Original Article

Interpersonal communication campaign promoting knowledge, attitude, intention, and consumption of iron folic acid tablets and iron rich foods among pregnant Indonesian women

Emily Gamboa MPH[1], Eliza Broadbent BSc[1], Noyra Quintana BSc[1], Sarah Callaway BSc[1], Paola Donoso MD[1], Mary Linehan MPH[2], Lindawati Wibowo[3], Otte Santika[3], Josh H West PhD[1], P. Cougar Hall PhD[1], Benjamin T Crookston PhD[1]

[1]*Department of Public Health, Brigham Young University, Provo, USA*
[2]*IMA World Health, Washington, D.C., USA*
[3]*Team for Accelerated Stunting Prevention (TP2AK), Jakarta, Indonesia*

Background and Objectives: Indonesia's community health delivery system offers services such as prenatal care and supplementation. Despite accessibility to these services, compliance with supplementation is low, and childhood stunting rates remain high. To address undernutrition, a National Nutrition Communication Campaign (NNCC) – using interpersonal communication (IPC) strategies – was implemented to promote consumption of iron-folic acid (IFA) supplements and iron-rich foods (ATIKA). The purpose of this study was to understand how participation in IPC activities influenced knowledge, attitude/intention, and consumption of IFA supplements and ATIKA among pregnant Indonesian women. **Methods and Study Design:** Cross-sectional data came from 766 pregnant women that participated in a survey that was based on the constructs from the Theory of Planned Behavior and Health Belief Model. Adjusted linear and logistic regression models were conducted to analyze the differences between self-reported IPC participants and non-IPC participants. Approximately 20% of women were exposed to the IFA portion of the IPC campaign, and 18% were exposed to the ATIKA portion. **Results:** Women that were exposed to the campaign reported significantly higher knowledge of IFA tablets and ATIKA, and improved attitudes/intentions towards IFA, compared to non-exposed women. Exposure was not associated with actual consumption behaviors. **Conclusions:** These findings suggest that exposure to a low-intensity intervention can increase knowledge but may not be sufficient to impact behavior. As such, future efforts to reduce stunting through improved maternal nutrition should seek to increase exposure, address barriers, understand perceived susceptibility, and improve self-efficacy in order to expand intervention reach in Indonesia.

Key Words: stunting, maternal, iron, IFA, Indonesia

INTRODUCTION

Stunted growth, or stunting, is characterized by impaired childhood growth and defined as child length more than two standard deviations below the recommended length-for-age.[1,2] Stunting is the outcome of inadequate nutrition during the first 1000 days of life, from conception until approximately age 2.[3] Suboptimal maternal nutrition during pregnancy prevents proper fetal growth, including brain development.[3] Malnourished mothers tend to deliver babies with low birth weight and limited fetal linear growth.[4-6] Women who were stunted as children tend to also have low birth weight babies, thus forming an intergenerational cycle of stunting.[4]

Rates of childhood stunting vary by region, country and even within countries. Despite marked improvements in reducing global stunting, rates are highest in East Africa and South Asia.[1] Southeast Asia has seen dramatic economic advances in the last two decades, yet child undernutrition and stunting remain serious public health problems. Stunting affects 37% of children in Indonesia, with the greatest prevalence found in rural areas.[7] Stunting in Indonesia is associated with a combination of complex factors, including inadequate maternal nutrition, hygiene habits, low maternal and paternal education, and childcare practices characterized by poor dietary diversity and suboptimal feeding practices.

Improving maternal nutrition during pregnancy is a public health stunting-prevention priority in Indonesia. Antenatal care is strongly associated with improved health outcomes for both mother and child.[8] In Indonesia, women have demonstrated a high participation rate in

Corresponding Author: Dr Benjamin Crookston, Department of Public Health, Brigham Young University, Provo, USA.
Tel: (801)422-3143
Email: benjamin.crookston@gmail.com
Manuscript received 29 February 2020. Initial review completed 11 May 2020. Revision accepted 23 July 2020.
doi: 10.6133/apjcn.202009_29(3).0013

antenatal care, with 95% attending at least one healthcare visit during pregnancy and 88% attending at least four healthcare visits during pregnancy.[9,10] This participation rate is, in part, due to the community health delivery system, called Poskesdes, which focuses on maternal health services and antenatal care.[11] In a stunting prevention effort, the Poskesdes has established the Minimum Standard Services, which encourages the village midwife to distribute free iron folic acid (IFA) supplements for pregnant women.[12-14] IFA supplements and iron rich foods (locally known as ATIKA) are proven to both reduce anemia and decrease the risk of childhood stunting.[15-19] Despite these efforts, compliance to prenatal IFA supplementation and consumption of ATIKA foods – which include hati/chicken liver (A), telur/egg (T) and ikan/fish (IKA) – remains low.[9] Low utilization of IFA and consumption of ATIKA foods may be influenced by the lack of a uniform health education message supportive of these behaviors provided at Poskesdes. Stocking and distributing IFA supplies presents a challenge as well.[20] Of the women who attend at least one antenatal visit, 19% never receive IFA tablets, and of those who do receive the supplement, only 7% take the recommended number of tablets.[9,21] Another factor of noncompliance may be the result of poor nutritional education, as nutritional knowledge is highly associated with a higher consumption rate of IFA tablets and ATIKA foods such as eggs, chicken liver, and fish.[22]

A recent social and behavior change communication effort in Indonesia, known as the National Nutrition Communication Campaign (NNCC), sought to educate the public on stunting, including the preventative effects of adequate maternal nutrition. The NNCC targeted 10 provinces across the Indonesian archipelago and included both mass media communications and interpersonal communication (IPC) approaches. Generally, IPC strategies include a face-to-face verbal or non-verbal exchange of information and feelings between two or more people. In the NNCC, IPC interventions focused on health workers communicating to mothers the importance of IFA supplementation and the consumption of ATIKA. Channels for the delivery of NNCC IPC messages included women's groups, maternal health classes, and Poskesdes services for women and children throughout rural Indonesia. The purpose of this study was to understand how participation in the IPC activities impacted maternal knowledge, attitude, intention, and consumption of prenatal IFA supplements and ATIKA foods among pregnant Indonesian women.

METHODS

Study design and sampling

This study examined data from a cross-sectional survey of pregnant women in Indonesia following the NNCC. The independent agency, Reconstra, conducted the data collection in three provinces (South Sumatera, West Kalimantan, Central Kalimantan). IMA World Health, the organization that implemented the NNCC, selected these provinces. One district from each province was randomly selected - resulting in three total evaluated districts, including Banyuasin, Kubu Raya, and Katingan. Three-stage cluster sampling was used, with the village as the cluster unit. Approximately 30 clusters were randomly selected from each district, from which sub-villages and pregnant women from the sub-villages were randomly selected, resulting in a final study sample of 766 pregnant women.

Procedure

Data collection was conducted in 2018 from January to February by trained enumerators using electronic questionnaires installed on electronic tablets. Each enumerator interviewed a minimum of two pregnant women per day and finished the interview and data collection process within 18 days. All of the collected data were checked by field supervisors (1st stage data cleaning) prior to being uploaded for the 2nd stage of data cleaning. After data cleaning, variables were labeled for analysis.

Ethical approval was granted through the Ethical Research Committee in the Public Health department at Universitas Indonesia. Government approval was obtained from the Ministry of Home Affairs as well as provincial and district health offices. Each study participant signed an informed consent form prior to being interviewed. Participation was voluntary and all information was kept confidential and used only for study purposes.

Measurement

Demographic information was gathered, including age, level of education and total household income. A variable was created to determine exposure to IPC. This composite variable consisted of exposure to the three elements of the NNCC intervention: counseling, mother classes, and health activities.

The Theory of Planned Behavior and the Health Belief Model provided a framework for the survey items, which intended to ascertain respondents' knowledge, attitudes, intentions, and behaviors related to taking IFA supplements and eating ATIKA foods during pregnancy. Respondents were asked to identify foods rich in iron, determine the benefits of iron consumption, and list consequences of iron deficiency. Perceived social support was measured by the statements "If I am pregnant, I felt the people who mattered to me encouraged me to consume iron tablets daily during pregnancy" and "I felt the people who mattered to me encouraged me to eat one serving of ATIKA every other day during pregnancy". Attitudes were measured with five questions asking about the ease or difficulty of taking IFA supplements or eating foods rich in iron, such as "I do need to consume one iron tablet daily during pregnancy," "I will consume one iron tablet daily during pregnancy," "Eating one serving of ATIKA every other day during pregnancy, is needed to meet the needs of iron," "Eating one serving of chicken's liver, egg, or fish every other day during pregnancy is easy to do," and "If I am pregnant, I am lazy to eat one serving of ATIKA every other day during pregnancy". Questions evaluating attitudes were measured using a Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). These categories were then dichotomized: 0 = strongly disagree/disagree and 1 = agree/strongly agree. Behavior was measured using a 24-hour dietary recall of participants' breakfast, morning snack, lunch, afternoon snack, and dinner. Additionally, respondents were asked

if they had ever been given or purchased IFA supplements, and how often they consumed IFA supplements.

Analysis

SAS version 9.4 was used to calculate all test statistics. Frequency statistics were calculated to describe participant demographics and exposure to IPC. Unadjusted bivariate logistic regression and adjusted multivariate regression models were conducted to analyze differences in responses between IPC participants and non-IPC participants. In the adjusted regression models sociodemographic variables (mother's age, mother's education, and total household income) were used to control for potential confounding.

RESULTS

Mean age for mothers in the study was approximately 30 years old. The majority of mothers had at least completed primary school, and about a quarter had completed up to senior high school. The most common occupation was unemployed/housewife (84.73%). Islam was the predominant religion (see Table 1).

Frequency percentages of IFA knowledge variables show that knowledge was high regarding benefits, and when/how to consume IFA tablets, but low on the side effects of IFA. Frequencies for both IFA attitude/intention and practice were high, showing positive attitude and high intent as well as high consumption levels. For ATIKA, knowledge was much lower in comparison to IFA. Roughly a quarter of the participants knew the benefits of ATIKA, knew the consequences of iron deficiency, and had heard the term ATIKA. Attitude and intention towards ATIKA were similar to those of IFA (see Table 2).

Approximately 20% of women were involved in the IPC campaign on IFA tablets, and 18% were involved in the IPC campaign on ATIKA. Involvement with the IPC aspects of the NNCC intervention was associated with significant differences in knowledge of IFA and ATIKA. Compared to those who did not participate, participants had higher knowledge of the following: IFA benefits [OR=2.23], IFA side effects [OR=2.35], how to consume IFA [OR=2.12], when to consume IFA [OR=2.83], ATIKA benefits [OR=3.60], and consequences of iron deficiency [OR=3.74] (see Table 3). For attitude/intention, pregnant women who were IPC participants had significantly increased odds of believing they needed to consume IFA [OR=1.79] and intent to consume IFA [OR=3.36] (see Table 4). Furthermore, IPC participation was not predictive of consuming IFA tablets or consumption of iron rich foods in the last 24 hours (see Table 5). No differences were found between the three provinces from which data were collected.

DISCUSSION

This study examined an intervention utilizing a community health care delivery system to provide an IPC campaign to pregnant women, with the aim of improving knowledge, attitudes, and behavior regarding IFA and ATIKA consumption among pregnant Indonesian women. Women who participated in the IPC were more likely to know the benefits of supplementation and iron-rich foods, the proper way to consume them, and the consequences of iron deficiency. The intervention was also positively associated with attitude and behavior regarding IFA tablets. However, there was no association between the IPC intervention and attitude and behavior for ATIKA.

The intervention was associated with maternal knowledge of IFA and ATIKA, yet there were some disparities within knowledge. Most women in the study reported knowing the benefits of IFA for pregnant women (e.g., healthier fetal growth and avoiding anemia), but few understood the side effects of this supplement (e.g., vomiting and constipation). Additionally, even though IPC participation did improve knowledge of ATIKA, knowledge was still relatively low at the end of the intervention. This is in contrast to IFA tablets, where maternal knowledge was high at intervention completion; however a mother's baseline knowledge of IFA supplements could have been higher than ATIKA knowledge because Indonesia has established IFA supplementation as part of the Minimum Standard Services of antenatal care.[14] Only

Table 1. Participant demographics of pregnant women

Demographics	N (%)/ Mean (SD)
Mean age	27.7 (5.96)
Education	
None	40 (5.2%)
Primary school	288 (37.7%)
Junior high school	186 (24.3%)
Senior high school	206 (26.9)
Tertiary education	45 (5.9%)
Occupation	
Unemployed/Housewife	649 (84.7%)
Farmer	19 (2.5%)
Light traders/Shop owner	42 (5.5%)
Other	56 (7.3%)
Religion	
Islam	733 (95.7%)
Other	33 (4.3%)
Mean total household income (Rp)†	2210821.9 (2240347.3)

† Indonesian rupiah (official currency of Indonesia)

Table 2. IFA and ATIKA knowledge, attitude, and practices among pregnant women

Part A: IFA tablets	N/(%)	N/(%)
Knowledge	Yes	No
Know benefits of IFA for pregnant women	519 (67.8)	247 (32.3)
Know the side effects of IFA	167 (21.8)	599 (78.2)
Known how to consume IFA properly	520 (67.9)	246 (32.1)
Know when to consume IFA	518 (67.6)	248 (32.4)
Attitude/ Intention	Agree	Disagree
I do need to consume one iron tablet daily during pregnancy	589 (77.0)	176 (23.0)
The people who mattered to me encouraged me to consume one iron tablet daily during pregnancy	629 (82.3)	135 (17.7)
I will consume one iron tablet daily during pregnancy	662 (86.5)	103 (13.5)
Consumption	Yes	No
Ever given/bought IFA tablets?	628 (82.0)	138 (18.0)
Do you consume IFA tablets?	601 (95.7)	27 (4.3)
Part B: ATIKA	**N/(%)**	**N/(%)**
Knowledge	Yes	No
Know benefit of ATIKA	198 (25.9)	568 (74.2)
Know consequences of iron deficiency	182 (23.8)	584 (76.2)
Knowledge on ATIKA	255 (33.3)	511 (66.7)
Ever heard the term ATIKA	197 (25.7)	569 (74.3)
Attitude/ Intention	Agree	Disagree
Eating one serving of ATIKA every other day during pregnancy, is needed to meet the needs of iron	726 (94.8)	40 (5.2)
Eat one serving of ATIKA every other day during pregnancy is easy to do	682 (89.2)	83 (10.9)
I felt the people who mattered to me encouraged me to eat one serving of ATIKA every other day during pregnancy	683 (89.4)	81 (10.6)
If I am pregnant, I am lazy to eat one serving of ATIKA every other day during pregnancy	425 (55.6)	340 (44.4)
Consumption	N (%)	
Consumption of ATIKA in the last 24 hours		
0 Times	35 (4.6)	
1 Time	95 (12.4)	
2 Times	222 (29.0)	
3 Times	413 (54.0)	
Participation in IPC	N (%)	
IFA	154 (20.1)	
ATIKA	141 (18.4)	

IFA: iron folic acid; ATIKA: chicken's liver, egg, or fish; IPC: interpersonal communication

Table 3. Exposure to intervention and impact on knowledge of IFA tablets and ATIKA

Part A: IFA tablets	Unadjusted OR (CI)	Adjusted OR (CI)
Know benefits of IFA for pregnant women	2.39 (1.54-3.69)***	2.23 (1.42-3.49)**
Know the side effects of IFA	2.20 (1.49-3.26)***	2.35 (1.57-3.53)***
Known how to consume IFA properly	2.26 (1.46-3.47)**	2.12 (1.35-3.31)**
Know when to consume IFA	2.96 (1.87-4.68)***	2.83 (1.76-4.54)***
Part B: ATIKA	**Unadjusted OR (CI)**	**Adjusted OR (CI)**
Know benefit of ATIKA	3.41 (2.33-5.00)***	3.60 (2.40-5.42)***
Know consequences of iron deficiency	3.18 (2.16-4.68)***	3.74 (2.44-5.72)***
Knowledge on ATIKA	3.02 (2.08-4.39)***	3.29 (2.19-4.94)***
Ever heard the term ATIKA	5.92 (4.01-8.75)***	6.02 (4.01-9.03)***

IFA: iron folic acid; ATIKA: chicken's liver, egg, or fish.
All adjusted models include maternal age, maternal education level, and total household income.
**p<0.001; ***p<0.0001.

25% of pregnant women reported knowing the benefits of ATIKA compared to 75% who did not report such knowledge. This discrepancy may be due in part to the large portion of participants (74%) who reported never having heard the term "ATIKA" before. It is possible these women would know or recognize the iron-rich foods that ATIKA stands for but do not recognize the acronym or associate it with the specific foods.

Even though knowledge regarding IFA and ATIKA were both higher for women who participated in the IPC campaign, participants only saw improvements in attitudes and behaviors for IFA and not for ATIKA. Those who participated in the intervention were more likely to agree that they needed to consume IFA tablets daily during pregnancy and to intend to consume one tablet daily. They were also significantly more likely to have been given or bought IFA tablets; this can be taken as a

Table 4. Exposure to intervention and impact on attitude/intention towards IFA tablets and ATIKA

Part A: IFA Tablets	Unadjusted OR (CI)	Adjusted OR (CI)
I do need to consume one iron tablet daily during pregnancy	1.69 (1.06-2.70)*	1.79 (1.09-2.93)*
The people who mattered to me encouraged me to consume one iron tablet daily during pregnancy	1.01 (0.64-1.61)	0.98 (0.61-1.57)
I will consume one iron tablet daily during pregnancy	2.93 (1.44-5.95)*	3.36 (1.59-7.10)*
Part B: ATIKA	Unadjusted OR (CI)	Adjusted OR (CI)
Eating one serving of ATIKA every other day during pregnancy, is needed to meet the needs of iron	2.09 (0.73-5.98)	1.95 (0.68-5.61)
Eat one serving of ATIKA every other day during pregnancy is easy to do	2.27 (1.07-4.82)*	2.07 (0.97-4.44)
I felt the people who mattered to me encouraged me to eat one serving of ATIKA every other day during pregnancy	0.99 (0.55-1.78)	1.15 (0.60-2.21)
If I am pregnant, I am lazy to eat one serving of ATIKA every other day during pregnancy	0.89 (0.62-1.28)	0.88 (0.60-1.29)

IFA: iron folic acid; ATIKA: chicken's liver, egg, or fish.
All adjusted models include maternal age, maternal education level, and total household income.
*$p<0.05$.

Table 5. Exposure to intervention and impact on consumption of IFA tablets and ATIKA

Part A: IFA tablets	Unadjusted OR (CI)	Adjusted OR (CI)
Ever given/bought IFA tablets?	8.27 (3.33-20.58)***	7.35 (2.94-18.38)***
Part B: ATIKA	Unadjusted point estimate (p-value)	Adjusted point estimate (p-value)
Consumption of ATIKA in the last 24 hours	0.06 (0.50)	0.03 (0.76)

IFA: iron folic acid; ATIKA: chicken's liver, egg, or fish.
All adjusted models include maternal age, maternal education level, and total household income.
***$p<0.0001$.

measure of consumption behavior, as 95% of those with tablets consumed them. These results parallel Nguyen et al.'s findings that high nutrition knowledge was strongly associated with maternal IFA supplementation compliance in an IPC intervention in Bangladesh.[23] Similarly, a recent review of maternal nutrition interventions in South Asia found that higher maternal knowledge was predictive of greater IFA consumption.[24] This research also confirms other studies reporting that positive attitude and perceptions of IFA can improve adherence to supplementation in low-resource settings.[25-27] In line with the Theory of Planned Behavior, the NNCC intervention was associated with higher knowledge of IFA, which likely led to improvements in attitude/intention and behavior. Programs that utilize these constructs (knowledge, attitude/intention, and behavior) may be able to increase compliance to IFA tablet supplementation even in the presence of other barriers, such as the negative physical side effects of IFA tablets (which include gastro-intestinal discomfort, nausea, and vomiting); the unappealing physical characteristics of the size, coating, color, packaging, and storage life of generic tablets dispensed at a Poskesdes; forgetfulness; and negative cultural perceptions of pills.[28-34] Increasing consumption of iron-rich foods has been cited as a potentially worthwhile area for future efforts to combat maternal anemia during pregnancy and the resulting high rates of stunting in Indonesia, as iron-rich food avoids many of the barriers to IFA tablet consumption.[4,35,36] However, higher knowledge was not sufficient for improving attitude/intention or behavior regarding ATIKA in the intervention group, suggesting other factors may need to be addressed in order to improve maternal compliance. This is consistent with findings that maternal knowledge, beliefs, self-efficacy, and social norms are all associated with improved dietary diversity among pregnant women.[23] Furthermore, a three-pronged intervention (including IPC, community events, and a mass media campaign) to improve maternal diet in Nepal found a significant positive association between exposure to more intervention strategies and maternal dietary diversity, suggesting a need for a more holistic approach to changing dietary behaviors.[37]

The NNCC intervention utilized all but three constructs - perceived barriers, perceived susceptibility, and self-efficacy – from the Health Belief Model and Theory of Planned Behavior to evaluate maternal knowledge, attitude/intention, and behaviors. Though there were some improvements in knowledge and attitude/intention toward IFA and ATIKA, subsequent efforts should address the other constructs, particularly the barriers to consumption. Compliance is likely not a problem of access, as fish, eggs, and chicken's liver are inexpensive foods that are readily available in local Indonesian markets.[35,38] Cultural beliefs have been cited as one salient barrier to dietary diversity, but more research is needed to examine other barriers to increasing maternal consumption of iron-rich foods.[3,35] As stunting often starts in utero, efforts to improve the nutritional status of adolescent girls and pre-pregnancy women have the potential to reduce high child stunting rates in Indonesia.[39]

This study had several limitations. It used cross-sectional analysis, and thus it is not possible to infer causality from any of the associations. Consumption of IFA and ATIKA was self-reported by women who were pregnant during a one-on-one interview. This method of data collection had the potential for interviewer bias, as wom-

en may have felt pressure to self-report more positively instead of accurately. Another limitation is the low rate of participation (18-20%) in the IPC intervention, which limits the ability to achieve statistical significance. Additionally, the NNCC sought to address numerous health issues, making the depth of education regarding ATIKA potentially insufficient for women to internalize, comprehend, and adopt behavior changes. Further, there were several survey items for IFA consumption behavior that would have provided a fuller view of maternal compliance (e.g., total number of IFA tablets taken); however, the sample sizes were too small and would not have generated robust and reliable results.

Conclusion

The findings suggest that women who participated in the intervention were more likely to have correct knowledge of both IFA and ATIKA and were more likely to have better attitudes/intentions and behaviors regarding IFA. However, participation did not appear to impact attitudes/intentions or consumption of ATIKA. More research is needed to understand the barriers to ATIKA consumption, as improved knowledge did not translate into higher attitude/intention towards or consumption of ATIKA. Interventions designed to improve compliance with ATIKA should strive to ensure high exposure, address barriers, understand perceived susceptibility, and improve self-efficacy. These constructs, if not addressed, could greatly reduce the effectiveness of interventions designed to decrease stunting through the means of prenatal nutrition. Further, although the current intervention was effective in improving maternal IFA knowledge, attitude, and behavior, exposure to the intervention was low. Future efforts by the Indonesian government to reduce stunting through improved maternal nutrition should seek to address barriers to intervention exposure in order to expand intervention reach in Indonesia.

AUTHOR DISCLOSURES

The authors declare no conflict of interest.

REFERENCES

1. UNICEF. Malnutrition in Children 2019 [cited 2020/07/25]; Available from: https://data.unicef.org/topic/nutrition/malnutrition/.
2. De Onis M, Blössner M, Borghi E. Prevalence and trends of stunting among pre-school children, 1990–2020. Public Health Nutr. 2012;15:142-8. doi: 10.1017/S1368980011001315.
3. Victora CG, Barros FC, Assuncao MC, Restrepo-Mendez MC, Matijasevich A, Martorell R. Scaling up maternal nutrition programs to improve birth outcomes: a review of implementation issues. Food Nutr Bull. 2012;33(2 Suppl): S6-26. doi: 10.1177/15648265120332s102.
4. Hambidge KM, Krebs NF. Strategies for optimizing maternal nutrition to promote infant development. Reprod Health. 2018;15(Suppl 1):87. doi: 10.1186/s12978-018-0534-3.
5. Christian P, Mullany LC, Hurley KM, Katz J, Black RE. Nutrition and maternal, neonatal, and child health. Seminars in Perinatol. 2015;39:361-72. doi: 10.1053/j.semperi.2015.06.009.
6. Sofiatin Y, Pusparani A, Judistiani TD, Rahmalia A, Diana A, Alisjahbana A. Maternal and environmental risk for faltered growth in the first 5 years for Tanjungsari children in West Java, Indonesia. Asia Pac J Clin Nutr. 2019;28:S32-S42. doi: 10.6133/apjcn.201901_28(S1).0003.
7. Rachmi CN, Agho KE, Li M, Baur LA. Stunting, underweight and overweight in children aged 2.0–4.9 years in Indonesia: prevalence trends and associated risk factors. PLoS One. 2016;11:e0154756. doi: 10.1371/journal.pone.0154756.
8. Huy ND, Hop LT, Shrimpton R, Hoa CV. An effectiveness trial of multiple micronutrient supplementation during pregnancy in Vietnam: impact on birthweight and on stunting in children at around 2 years of age. Food Nutr Bull. 2009;30(4 Suppl):S506-16. doi: 10.1177_15648265090304S405.
9. Statistics Indonesia - Badan Pusat Statistik - BPS and Macro International. Indonesia demographic and health survey, 2007. Calverton, Maryland USA: BPS and Macro International; 2008.
10. Indonesia Ministry of Health. Indonesia health profile 2018. Jakarta, Indonesia: Indonesia Ministry of Health; 2018
11. Indonesia country nutrition profile. Global Nutrition Report. 2018 [cited 2020/7/25]; Available from: https://globalnutritionreport.org/media/profiles/3.0.3/pdfs/indonesia.pdf
12. Aguayo VM, Menon P. Stop stunting: improving child feeding, women's nutrition and household sanitation in South Asia. Matern Child Nutr. 2016;12:3-11. doi: 10.1111/mcn.12283.
13. The World Bank. World development indicators. 2019 [cited 2020/07/25] Available from: https://databank.worldbank.org/reports.aspx?source=2&series=SH.ANM.ALLW.ZS&country=.
14. Indonesia Ministry of Health. Indonesia minimum service standards for nutrition: technical brief for governors and heads of districts. Jakarta, Indonesia, and Washington, DC: Indonesia Ministry of Health and FHI 360/Food and Nutrition Technical Assistance III Project; 2017.
15. Kurniawan YA, Muslimatun S, Achadi EL, Sastroamidjojo S. Anaemia and iron deficiency anaemia among young adolescent girls from the peri urban coastal area of Indonesia. Asia Pac J Clin Nutr. 2006;15:350-6.
16. Christian P, Kim J, Mehra S, Shaikh S, Ali H, Shamim AA, Wu L, Klemm R, Labrique AB, West, KP Jr. Effects of prenatal multiple micronutrient supplementation on growth and cognition through 2 y of age in rural Bangladesh: the JiVitA-3 Trial. Am J Clin Nutri. 2016;104:1175-82. doi: 10.3945/ajcn.116.135178.
17. Nguyen PH, Gonzalez-Casanova I, Young MF, Truong TV, Hoang H, Nguyen H, Nguyen S, DiGirolamo AM, Martorell R, Ramakrishnan U. Preconception micronutrient supplementation with iron and folic acid compared with folic acid alone affects linear growth and fine motor development at 2 years of age: A randomized controlled trial in vietnam. J Nutr. 2017;147:1593-601. doi: 10.3945/jn.117.250597.
18. IMA World Health. End of Campaign Assessment for the National Communication Campaign (NNCC). Jakarta, Indonesia: IMA World Health; 2018.
19. Garrett GS, Bailey LB. A public health approach for preventing neural tube defects: folic acid fortification and beyond. Ann NY Acad Sci. 2018:1414:47-58. doi: 10.1111/nyas.13579.
20. National Research Council. Reducing maternal and neonatal mortality in Indonesia: saving lives, saving the future. Washington, DC: National Research Council; 2013. Report No.: 978-0-309-29076-0.

21. Main Results of Risks 2018. Ministry of Health of the Republic of Indonesia; 2018.
22. Sunuwar DR, Sangroula RK, Shakya NS, Yadav R, Chaudhary NK, Pradhan PMS. Effect of nutrition education on hemoglobin level in pregnant women: a quasi-experimental study. PLoS One. 2019;14:e0213982. doi: 10.1371/journal.pone.0213982.
23. Nguyen PH, Sanghvi T, Kim SS, Tran LM, Afsana K, Mahmud Z, Aktar B, Menon P. Factors influencing maternal nutrition practices in a large scale maternal, newborn and child health program in Bangladesh. PLoS One. 2017; 12:e0179873. doi: 10.1371/journal.pone.0179873.
24. Goudet S, Murira Z, Torlesse H, Hatchard J, Busch-Hallen J. Effectiveness of programme approaches to improve the coverage of maternal nutrition interventions in South Asia. Matern Child Nutr. 2018;14:e12699. doi: 10.1111/mcn. 12699.
25. Alam A, Rasheed S, Khan NU, Sharmin T, Huda TM, Arifeen SE, Dibley M. 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. doi: 10.1186/s12889-015-1697-2.
26. Galloway R, Dusch E, Elder L, Achadi E, Grajeda R, Hurtado E et al. Women's perceptions of iron deficiency and anemia prevention and control in eight developing countries. Soc Sci Med. 2002;55:529-44. doi: 10.1016/ s0277-9536(01)00185-x.
27. Ghanekar J, Kanani S, Patel S. Toward better compliance with iron-folic acid supplements: understanding the behavior of poor urban pregnant women through ethnographic decision models in Vadodara, India. Food Nutr Bull. 2002; 23:65-72. doi: 10.1177/156482650202300109.
28. Saronga NJ, Burrows T, Collins CE, Ashman AM, Rollo ME. mHealth interventions targeting pregnancy intakes in low and lower-middle income countries: systematic review. Matern Child Nutr. 2019;15:e12777. doi: 10.1111/mcn. 12777.
29. Pai N, Supe P, Kore S, Nandanwar YS, Hegde A, Cutrell E, Thies W. Using automated voice calls to improve adherence to iron supplements during pregnancy: a pilot study. Proceedings of the Sixth International Conference on Information and Communication Technologies and Development. 2013;1:153-63. doi: 10.1145/2516604. 2516608.
30. Siekmans K, Roche M, Kung'u JK, Desrochers RE, De-Regil LM. Barriers and enablers for iron folic acid (IFA) supplementation in pregnant women. Matern Child Nutr. 2018;14(Suppl 5):e12532. doi: 10.1111/mcn.12532.
31. Taye B, Abeje G, Mekonen A. Factors associated with compliance of prenatal iron folate supplementation among women in Mecha district, Western Amhara: a cross-sectional study. Pan Afri Med J. 2015;20:43. doi: 10.11604/pamj.2015.20.43.4894.
32. Hyder SM, Persson LA, Chowdhury AM, Ekstrom EC. Do side-effects reduce compliance to iron supplementation? A study of daily- and weekly-dose regimens in pregnancy. J Health Popul Nutr. 2002;20:175-9. doi: 10.3329/jhpn. v20i2.142.
33. Titaley CR, Ariawan I, Hapsari D, Muasyaroh A, Dibley MJ. Determinants of the stunting of children under two years old in Indonesia: a multilevel analysis of the 2013 Indonesia basic health survey. Nutrients. 2019;11:1106. doi: 10. 3390/nu11051106.
34. Triharini M, Nursalam, Sulistyono A, Adriani M, Armini NKA, Nastiti AA. Adherence to iron supplementation amongst pregnant mothers in Surabaya, Indonesia: perceived benefits, barriers and family support. Int J Nurs Sci. 2018;5:243-8. doi: 10.1016/j.ijnss.2018.07.002.
35. Dijkhuizen MA, Greffeille V, Roos N, Berger J, Wieringa FT. Interventions to improve micronutrient status of women of reproductive age in Southeast Asia: a narrative review on what works, what might work, and what doesn't work. Matern Child Health J. 2019;23(Suppl 1):18-28. doi: 10. 1007/s10995-018-2637-4.
36. Alleyne M, Horne MK, Miller JL. Individualized treatment for iron deficiency anemia in adults. Am J Med. 2008;121: 943-8. doi: 10.1016/j.amjmed.2008.07.012.
37. Suresh S, Paxton A, Pun BK, Gyawali MR, Kshetri ID, Rana PP, Cunningham K. Degree of exposure to interventions influences maternal and child dietary practices: Evidence from a large-scale multisectoral nutrition program. PLoS One. 2019;14:e0221260. doi: 10.1371/journal.pone. 0221260.
38. World Food Programme. The cost of the diet study in Indonesia. 2017. Rome, Italy; World Food Program: 2018. pp. 68.
39. Mridha MK, Matias SL, Chaparro CM, Paul RR, Hussain S, Vosti SA et al. Lipid-based nutrient supplements for pregnant women reduce newborn stunting in a cluster-randomized controlled effectiveness trial in Bangladesh. Am J Clin Nutr. 2016;103:236-49. doi: 10.3945/ajcn.115.111336.