMATI S, AZAMI M, BADFAR G, PARIZAD N, SAYEHMIRI K. 2020. The relationship between maternal anemia during pregnancy with preterm birth: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med* 33(15): 2679–2689. DOI:10.1080/14767058.2018.1555811
- RAHMATI S, DELPISHE A, AZAMI M, HAFEZI AHMADI MR, SAYEHMIRI K. 2017. Maternal Anemia during pregnancy and infant low birth weight: a systematic review and Meta-analysis. *Int J Reprod Biomed* 15(3): 125–134.
- REN A, WANG J, YE RW, LI S, LIU JM, LI Z. 2007. Low first-trimester hemoglobin and low birth weight, preterm birth and small for gestational age newborns. *Int J Gynaecol Obstet* 98(2): 124–128. DOI:10.1016/j.ijgo.2007.05.011
- SCHOLL TO. 2005. Iron status during pregnancy: setting the stage for mother and infant. *Am J Clin Nutr* 81(5): 1218s–1222s. DOI:10.1093/ajcn/81.5.1218
- SENDEKU FW, AZEZE GG, FENTA SL. 2020. Adherence to iron-folic acid supplementation among pregnant women in Ethiopia: a systematic review and meta-analysis. *BMC Pregnancy Childbirth* 20(1): 138. DOI:10.1186/s12884-020-2835-0
- SHAH PM, SELWYN BJ, SHAH K, KUMAR V. 1993. Evaluation of the home-based maternal record: a WHO

- collaborative study. *Bull World Health Organ* 71(5): 535–548.
- SIMUYEMBA MC, BWEMBYA PA, CHOLA M, MICHELO C. 2020. A root cause analysis of sub-optimal uptake and compliance to iron and folic acid supplementation in pregnancy in 7 districts of Zambia. *BMC Pregnancy Childbirth* 20(1): 20. DOI:10.1186/s12884-019-2700-1
- SMITASIRI S, SOLON FS. 2005. Implementing preventive iron-folic acid supplementation among women of reproductive age in some Western Pacific countries: possibilities and challenges. *Nutr Rev* 63(12 Pt 2): S81–86. DOI:10.1301/nr.2005.dec.s81-s86
- TIMOTEO VJA, DALMACIO LMM, NACIS JS, MARCOS JM, AGARRADO REL, CAPANZANA MV. 2019. Determining Significant Predictors of Blood Iron Concentration and Status in Pregnant Filipino Women Using Linear Models. *Philippine Journal of Science* 148(1): 167–177.
- [WHO] World Health Organization. 1959. Iron deficiency anaemia: report of a study group [meeting held in Geneva from 29 to 04 Oct 1958]. Geneva. Retrieved on 06 Nov 2020 from <https://apps.who.int/iris/handle/10665/40447>
- [WHO] World Health Organization. 1968. Nutritional anaemias: report of a WHO scientific group [meeting held in Geneva from 13–17 March 1967]. Geneva. Retrieved on 06 Nov 2020 from <https://apps.who.int/iris/handle/10665/40707>
- [WHO] World Health Organization. 1994. Home-based maternal records: guidelines for development, adaptation and evaluation. Geneva. Retrieved on 06 Nov 2020 from https://apps.who.int/iris/bitstream/handle/10665/39355/9241544643_eng.pdf?sequence=1
- [WHO] World Health Organization. 2012. Guideline: Daily iron and folic acid supplementation in pregnant women. Geneva. Retrieved on 06 Nov 2020 from https://apps.who.int/iris/bitstream/handle/10665/77770/9789241501996_eng.pdf?sequence=1
- [WHO] World Health Organization. 2015. The global prevalence of anaemia in 2011. Geneva. Retrieved on 06 Nov 2020 from https://www.who.int/nutrition/publications/micronutrients/global_prevalence_anaemia_2011/en/
- [WHO] World Health Organization. 2016. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva. Retrieved on 06 Nov 2020 from https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/anc-positive-pregnancy-experience/en/
- [WHO] World Health Organization. 2020. Anaemia. Retrieved on 06 Nov 2020 from https://www.who.int/health-topics/anaemia#tab=tab_1