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## Original Article

## Adherence to iron supplementation amongst pregnant mothers in Surabaya, Indonesia: Perceived benefits, barriers and family support

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## ABSTRACT

**Background:** Anaemia during pregnancy is a major nutritional problem that can cause preterm delivery and low birth weight. Adherence to iron supplementation can prevent anaemia during pregnancy. However, adherence to iron supplementation remains a problem in many countries.

**Objective:** This study aimed to identify the correlations of the perceived benefits and perceived barriers of and family support for iron supplementation with adherence to this practice amongst pregnant woman in Surabaya, Indonesia.

**Methods:** A cross-sectional study was carried out on 102 pregnant women who attended check-ups at the Puskesmas and received iron supplementation. Data were collected using questionnaires.

**Results:** Perceived benefits ( $r = 0.334$ ,  $P = 0.001$ ), perceived barriers ( $r = -0.294$ ,  $P = 0.003$ ) and family support ( $r = 0.263$ ,  $P = 0.008$ ) were noted to be correlated with adherence to iron supplementation amongst pregnant woman in Surabaya, Indonesia.

**Conclusion:** Perceived benefits, perceived barriers and family support are related to adherence to iron supplementation; thus, developing good perceptions and family support should be properly promoted.

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## 1. Introduction

The maternal mortality rate (MMR) in Indonesia is high. In 2007, the number of maternal deaths was 228 per 100,000 live births. This value increased to 305 per 100,000 live births in 2015. The most common cause of maternal death was bleeding (30.3%). Other causes were hypertension (27.1%) and infection (7.3%) [1]. Disorders experienced by pregnant women are associated with anaemia during pregnancy. Anaemia during pregnancy adversely impacts on pregnancy, childbirth and the post-partum period [2]. Anaemia during pregnancy is also harmful to infants and increases the risk of preterm delivery, low birth weight and perinatal mortality [3].

Anaemia in pregnancy is a condition defined by haemoglobin levels below 110 g/L in the first and third trimesters or a

haemoglobin level below 105 g/L in the second trimester [4]. A total of 53.4% of the pregnant women in Africa [5], 36.1% in Ethiopia [6], 37.1% in Indonesia according to Riskesdas [7] and 25.3% in East Java [8] were anaemic. Secondary data show that in 2015, 16 of the 62 Puskesmas in Surabaya city were recorded with anaemia incidence rates amongst pregnant women of over 10% [9].

Various health-promotion efforts have been implemented by health workers in Indonesia to reduce the incidence of anaemia amongst pregnant women. Haemoglobin examination is performed in pregnant women in their first visits to the Puskesmas and is repeated in the third trimester amongst women at risk of anaemia for labour preparation. Health education has routinely instructed pregnant women on the importance of increasing iron intake through food and reducing the consumption of food that can inhibit iron absorption, such as phytate, phosphate and tannin [4].

The behaviour of pregnant women in preventing anaemia is influenced by many factors. Perceived benefits, perceived self-efficacy, interpersonal influences and commitment to a plan of action affect nutrition intake [10]. Some of the factors inhibiting the

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adherence to iron supplementation relate to a misunderstanding of the benefits of iron supplementation and the unaffordable access to such supplementation [11]. The perceptions of anaemia in pregnancy also affect women's behaviours towards its prevention [12].

The side effects of the iron tablets decrease maternal compliance. Iron supplements may cause gastrointestinal discomfort, such as nausea after taking the supplements, and hence promote poor compliance [13]. A false perception on iron tablets affecting maternal behaviour also remains. Moreover, the fear of side effects that may harm the health of the infants affects adherence [14]. Families play a role in providing support for mothers in taking iron supplement tablets. Family support can be provided in the form of emotional, physical, instrumental and informational support [15].

To date, research has barely explored the influences of internal and external factors on pregnant women's adherence to iron supplementation. In this regard, this study aimed to identify the correlations of the perceived benefits, perceived barriers and family support with adherence to iron supplementation.

## 2. Materials and methods

### 2.1. Research design and setting

This descriptive cross-sectional study was conducted between November and December 2016 on 102 women. The population included pregnant women attending antenatal care at the Puskesmas Sidotopo Wetan and Tanah kali Kedinding in Surabaya, East Java, Indonesia.

### 2.2. Sample

A total of 102 women satisfied the inclusion criteria and comprised the sample population. The inclusion criteria covered the pregnant women who were receiving iron supplementation from Puskesmas. The exclusion criteria included the pregnant women with complications or severe concomitant diseases that require specific medical treatment.

### 2.3. Measurement tool

The data collection tool was a questionnaire on sociodemographic characteristics, perceived benefits, perceived barriers and adherence to iron supplementation. The sociodemographic characteristics questions asked about age, parity, education and income.

The questionnaires were developed by researchers with items based on the theory of prevention of maternal anaemia and the health-promotion model (HPM) [3,16]. Whilst preparing the questionnaire contents, the researchers were assisted by two experienced nurses in the field of maternity nursing. Translation was accomplished by a qualified translator from Indonesia and proofreader from United Kingdom. Before use in data collection, the compiled questionnaires were tested for validity and reliability on 17 pregnant women who attended antenatal care at the Community Health Centre of Tanah Kali Kedinding Surabaya.

The perceived benefit questions inquired about the benefits of iron supplementation for babies and mothers during pregnancy and delivery. The questionnaire consists of six questions. The Cronbach's  $\alpha$  was 0.787. The six questions featured a Likert scale with the following options: strongly agree, slightly agree, slightly disagree and strongly disagree. The total scores for this section were in the range of 6–24, with higher scores indicating higher levels of perceived benefits.

The perceived barrier questions asked about boredom, side effects and forgetting. The questionnaire consisted of six questions with a Cronbach's  $\alpha$  of 0.728. The six questions used a Likert scale

with the following options: always, often, sometimes, rarely and never. The total scores for this section were in the range of 0–24, with lower scores indicating higher levels of perceived barriers.

The family support questions inquired about receiving advice from family on any issue related to taking iron tablets, receiving support or praise for taking iron tablets regularly, receiving help with household chores, receiving funds for nutritional food and receiving support in the form of checking in on the pregnancy regularly. The questionnaire consisted of five questions with a Cronbach's  $\alpha$  of 0.762. The five questions used a Likert scale with the following options: always, often, sometimes, rarely and never. The total scores for this section were in the range 0–20, with lower scores indicating lower levels of family support.

The questions on adherence to iron supplementation focused on three items: regularity, time and absorption process. The questionnaire consisted of four questions with a Cronbach's  $\alpha$  of 0.761. Each item was converted into a Likert scale with the following options: always, often, sometimes, rarely and never. The total scores for this section were in the range 0–16, with higher scores indicating higher levels of adherence to iron supplementation.

### 2.4. Data analysis

Spearman's rho values were used to determine the correlations of perceived benefits, perceived barriers and family support with adherence to iron supplementation. Descriptive statistics including frequencies, percentages, means and standard deviations were used to describe sociodemographic characteristics, perceived benefits, perceived barriers, family support and adherence to iron supplementation. In all statistical analyses, a  $P$ -value  $< 0.05$  was considered significant. All data were analysed using the SPSS software.

## 3. Results

### 3.1. Sociodemographic characteristics

The mean age of the women in the study was 28.44 years ( $SD = 5.27$  years). Most of the women ( $n = 42$ , 41.2%) were primigravids. More than three-quarters of the women ( $n = 84$ , 82.4%) finished secondary education. Two-thirds of the women ( $n = 65$ , 63.7%) possessed an income below 3 million rupiah per month (Table 1).

### 3.2. Perceived benefits

The majority of the participants strongly agreed that regular iron supplementation causes the foetus to grow normally ( $n = 56$ , 54.9%), does not tire mothers quickly ( $n = 63$ , 61.8%), promotes the pregnancy health ( $n = 72$ , 70.6%), ensures smooth labour ( $n = 52$ , 51.0%), reduces the risk of postnatal infection ( $n = 49$ , 48.0%) and

**Table 1**  
Sociodemographic characteristics in participants ( $n = 102$ ).

Variable	$n$ (%)	Variable	$n$ (%)
Age(yrs)		Education	
< 25	23 (22.6)	Elementary	15 (14.7)
25–35	68 (66.7)	Secondary	84 (82.4)
>35	11 (10.8)	University	3 (2.9)
Parity		Income(Rupiah)	
1	42(41.2)	< 3 million	65(63.7)
2	16(15.7)	≥ 3 million	37(36.3)
3	12(11.8)		
4	2(2.0)		

Note: 13,000 rupiah equal to 1 US \$.

prevents heavy bleeding during labour ( $n = 45, 44.1\%$ ).

Of the six perceived benefit statements, 'regular iron supplementation will make the foetus grow normally' achieved the highest average score ( $3.43 \pm 0.52$ ) and 'regular iron supplementation will reduce the risk of postnatal infection' scored the lowest average ( $2.81 \pm 0.85$ ) (Table 2).

### 3.3. Perceived barriers

Most of the participants occasionally felt 'bored' of taking iron supplements daily ( $n = 56, 54.9\%$ ), did not want to take them regularly because of the side effects ( $n = 37, 36.3\%$ ) and did not take them if they felt nauseated ( $n = 31, 30.4\%$ ). Most of the participants never feared that their blood pressure would be high due to regular iron supplementation ( $n = 59, 57.8\%$ ) and never felt that iron supplementation was not very important during pregnancy ( $n = 64, 62.7\%$ ). Most of the participants occasionally forgot to take their supplements ( $n = 37, 36.3\%$ ).

Of the six perceived barrier statements, 'I feel that iron supplementation is not very important during pregnancy' achieved the highest score ( $3.13 \pm 1.32$ ) and 'I feel bored having to take iron supplements everyday' obtained the lowest ( $2.26 \pm 1.06$ ) (Table 2).

### 3.4. Family support

Most of the participants had never received advice from family for any of their complaints on taking iron tablets ( $n = 30, 29.4\%$ ). The majority had always received support or praise from family for taking iron tablets regularly ( $n = 29, 28.4\%$ ), had always received help from family with household chores ( $n = 44, 43.1\%$ ), had received funds from family for nutritional food ( $n = 63, 61.7\%$ ) and had been supported to attend antenatal care regularly ( $n = 69, 67.7\%$ ).

Of the six family support statements, 'My family have supported me to attending antenatal care regularly' attained the highest score ( $3.56 \pm 0.69$ ) and 'My family have given me advice on any complaints I have had about taking iron tablets' achieved the lowest ( $1.90 \pm 1.44$ ) (Table 2).

### 3.5. Adherence to iron supplementation

Most of the participants had always taken iron supplements

every day ( $n = 59, 57.8\%$ ) and ideally not close to drinking tea ( $n = 44, 43.1\%$ ). About one-third of the participants had always or sometimes taken the tablets at night ( $n = 38, 37.3\%$ ). Most of the participants had never taken the iron supplements with orange juice or vitamin C drinks to lower nausea ( $n = 68, 66.7\%$ ).

Of the four adherence to iron supplementation statements, 'I take iron supplements regularly every day' showed the highest score ( $3.35 \pm 0.87$ ) and 'I take iron supplements along with orange juice or vitamin C drinks' revealed the lowest ( $0.72 \pm 1.18$ ) (Table 3).

The mean score of perceived benefits was 18.99 (95% CI = 18.44–19.54), whereas those for perceived barriers and family support were 16.56 (95% CI = 15.68–17.43) and 14.52 (95% CI = 13.85–15.19), respectively. The mean score of adherence to iron supplementation was 11.25 (95% CI = 15.68–17.43). Perceived benefits ( $r = 0.334$ ;  $P = 0.001$ ), perceived barriers ( $r = -0.294$ ;  $P = 0.003$ ) and family support ( $r = 0.263$ ;  $P = 0.008$ ) were significantly correlated with adherence to iron supplementation (Table 4).

## 4. Discussion

Adherence to iron supplementation is very important to the prevention of pregnancy anaemia. Health services have exerted efforts to improve maternal adherence through health promotion efforts, but non-adherence rates remained high. This study shows that perceived benefits, perceived barriers and family support are significantly correlated with adherence to iron supplementation.

The highest score on perceived benefits was achieved from the item of 'Regular iron supplementation will make the foetus grow normally'. This statement shows that most of the respondent primigravids tended to conduct healthy behaviour for the health of the foetus. This observation is supported by the results of research showing that primigravids possess better foetal–maternal attachment than that of multigravids [17]. Maternal–foetal attachment is the relationship between mother and foetus during pregnancy where the mother reflects the physical and emotional condition of the foetus [18]. This phenomenon can be observed from a mother's involvement in showing affection, care and commitment to maintain the health of her foetus. Pregnant mothers who hold a strong foetal–maternal attachment will constantly exert effort in maintaining a healthy pregnancy; actions include regularly taking iron tablets despite experiencing some obstacles. The lowest score on perceived benefits was on the item of 'Regular iron

**Table 2**  
Item scores of perceived benefits, perceived barriers and family support.

No	Item	Mean	SD
Perceived benefits			
1	Regular iron supplementation will make the foetus grow normally	3.43	0.52
2	Regular iron supplementation will make the pregnancy healthier	3.25	0.48
3	Regular iron supplementation will make mothers not get tired as quickly	3.09	0.78
4	Regular iron supplementation will ensure labour goes smoother	3.09	0.76
5	Regular iron supplementation will reduce the risk of postnatal infection	2.81	0.85
6	Regular iron supplementation will prevent heavy bleeding during labour	2.75	0.89
Perceived barriers			
1	I feel that iron supplementation is not very important during pregnancy	3.13	1.32
2	I fear that my blood pressure will become high if I regularly take iron supplements	3.08	1.25
3	I do not take the supplements if I feel nauseated	2.84	1.12
4	The side effects make me not want to take the supplements regularly	2.81	1.11
5	I do not take the supplements regularly because I forget	2.56	1.10
6	I feel bored having to take iron supplements everyday	2.26	1.06
Family support			
1	My family have supported me to attending antenatal care regularly	3.56	0.69
2	My family have provided me with funds for nutritional food	3.48	0.73
3	My family have helped me with household chores	3.11	1.05
4	My family have given me support or praise for taking iron tablets regularly	2.47	1.30
5	My family have given me advice on any complaints I have had about taking iron tablets	1.90	1.44

Note: Range 0–4; SD: standard deviation.

**Table 3**  
Item scores of adherence to iron supplementation.

No	Item	Mean	SD
1	I take iron supplements regularly every day	3.35	0.87
2	I take iron supplements at night	2.81	1.09
3	I do not take iron supplements close to drinking tea	2.25	1.78
4	I take iron supplements with orange juice or vitamin C drinks to lower nausea	0.72	1.18

Note: Range 0–4; SD: standard deviation.

**Table 4**  
Correlation of perceived benefits, perceived barriers, and family support with adherence to iron supplementation.

Variable	Mean	SD	95%CI	r	P
Perceived benefits	18.99	2.81	18.44–19.54	0.334	0.001
Perceived barriers	16.56	4.45	15.68–17.43	–0.294	0.003
Family support	14.52	3.41	13.85–15.19	0.263	0.008
Adherence to iron supplementation	11.25	4.05	10.46–12.05		

Note:SD: standard deviation; r:Spearman correlation coefficient.

supplementation will prevent heavy bleeding during labour'. The non-adherence of pregnant mothers in taking iron tablets is influenced by the knowledge of pregnant mothers and the role of health workers who have not provided an explanation about the benefits of iron supplementation [19].

A lower score on perceived barriers reflects a higher level of this category. From the result of item analysis of perceived barriers, we found that the highest perceived barrier was on the item of 'I feel bored having to take iron supplements everyday'. Taking iron tablet supplements continuously during pregnancy causes boredom amongst pregnant mothers. Pregnant mothers should take at least 90 iron tablets to prevent anaemia [20]. A barrier in the form of boredom in taking iron supplementations will cause frustration and hinders women from taking the supplements regularly [19]. Boredom can be caused by the lack of understanding of the benefits, as shown by related research [21]. A research on the perception of taking iron tablets in eight developing countries found that the main cause of irregular intake was the feeling of health amongst mothers who then erroneously exempt themselves from supplementation [22].

The highest score of family support was on the item of 'My family have supported me to attending antenatal care regularly'. Although the husbands lack time to accompany the mothers to attend antenatal care because of work, the former can provide support by reminding the mothers to attend antenatal care regularly and monitor the health of their pregnancy. This observation was shown by related studies on the perception of expectant mothers about husbands' support during pregnancy [23]. Husbands' support to pregnant mothers benefit by lowering anxiety and the risk of complications in pregnancy [24,25].

If a mother adheres to iron supplementation, the baby likely grows normally in the womb, the mother is less likely tired, the pregnancy becomes healthier, the delivery is smoother, infection risk during childbirth is reduced and heavy bleeding during childbirth is prevented than in non-adherence. A pregnant woman must understand that iron supplementation aims to meet her nutrient needs whilst pregnant. The importance of nutrition in pregnancy is to maximise the chance of delivery of a healthy infant [26]. Some pregnant women in low socioeconomic groups hold health risks because of their inability to afford diets sufficient for optimum nutrition in pregnancy [27].

Perceived barriers are the perceptions of the difficulty and cost required to perform certain health behaviours. A study in patients with multiple sclerosis found that a decrease in perceptions of barriers improved behaviour relating to health promotion and

quality of life [28]. Barrier perception may relate to health behaviours [29]. Greater perceived barriers appeared to better predict non-adherence to aromatase inhibitors in survivors of breast cancer [29]. Perceived barriers decreased adherence to treatment amongst Indonesian older adults with type 2 diabetes mellitus [30].

Pregnant women who struggle with consuming iron tablets, such as those who experience from nausea, forgetfulness and boredom, show a reduced adherence to consuming iron supplements. This study's assessment of adherence to iron supplementation aimed to observe the behaviour of mothers in taking iron tablets, including their regular consumption daily, at night, not close to drinking tea and in conjunction with orange juice or vitamin C drinks. Tea and coffee, which reduce iron absorption, can be substituted with orange juice, which is rich in vitamin C and thus increases iron absorption [31]. Iron requirements during pregnancy are difficult to meet without additional iron supplements. Iron deficiency during pregnancy affects the health of the mother and foetus [32].

The questionnaire in this study sought information on the barriers felt by the mothers in taking iron supplements. These perceived barriers include boredom, side effects, nausea, fear of increased blood pressure, forgetfulness and the assumption of non-importance of the supplements. Some barriers that cause irregularities in taking iron supplements are influenced by the misconception equating anaemia with low blood pressure. This misconception causes the mother to worry about taking supplements regularly because of her wrong assumption that such intake will cause high blood pressure. This perceived barrier can be more strongly felt by pregnant women who suffer from eating disorders. They can feel more nauseated and less inclined to take the supplements regularly [33].

Individual perceptions are related to health behaviours [34]. Perceptions impacted the adherence to self-care activities of adults with type 2 diabetes mellitus in Saudi Arabia [35]. A pregnant woman who perceives the benefits of taking iron supplements tends to exhibit better health behaviour, such as regularly taking iron tablets, despite a moderate perception of barriers.

The adherence of patients in therapy is influenced by their perception of barriers. Providing information about a treatment and possible side effects greatly improves patient adherence. The discomfort derived from therapy may lead to non-adherence if the patient does not understand the benefits of the therapy [29,36]. The perception of harm from illness can affect a person's behaviour. Fear of falling in community-dwelling older adults increase caution and asking support from others [37]. Pregnant women who



understand the dangers of anaemia to their health and that of their foetuses will exert effort to prevent anaemia by adhering to iron supplementation.

The results showed that family support in giving advice about issues with taking iron tablets achieved the lowest score. The side effects of iron tablets, such as nausea, can dissuade pregnant women from taking the supplements regularly [36]. Emotional support from family is very important for pregnant women and holds a significant relationship with pregnancy outcome [38].

Obstacles to adherence to iron supplementation may be influenced by culture in the community. Some people believe that excess iron will cause an increase in the amount of blood and large babies and render childbirthing difficult [22]. Pregnant women need to obtain support in the form of advice and encouragement to avoid perceiving the discomfort from iron supplementation as obstacles. Families can provide support for adherence to iron supplementation by monitoring their pregnant relatives directly every day. This suggestion is supported by the results of research on the importance of direct observation for improving adherence to oral iron supplementation during pregnancy [39].

## 5. Conclusion

Perceived benefits, perceived barriers and family support were correlated with adherence to iron supplementation. Health education should be developed to improve the perceptions of the benefits, reduce perceptions of the barriers and improve family support for adherence to iron supplementation. Educational materials on iron supplementation should also emphasise taking iron supplements properly and understanding the effect of anaemia on the mother and foetus. Health workers need to involve families in the provision of health education to increase support for pregnant women in adhering to iron supplementation. Such education should consider the socioeconomic and demographic characteristics of pregnant women.

## Conflicts of interest

The authors declare the absence of conflict of interest as regards their present work.

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## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ijnss.2018.07.002>.

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