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The Four Pillars Approach: a new model for iron deficiency anaemia management during pregnancy

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The Four Pillars Approach: a new model for iron deficiency anaemia management during pregnancy

Doctoral Thesis

to obtain the degree of doctor
from Radboud University Nijmegen
on the authority of the Rector Magnificus,
according to the decision of the Council of Deans
to be defended in public on Thursday, March 10, 2016
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CHAPTER 1

Introduction
Demographic characteristics

Indonesia is the world’s fourth most populous country, and is located at the meeting point of two tectonic plates. The population is highly vulnerable to natural disasters such as earthquakes and tsunamis. More than 248 million inhabitants live in the 1.9 million km² of the Indonesian archipelago. Indonesia has more than 17,000 islands, of which only 6,000 are inhabited. Approximately 60 percent of the total population is living in less than 7 percent of the total land area of Indonesia, namely on the island of Java. Indonesia is characterized by a population with hundreds of ethnic groups, each with its own language. The country is ethnically diverse. The Indonesian motto, “Unity in Diversity” reflects the country’s heterogeneity.¹ (Fig. 1)

![Figure 1. Map of Indonesia](image)

Based on demographic data of 2012, just over 50 percent of the population is female. Nearly half of the population is between 14 – 64 years old and the birth rate is 2.6 children. More than 60 percent of the total population received less than nine years education. On average, the daily income per capita of the population is less than 2 US dollars. Furthermore, the Indonesian government is still struggling to decrease the 12 percent of the total population who live in poverty.¹²

Yogyakarta Special Province is one of the 34 provinces in Indonesia, it is located on Java island, and has about 4 million inhabitants. Yogyakarta Special Province is the third most populous province in Indonesia after Jakarta and West Java Province, with more than 1.085 inhabitants per km². The literacy percentage in Yogyakarta Special Province is 93 percent, slightly below the national literacy rate of 94 percent. The province is divided into five
districts: Gunung Kidul, Sleman, Kota Yogyakarta, Bantul, and Kulonprogo (Fig. 2). The province is home to the most active volcano in the world, Mount Merapi. Both Yogyakarta Special Province and Central Java Province have similarities in their demographic characteristics, health profiles, and human development index (HDI). Moreover, both provinces also have similarities in their social and cultural backgrounds, and the majority of the population is Muslim.\textsuperscript{1,3,4} The Central Java Province was used as the control group in this study.

Undersubtitle

The Indonesian Health System

At the central government level the organisation of public health has two main arms. The National Development Planning Agency, BAPPENAS, is the national unit responsible for policy, planning and budgeting of all sectors, including health. The technical leadership of health planning and implementation is the responsibility of the Ministry of Health (MoH). At the local level, BAPPEDA (the local counterpart of BAPPENAS) is in charge of overall policy, planning and budgeting, while Dinkes (the local counterpart of the Department of Health) is responsible for the formulation of technical standards.

The delivery of health care services in the country has traditionally been organised under a multi-tiered hierarchical system as described in Figure 3.
Table 1. Demographic characteristics

<table>
<thead>
<tr>
<th>Characteristics/Profile</th>
<th>Indonesia</th>
<th>Yogyakarta Special Province</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General profile</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width Area (km²)</td>
<td>1,890,754</td>
<td>±3,185.80</td>
</tr>
<tr>
<td>Population</td>
<td>248,422,956</td>
<td>3,630,770</td>
</tr>
<tr>
<td>Population under poverty line (percent)</td>
<td>11.5</td>
<td>11.3</td>
</tr>
<tr>
<td>Literacy Rate (percent)</td>
<td>94.1</td>
<td>92.9</td>
</tr>
<tr>
<td>Major Religion</td>
<td>Muslim</td>
<td>Muslim</td>
</tr>
<tr>
<td>Ethnics</td>
<td>Variety</td>
<td>Javanese</td>
</tr>
<tr>
<td>Life expectancy at birth M/F (years)</td>
<td>69/73</td>
<td>72/76</td>
</tr>
<tr>
<td>Per capita total expenditure on health (US$)</td>
<td>340</td>
<td>No data</td>
</tr>
<tr>
<td>General government expenditure on health as percent of total government expenditure (percent)</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Out of pocket expenditure as percent of total expenditure on health (percent)</td>
<td>38</td>
<td>No data</td>
</tr>
</tbody>
</table>

Sources: Indonesia Demographic and Health Survey 2012, Indonesia Health Profile 2012, DIY Health Profile 2012, WHO country data sheet 2012.

Figure 3. The Health Care System in Indonesia

Figure 3 shows the levels of health care services and the referral system in Indonesia. The first level, primary health care, is provided by the Public Health Centre (PHC), an integrated health post, which is also the village maternity post where the village midwife is employed. The integrated health post is operated voluntarily by the community and is supervised by the nurse-midwife at the PHC. They were originally organised as nutrition posts providing basic nutrition and growth monitoring services. The PHCs deliver a
comprehensive package of health services, including those related to maternal, neonatal and child health. They are the backbone of the delivery of primary health care services in the sub districts. Due to the geographical barriers to accessing health centres and sub-centres, the village midwives have the responsibility of providing primary maternity care, including antenatal care and birth delivery in each village. Public health facilities are officially owned and financed by the local government. However, local governments fail to allocate adequate resources. As a result, facilities rely on central subsidies and user fees to cover their expenses.  

At the second level, health care services are provided by district hospitals, so called type C and D, which are served by at least four specialists (pediatrician, obstetrician, internist, and surgeon). Referral from a primary health care provider is required to access hospital services, except in emergency cases. Lastly, at the third level, health care services are delivered by provincial hospitals, called type B. Type A hospitals are top referral academic hospitals at national level.

**Public and Private Health Care Providers**

An estimated 60-70 percent of civil servant health workers have both a private solo practice and work in private facilities. This dual practice was introduced in the early 1970s with the expectation that private income could supplement the low salaries of publicly employed health staff. This policy was aimed at minimising the risk of human resource shortages in remote locations. However, the incentives for health workers to live in remote areas have not changed the shortages. Furthermore, the dual practice negatively influences the quality and number of services provided in public facilities. It results in absenteeism, the diversion of public patients to private practices where higher user fees apply, resulting in the misallocation of resources.

**Health Insurance**

In 2008, a new health insurance programme, the *Jamkesmas* (health insurance for people with insufficient financial means) was implemented. Jamkesmas is financed from the national budget through a complex fund channelling mechanism, with 4.6 trillion Rupiah (317 million Euro) allocated in 2008. At the same time, a local government health insurance scheme (*Jamkesda*) provided for the local communities. The new Jamkesmas programme provides free-of-charge health care services, including maternal, neonatal and child health. The costs have increased sharply from 36 million Rupiah (2.5 million Euro) in 2004 to 76.4 million Rupiah (5.3 million Euro) in 2007. Although considerable efforts have been made, the quality of service is still insufficient.
Maternal Health

The maternal health programme was initiated, planned, and implemented by the central government. As a result the large majority of maternal, neonatal and child health policies in Indonesia, such as Village Midwives, Making Pregnancy Safer and Integrated Management of Childhood Illness are national initiatives driven by the central government. They are strongly influenced by international agendas. In 2002, The World Health Organisation’s (WHO) Making Pregnancy Safer policy was adopted as the key strategy for maternal health in Indonesia. The policy was established as a continuation of the government’s Safe Motherhood programme. The translation of the Safe Motherhood policy into effective implementation, and more importantly into improvements in maternal and neonatal health at the local level suffered from serious shortcomings. The support from the central authorities to local governments was insufficient. Local governments have not been mobilised to prioritise and fund the maternal, neonatal and child health agendas. Furthermore, the central government has limited capacity to finance the provision of maternal, neonatal and child health services along the continuum of care; and to address the social determinants of health in the local communities.

Since 1989 the central government has tried to improve access to skilled birth attendants by placing midwives in every village, however by 2006 only 40 percent of Indonesian villages had midwives in place. Due to many (cultural) barriers, women continued to use more traditional birth attendants, rather than the skilled birth attendants. Also a lack of clinical experience as well as the limited leadership capacity of the village midwives, combined with a large number of mothers not having access to health centers, were barriers to achieving a sufficient quality of maternal health care.

In 2012, the government decided to place an average of 11 nurse-midwives in every PHC. They have a responsibility to provide maternity health care at the sub district level. Antenatal care services by the nurse-midwives include height and weight measurements, blood pressure measurements, the provision of iron tablets to all pregnant women, tetanus toxoid immunization, abdominal examinations, health education, blood and urine tests as well as detection of the early signs and symptoms of a pregnancy at risk. Nationally, only 53 percent of the pregnant women appeared to be informed about the signs and symptoms of anaemia during pregnancy, only 29 percent of the pregnant women took at least 90 iron tablets during their pregnancy and 41 percent of the pregnant women underwent any blood test for anaemia (table 2). Health education has only been given to primigravida.

In 2013, 87 percent of the pregnant women received at least four antenatal care visits, which is the national target. The percentage in Yogyakarta Special Province was slightly
below the national standard, 83 percent. Maternal deaths in Indonesia are mainly caused by post partum haemorrhage, pregnancy induced hypertension, infection, stillbirth and abortion.\textsuperscript{1,5} Information about maternal health is given in table 2.

**Table 2. Maternal Health Profile (2012)**

<table>
<thead>
<tr>
<th>Health profile</th>
<th>Indonesia</th>
<th>Yogyakarta Special Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Rate</td>
<td>2.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Antenatal care of at least four visits (percent)</td>
<td>87</td>
<td>83</td>
</tr>
<tr>
<td>Mother Mortality Rate (MMR) per 100,000 live births</td>
<td>220</td>
<td>104</td>
</tr>
<tr>
<td>Taking 90 iron tablets during pregnancy (percent)</td>
<td>29.2</td>
<td>54.8</td>
</tr>
<tr>
<td>The range of anaemia prevalence among pregnant women (percent)</td>
<td>35-44</td>
<td>15-39</td>
</tr>
<tr>
<td>Post partum haemorrhage (percent)</td>
<td>20</td>
<td>30.3</td>
</tr>
<tr>
<td>Low Birth Weight (percent)</td>
<td>10.2</td>
<td>9.4</td>
</tr>
</tbody>
</table>

**Maternal health facilities**

| Number of PHCs with basic emergency obstetric and neonatal care               | 2,782     | 24                          |
| Total number of Midwives                                                     | 137,110   | 1,699                       |
| Number of Midwives working in PHCs                                           | 102,176   | 899                         |
| Number of Specialists                                                        | 36,746    | 1,237                       |
| Number of General Practitioners                                              | 41,841    | 1,408                       |

Sources: Indonesia Demographic and Health Survey 2012, Indonesia Health Profile 2012, DIY Health Profile 2012, WHO country data sheet 2012.

**Midwifery education and organisation**

In 1950, midwifery education became a part of the formal education at the senior high school level. Based on Government Regulation number 32/1996, midwifery became a part of the nursing resources, and midwifery education a part of a nurse’s training. A formal midwifery education is a three year diploma course, after three years of basic nursing training or senior high school.\textsuperscript{15,16} Less than 40 percent of the total nurse-midwives graduated the three year diploma course.\textsuperscript{16,17} There is a program of on-going education for nurse-midwives, but the opportunities to receive such training or continuing in education to improve nurse-midwives’ knowledge and skills are limited.

The professional organization for nurse-midwives (Ikatan Bidan Indonesia) was established in 1951 and in 1956, this organisation became a member of the International Confederation of Midwives (ICM).\textsuperscript{15} In 2007, the Ministry of Health launched a national regulation to standardize midwifery practices in Indonesia.\textsuperscript{18} A registration and certification system for the nurse-midwives has existed since 2013. The nurse-midwives can renew their certification every five years by completing certain requirements, such as training,
continuing education, and seminars. However, Indonesia does not have a national board of nurse-midwifery that can control and monitor the quality of midwifery practices.

**Anaemia amongst pregnant women as a major problem**

Anaemia during pregnancy is defined as a condition where the pregnant woman has a haemoglobin level lower than 11 g/dl. It is classified into three categories, mild (Hb level at ≥9 g/dl to ≤11 g/dl), moderate (Hb level at ≥7 g/dl to ≤9 g/dl) and severe (Hb level less than 7 g/dl).\(^{19}\)

The Indonesian Demographic Health Survey 2012 mentions that the high maternal mortality rate remains a serious problem and the high prevalence of anaemia during pregnancy is one of the major causes of the high maternal mortality rate.\(^1\) Indonesia has the highest prevalence of anaemia during pregnancy amongst the South East Asian nations.\(^20\) In 2011, about 40 percent of pregnant women in Indonesia were anaemic.\(^20\) However, the detailed data of the prevalence of anaemia amongst pregnant women in every province in Indonesia is limited and dated.

Anaemia during pregnancy can be caused by many factors, such as infections (HIV, TB, malaria, hookworm) and iron deficiency.\(^{19-21}\) The major cause of anaemia in Indonesia, as well as in Yogyakarta Special Province, is Iron Deficiency Anaemia.\(^1,22\) We knew that anaemia during pregnancy had many consequences to maternal and child health, such as post partum haemorrhage, miscarriage, premature birth, and low birth weight.\(^{19,23}\) Iron Deficiency Anaemia contributes to the high numbers of maternal mortality in Indonesia.\(^23\)

The prevalence of anaemia during pregnancy in Yogyakarta Special Province is about 39 percent, slightly below the national percentage.\(^24\) Interestingly, Yogyakarta Special Province has the highest coverage of iron tablets distribution (89.5 percent) in Indonesia, but the compliance with taking these iron tablets is only 54.8 percent. Yogyakarta Special Province also has the highest coverage of antenatal care visits compared to the other provinces. Nevertheless, the quality of care received during antenatal care is inadequate.\(^1,3,25\) There is a lack of studies which give profound insights into why the prevalence of iron deficiency anaemia amongst pregnant women in Yogyakarta Special Province remains high.

**National programme to combat anaemia**

In 2000, along with all the other nation states, Indonesia signed up to the Millennium Development Goals (MDGs). Regarding the maternal health care improvement, which is the fifth of the eight targets of the MDGs, Indonesia committed to decrease the maternal
mortality rate from 228/100,000 live births to 104/100,000 live births by 2015, as one of the targets of the Millennium Development Goals (MDGs).\(^{26}\)

Since 1978, the Ministry of Health has implemented a national programme to minimize the prevalence of anaemia, as well as to increase the number of antenatal care visits. Free iron tablets were given to all pregnant women who attended antenatal care services.\(^{27}\) Food supplements were also given to pregnant women with severe anaemia. The number of nurse-midwives was increased, in order to improve the antenatal care service in the country.

Nevertheless, the targets of both national and international programmes were hard to achieve. Some barriers to prevent anaemia during pregnancy were identified, such as the patients’ low compliance with the regimen of treatment, the patients’ health illiteracy, a lack of competence by the nurse-midwives in identifying the early signs of anaemia during pregnancy, and a lack of compliance with the antenatal care standard.\(^{26-30}\) Maybe other barriers exist amongst patients and nurse-midwives, such as the patients’ strength of cultural beliefs or their lack of health education, or the lack of social support from the patients’ husbands and families.

**Essential factors to improve the quality of care of pregnant women with iron deficiency anaemia**

Iron deficiency anaemia is related with an unhealthy lifestyle and poverty. Poor eating habits (taking iron tablets combined with drinking coffee or tea after meals), non-compliance with taking the iron tablets, not attending antenatal care during pregnancy, and health illiteracy are some of the predictors of iron deficiency anaemia during pregnancy.\(^{31,32}\) Therefore, a healthy life style is essential to prevent anaemia during pregnancy.

The role of the husbands and/or family members in giving social support to the pregnant women is also important. Some studies reveal that this lack of social support from husbands and/or family members has an impact on low birth weights, poor labour progress, preterm labour as well the development of depression and anxiety.\(^{33-35}\) In contrast, the active involvement of husbands and/or family in antenatal care programmes positively contributes to the utilization of the antenatal care services. They motivate the pregnant women to comply with the antenatal care schedule.\(^{36}\)

Also the nurse-midwives’ professional behaviour plays a role in increasing the utilization of the antenatal care services. Their interaction, and the way nurse-midwives communicate with their patients and/or family members seemingly influences antenatal care attendance.\(^{37}\) Patients also expect the nurse-midwives to provide care based on the...
patient’s needs.\textsuperscript{38} Moreover, many studies report the substandard care given by nurse-
midwives.\textsuperscript{26-30} Therefore, adequate midwifery competencies need to be achieved by the
nurse-midwives in order to improve their quality of antenatal care. Some studies suggest
that training and continuing education for nurse-midwives were the best investments for
improving the quality of midwifery care.\textsuperscript{39,40}

In summary, it can be identified that at least four essential themes/pillars should be
considered to improve the quality of antenatal care for pregnant women with iron
deficiency anaemia. Those four essential pillars are: the pregnant women’s healthy life
style, social support from the husband and/or family members, the nurse-midwife’s
professional behaviour, and adequate midwifery treatment.

**An alternative strategy to combat iron deficiency anaemia**

Iron deficiency anaemia in pregnancy needs to be responded to by combining strategic
actions that can comprehensively combat the disease.\textsuperscript{41,42} The strategic actions include
improvements in the women’s health literacy, the involvement of their husbands or family
members in the antenatal care programmes, the stimulation and encouragement of a
healthy lifestyle for the women and their families, the offering of adequate antenatal
treatments and improvements of the professional attitudes of the nurse-midwives.\textsuperscript{40,43}
Those strategic actions must result in ensuring better maternal care as well as in a better
timing of antenatal care enrolment.\textsuperscript{44-46} Because the experiences of the nurse-midwives are
very important, we firstly wished before developing a new model, to interview nurse-
midwives to get more insights into their views and opinions.

The results of these interviews with the nurse-midwives, the existing literature, and
experts’ opinions, will be our guide in designing a new model for antenatal care to manage
pregnant women with iron deficiency anaemia. Based on the four themes we called this
new model the Four Pillars Approach: the pillars of encouraging and improving a healthy
lifestyle for the pregnant women, of improving pregnant women’s social support by the
husband and family members, of providing an adequate midwifery treatment, and of
improving the professional behaviour of the nurse-midwives.

The first and second pillar, a healthy lifestyle and the strengthening of social support,
represent the patients’ empowerment. Patient empowerment will be stimulated by
involving pregnant women and their husbands or family members in parenting classes
during the period of the pregnancy, and by providing a guide book about how to deal with
anaemia during pregnancy.
The third and fourth pillar, adequate midwifery treatment and the professional behaviour of the nurse-midwives, represent the empowerment of the nurse-midwives. The nurse-midwives professional competences will be improved by conducting training in the Four Pillars Approach to managing pregnant women with iron deficiency anaemia. This new approach will be developed, implemented and evaluated in the Yogyakarta Special Province. Therefore, a series of studies on anaemia management in Public Health Centres was conducted in Yogyakarta Special Province and Central Java Province. Our findings might be important and relevant for other provinces in Indonesia or for other countries that are struggling against anaemia during pregnancy.

**Study aims**

Iron deficiency anaemia is one of the health problems among pregnant women that contributes to the high prevalence of maternal death in Indonesia. National programmes have been conducted to decrease the prevalence of anaemia, however iron deficiency anaemia amongst pregnant women still remains a big problem. There is a lack of studies that give any insight into why its prevalence remains so high, and of studies which investigated the effectiveness of interventions in iron deficiency anaemia.

The aim of this study is to develop and to evaluate the effectiveness of a new model in managing pregnant women with iron deficiency anaemia in Public Health Centres.

**Research questions**

1. What are the experiences of the nurse-midwives in Yogyakarta Special Province in managing antenatal care for pregnant women with iron deficiency anaemia, and how do the nurse-midwives perceive their competences in the prevention of anaemia?

2. How effective is the new model called the Four Pillars Approach to managing pregnant women with iron deficiency anaemia compared to the usual care?

3. What are the facilitators and barriers to the intervention of the Four Pillars Approach in PHCs in Yogyakarta Special Province, from the perspectives of the nurse-midwives and nurse-midwife coordinators?

4. How satisfied are the nurse-midwives and their patients with the Four Pillars Approach in Public Health Centres in Yogyakarta, Indonesia?
Outline of the thesis

The main body of this thesis comprises a series of five articles reporting on the studies that are part of this thesis. All articles stand on their own, comprising of an introduction, a method, a result and a discussion paragraph, which makes a certain degree of repetition inevitable. The research questions are addressed in the subsequent chapters of this thesis.

Chapter 1 provides a general introduction to the thesis.

Chapter 2 describes a qualitative study, in which we conducted indepth interviews to explore the nurse-midwives’ experiences with and the barriers to the prevention of anaemia during pregnancy, and nurse-midwives’ perceptions of their competencies related to anaemia management at Public Health Centre in Yogyakarta Special Province. (question 1)

Chapter 3 describes the study protocol of the evaluation of the new model, the Four Pillars Approach in managing pregnant women with iron deficiency anaemia.

Chapter 4 presents the results of a non randomized intervention controlled study, conducted to measure the effectiveness of the new model in managing pregnant women with iron deficiency anaemia compared to the usual care. (question 2)

Chapter 5 addresses the barriers and facilitators of the new model in managing pregnant women with iron deficiency anaemia. Focused group discussions with nurse-midwives and nurse-midwife coordinators, who received training about the Four Pillars Approach, were used to investigate the barriers and facilitators from their perspectives. (question 3)

Chapter 6 describes the satisfaction of the nurse-midwives and patients using quantitative (questionnaire) and qualitative methods (focus groups). (question 4)

Chapter 7 presents the general discussion with regard to the main findings and reflections on the outcomes of this thesis. The main methodological issues of the study will be discussed. The chapter ends with clinical implications for practice and recommendations for further research.
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CHAPTER 2

A qualitative study on barriers of managing anaemia during pregnancy in Public Health Centres: Perceptions of Indonesian nurse-midwives

Widyawati
Suze Jans
Sutarti Utomo
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Antoinette LM Lagro – Janssen

BMC Pregnancy and Childbirth 2015;15:47
Abstract

Background
Anaemia in pregnancy remains a major problem in Indonesia over the past decade. Early detection of anaemia in pregnancy is one of the components which are unsuccessfully implemented by nurse-midwives. This study aims to explore nurse-midwives’ experiences in managing pregnant women with anaemia in Public Health Centres.

Methods
We conducted a qualitative study with semi-structured face to face interviews from November 2011 to February 2012 with 23 nurse-midwives in five districts in Yogyakarta Special Province. Data analysis was thematic, using the constant comparison method, making comparison between participants and supported by ATLAS.ti software.

Results
Twelve nurse-midwives included in the interviews had less than or equal to 10 years’ working experience (junior nurse-midwives) and 11 nurse-midwives had more than 10 years’ working experience (senior nurse-midwives) in Public Health Centres. The senior nurse-midwives mostly worked as coordinators in Public Health Centres. Three main themes emerged: 1) the lack of competence and clinical skill; 2) cultural beliefs and low participation of family in antenatal care programme; 3) insufficient facilities and skilled support staff in Public Health Centres. The nurse-midwives realized that they need to improve their communication and clinical skills to manage pregnant women with anaemia. The husband and family involvement in antenatal care was constrained by the strength of cultural beliefs and lack of health information. Moreover, unfavourable work environment of the Public Health Centres made it difficult to apply antenatal care the pregnant women’s’ need.

Conclusions
The availability of facilities and skilled staffs in Public Health Centre as well as pregnant women’s husbands or family members contribute to the success of managing anaemia in pregnancy. Nurse-midwives and pregnant women need to be empowered to achieve the optimum result of anaemia management. We recommend a more comprehensive approach in managing pregnant women with anaemia, which synergizes the available resources and empowers nurse-midwives and pregnant women.

Keywords: nurse-midwives, competences, anaemia, pregnant women, antenatal care, comprehensive approach
Background

Anaemia in pregnancy remains a major problem in Indonesia.\textsuperscript{1,2} Anaemia in pregnancy is defined as a condition where the level of haemoglobin (Hb) in the blood is less than 11 g/dl.\textsuperscript{3} Based on data of the Indonesia Health Survey 2007, the prevalence of anaemia in pregnancy in Indonesia is 44\%, with a similar percentage found in Yogyakarta in 2009.\textsuperscript{4,5} Studies have suggested that the main cause of anaemia in pregnancy in Indonesia is iron deficiency, resulting from the insufficient consumption of foods containing iron, vitamin A and folic acid, and from the presence of hookworms.\textsuperscript{1,2,6-8} In several places in Indonesia, anaemia is also caused by HIV and malaria.\textsuperscript{9,10}

Considering the impact of anaemia on the outcome of pregnancy, pregnant women need to receive an adequate antenatal care. Adequate antenatal care prevents the women and the unborn baby to have health problems.\textsuperscript{11} In order to provide an adequate antenatal care, in 2007 the Ministry of Health decreed the standard of midwifery care which consists of antenatal care, intranatal care, postnatal care, neonatal care, healthy child care under five, and reproductive period care.\textsuperscript{12} Indonesian antenatal care standard consists of 11 procedures that have to be accomplished by nurse-midwives.\textsuperscript{13} These procedures are 1) weight measurement, 2) upper arm circumference measurement, 3) blood pressures measurement, 4) fundal height measurement, 5) fetal heart rate measurement, 6) determine fetal presentation, 7) provide tetanus toxoid immunisation, 8) provide iron tablet, 9) provide laboratory test, 10) provide referral properly, 11) provide health education. To implement these procedures correctly, every Public Health Centre is required to develop a technical procedure or technical guideline, which describes in details on how the nurse-midwives should implement these procedures promptly.\textsuperscript{13}

According to the Indonesia Demographic and Health Survey 2002 and 2012, one time antenatal care visit and four time antenatal care visits had respectively a coverage of 94.9\% and 81.0\% which is quite high.\textsuperscript{14,15} Despite the high percentages of antenatal care visits, it has not represented the quality of antenatal care given. The studies on the quality of antenatal care related to anaemia prevention in Indonesia shown that 30\% of pregnant women who attend antenatal care in Public Health Centres have not received iron tablet, and 40\% of the pregnant women have not been informed about signs of pregnancy complications.\textsuperscript{16} More over, only 58\% of pregnant women get an early examination of signs and symptoms of anaemia during pregnancy.\textsuperscript{17}

The background to why these procedures are not carried out is unknown. More insight into the difficulties in implementation of the antenatal care standard to detect anaemia early in
pregnancy would support policy maker and nurse-midwives in achieving a clinical practice which is well tailored to the pregnant women’s needs.

Our study aims to explore the experiences of the nurse-midwives in Yogyakarta Special Province on how they carry out antenatal care for pregnant women with anaemia, as well as to provide insight into their perceived competencies in prevention of anaemia.

Methods

Design
We used a qualitative method with semi-structured interviews.

Setting and sample

Characteristics of the setting
The data were collected in the main Public Health Centres located in Yogyakarta Special Province, in Indonesia. In total, there are 24 main Public Health Centres with a total of 264 nurse-midwives responsible for the provision of health care services for almost 3.5 million inhabitants. All mother and child health care services in Public Health Centres are conducted by nurse-midwives.

Sample and recruitment
The inclusion criteria of participants were: being a nurse-midwife with a formal educational background in nurse-midwifery at diploma level, with at least two years of antenatal work experience, employed by a Public Health Centre and resident of Yogyakarta Special Province. The head of the Public Health Centre chose one of the nurse-midwives as a representative from each public health centre.

Data collection
The interview guide was based on the existing literature about implementation of antenatal care services including the standard component of early detection on anaemia in pregnancy as well as expert (senior nurse-midwives’) opinion. The topics included: the nurse-midwife’s experience in applying the current antenatal care standard; the nurse-midwife’s perception of her competencies to manage pregnant women with anaemia; the nurse-midwife’s perception of patients’ and their family’s experience of antenatal care; and the availability of supporting resources such as medical facilities and human resources in the Public Health Centres.
At the start of the interview additional information was collected about participants’ characteristics, such as age, years of experience as a nurse-midwife, and details of training followed during the last five years.

All interviews were carried out between November 2011 till February 2012 by two senior nurses experienced in qualitative interviewing. Each interview lasted around 30 minutes. To minimize disturbances to the daily running of the clinics, interviews were scheduled before or after the working hours, located in a private room in the Public Health Centre. After 23 interviews the data collection was stopped because no new themes were emerging and therefore we concluded saturation was achieved. Interviews were fully recorded and anonymously transcribed by the interviewers. An observer used a log book (research diary) to record non-verbal aspects of the interviews.

**Data Analysis**

The process of data analysis was led by the primary researcher (WW). Data analysis was thematic, using the constant comparison method of noting and coding emerging themes, and making comparisons between participants. Each transcript was coded by two members of the research team (WW and SU). Quotes have been selected to illustrate the themes that emerged from the interviews and have been translated into English. ATLAS.ti software package was used to support the analysis of the transcripts.

There are two types of positions for nurse-midwives. The nurse-midwife and the nurse-midwife coordinator: both work at a Public Health Centre on a daily basis. The nurse-midwife coordinator has additional responsibilities in administrative work, and she is the supervisor of all nurse-midwives in the Public Health Centre.

Practical experience has been divided into two categories; junior nurse-midwives with equal or less than ten years practical experience and senior nurse-midwives with more than ten years practical experience.

We divided nurse-midwives into three age categories: under 25 years old, between 25 until 50 years old, and over 50 years old. Working area is based on the district where the Public Health Centre is located. Nurse-midwife’s training during the last five years has been classified into three categories: training in management of anaemia in pregnancy; other kinds of training related to maternal health; and never been trained.

**Ethical consideration**

Ethical approval was given by the Faculty of Medicine Universitas Gadjah Mada. Prior to the interview process, the interviewer explained the aim of the study to each participant and
voluntarily participation in the study was confirmed. Written consent was obtained prior to all interviews. All participants had the right to withdraw their participation at any given moment.

Results

Almost half of the 23 participating nurse-midwives were senior (Table 1). All participating nurse-midwives were women. Eight of the 23 nurse-midwives worked as coordinators. 39% of the participants were between 25 – 50 years of age. Almost equal numbers of junior and senior nurse-midwives participated in the study. The nurse-midwives have been trained in various maternity service aspects during their initial training but none of them received any training concerning the management of pregnant women with anaemia.

Data analysis identified three main themes among the experiences of the nurse-midwives: 1) the lack of competence and clinical skills; 2) cultural beliefs and low participation of family in the antenatal care programme; 3) insufficient facilities and support of staff in the Public Health Centres. Table 2 shows the data analytic framework of this study.

The lack of competences and clinical skills

The nurse-midwives mentioned their difficulties and expressed unease at providing health information to pregnant women. They worried that their explanation did not meet the patient’s need.

“The most difficult thing I have done so far is to deliver health information to patients ... I’m afraid that what I know is only a little bit ... then ... I could not answer patient’s questions ...” (junior nurse-midwife, 22 years old)

Besides communication skills, all nurse-midwives felt that patience, empathy, and politeness were important. The more experienced nurse-midwives said that their patience often decreased or was tested when they met a pregnant woman who did not understand or would not listen to what they tried to explain to her. These senior nurse-midwives said that they therefore readily delegated this task to a student.

“I frequently feel irritable when the patient does not understand what I’m saying ... Whether I don’t give the information clearly ... whether the patient is uneducated ... So, I ask the student to teach the patient ... if not ... let the nutritionist do so [give health information to the woman] ...” (senior nurse-midwife, 53 years old, coordinator)
Some of the nurse-midwives expressed doubts about their clinical skills to detect early signs of anaemia in pregnancy. They also mentioned that they still need a lot of practice to perform accurate investigations to detect anaemia early in pregnancy.

“....I feel that the knowledge I got from college is not enough, sometimes...I’m not sure to what I have done...detecting early signs of anaemia is not as simple as I learnt at college...“(junior nurse-midwife, 23 years old)

Table 1. Characteristics of participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N = 23</th>
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<tr>
<td>Nurse-midwife’s Position</td>
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<td>Nurse-midwife coordinator</td>
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<td>35</td>
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<td>Nurse-midwife non coordinator</td>
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<tr>
<td>Working Area</td>
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</table>
| Gunungkidul district                  | 5      | 21.7%
| Bantul district                       | 5      | 21.7%
| Sleman district                       | 4      | 17.4%
| Kota district                         | 3      | 13.1%
| Kulonprogo district                   | 6      | 26.1%
| Age                                    |        |    |
| < 25 years                             | 6      | 26.1%
| 25 – 50 years                         | 9      | 39.1%
| >50 years                              | 8      | 34.8%
| Practical experience                  |        |    |
| ≤ 10 years                             | 12     | 52 |
| >10 years                              | 11     | 48 |
| Training during last five years       |        |    |
| Anaemia in pregnancy management       | 0      | 0  |
| Other kinds of training related to maternal health | 20 | 87 |
| Never been trained                    | 3      | 13 |

Influence of cultural beliefs on family participation in antenatal care

The nurse-midwives were confronted with the strength of cultural beliefs concerning food taboos such as pregnant women are forbidden to eat meat, fish or eggs and the family’s attitudes toward pregnancy such as pregnant women should take care of herself and her pregnancy, but the husband will take the necessary decisions regarding to his wife’s pregnancy. For example, the husband will decide where the pregnant woman should attend her antenatal care (to the health professional or to the traditional healer) and where the pregnant woman should give birthing process (at home or at the public health centre). According to the nurse-midwives, the strength of cultural believes among pregnant women...
and her family members result in an unhealthy lifestyle of pregnant women. In addition, they reported a lack of health information resources such as booklet, leaflets, or health education that can be used by the women, husbands and family members to improve their knowledge about anaemia in pregnancy.

“It is rare that the patient is accompanied by the husband ... if he is there ... he will not join in the antenatal care room ... but he waits in the parking area ... he thinks that it is a women’s business ...” (senior nurse-midwife, 40 years old)

“... A difficult one is when the woman and her family have strong beliefs on dukun (traditional healer) ... they (family members including husband) do not want to report the pregnant woman’s health problem to us but will go to the dukun....” (senior nurse-midwife, 54 years old, coordinator)

“... I have to explain many times to the pregnant women that it is only a myth ... many pregnant women do not want to consume meat or fish (they do not want to consume because it is forbidden or food taboo for pregnant woman) ... because they believe that it will make odour in their blood ...” (senior nurse-midwife, 47 years old, coordinator)

The majority of the nurse-midwives believed the husband and family members had an important influence on pregnant women’s lifestyle. For example they thought husband and family remind a woman to take her daily iron tablets, and encourage her to make regular visits to the nurse-midwife. Nurse-midwives felt it was important that pregnant women were accompanied to their antenatal check-ups by family members so that they can be encouraged to participate in her care.

For me ... it is better if the husband can join in [in the antenatal room] ... to listen when I’m doing antenatal care ... and I can ask him to remind his wife to take the tablet [iron tablet] ... sometimes she forgot ... or she doesn’t want to take the pills because it can induce nausea ... (senior nurse-midwife, 45 years old)

One nurse-midwife said that involving a husband or family members will give her an additional task in antenatal care, because she has to spend extra time to answer the husband’s questions.

“... I do not believe that a husband involved in antenatal care will be helpful ... Based on my experiences ... is contrary ... a husband in the antenatal room makes my work doubled ... yes ... because usually men are asking more than women ...” (senior nurse-midwife, 53 years old)
<table>
<thead>
<tr>
<th>Theme Emerges</th>
<th>Topics</th>
<th>Classifications</th>
<th>Categories</th>
<th>Sub-categories</th>
<th>Code</th>
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<tbody>
<tr>
<td>The lack of competences and clinical skills</td>
<td>Antenatal care standard implementation</td>
<td>Barriers</td>
<td>Too many procedures that have to be accomplished</td>
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<td>Unclear procedures guideline</td>
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<td>Afraid of making a mistake</td>
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Table 2. Data Analytic Framework
However, most nurse-midwives believed that they can overcome inappropriate cultural beliefs by providing health information and actively involving the husbands and/or family member in antenatal care.

**Insufficient facilities, resources and support of staff**

All nurse-midwives mentioned that although equipment such as height and weight scales, portable ultrasound equipment, and stethoscopes were available at the Public Health Centre, they felt they were of insufficient quantity and quality. Some Public Health Centres have ultrasound equipment available, but the nurse-midwives said they have not been trained to use it.

Furthermore they expressed they were hindered in their work because of insufficient facilities and staff. They mentioned that blood and urine testing were available, but only one person in every Public Health Centre is capable to handle laboratory tests. As a consequence, the nurse midwives felt doubtful about being able to implement an adequate standard of antenatal care.

All nurse-midwives mentioned that they prescribed iron tablets as a routine procedure to all pregnant women without exception. But they mentioned that the technical procedure did not give any clarity about timing and indications of Hb testing.

*It depends .... there are some that have the Hb measurement and some that don’t .... it is not clear when they should be measured (Hb) .... because it’s not written in the technical procedure...* (Nurse-midwife, 37 years old)

All nurse-midwives and nurse-midwives coordinators mentioned that the large workload and insufficient staff numbers prevent them from carrying out their work according to procedures.

*“What is a bother is having to do a lot of writing in this format, not only writing the daily reports, but it’s even more of a bother if there is a request from the departments for data for the annual report...”*(senior nurse-midwife, 55 years old, coordinator)

For example they understand that checking Hb is one of the components of standard antenatal care, but they reported that their compliance with the standard varied, depending on their workload.

*“... sometimes I did not check a patient's condition in detail ... and I forgot to check the woman’s Hb, mostly when so many patients are queuing outside ...”*(senior nurse-midwife, 47 years old, coordinator)


Discussion

Main finding

According to the perceptions of nurse-midwives there are three factors which hinder the adequate prevention of anaemia in pregnancy in Public Health Centres: the substandard antenatal care; the competences to cope with cultural beliefs; and the need of a more comprehensive approach to antenatal care.

Substandard antenatal care

The nurse-midwives perceived that insufficient facilities, high work load, lack of training opportunities and learning resources for the nurse-midwives, and limited supporting staff appear to be the most important barriers for better antenatal care services in Public Health Centres. A different perception arose from pregnant women, they perceived that the substandard antenatal care they have received in Public Health Centres is related to the services free of charges.\(^\text{19}\)

Other studies in South Sumatra, North Jakarta, Kebumen, and Central Java highlight similar factors which affect the success of maternal health care programmes. In these studies, ineffectiveness of nurse-midwives’ work placement coupled with the lack of training opportunities, and the lack of learning resources, resulted in substandard care for pregnant women.\(^\text{22,23}\) In West Java, only 18% of nurse-midwives in Public Health Centres have been trained in early risk detection in pregnancy and normal delivery care and 4% on live saving skills.\(^\text{24}\) Other studies mentioned that 90% of nurse-midwives in Indonesia have not had any opportunities for continuing education.\(^\text{25}\) More over, the Ministry of Health stated that the skills of 60% the nurse-midwives’ were misused and underused because of the absence of a clear job description.\(^\text{26}\) Therefore, the competence of nurse-midwives in taking care for pregnant women with anaemia can not be guaranteed.

Coping with cultural beliefs

Nurse-midwives seem to struggle with how to cope with the women’s and their families’ cultural beliefs. The strength of cultural beliefs enormously influences women’s healthy lifestyle and family participation in antenatal care programme.\(^\text{27}\) Cultural beliefs on food taboo for pregnant women contributes to the incidence of anaemia in many countries.\(^\text{28-32}\) The strength of cultural beliefs enormously influences women’s healthy lifestyle and family participation in antenatal care programme.\(^\text{27}\) Therefore the nurse-midwives must acquire the appropriate knowledge and skills in cultural sensitive care.\(^\text{33}\)
To gain more insight into the level of health literacy of pregnant women and their families, nurse-midwives need to explore women’s knowledge of what constitutes a healthy lifestyle as well as their cultural beliefs. Communication skills are essential to bridge the cultural diversity between health care providers and their clients. Communication skills have been emphasized as one of nurse-midwives’ core competencies. However, our study reveals that the majority of nurse-midwives express a need for more training in communication skills. They would like to feel more confident by being competent in delivering health information about anaemia and a healthy lifestyle to pregnant women and being able to bridge the cultural beliefs. Moreover they like to be more competent in an early detection of anaemia in pregnancy.

Our study results are supported by other studies which concluded that nurse-midwives’ communication skills and the interaction with the client need to be improved and highlighted that basic medical skill also important to be improved.

**A more comprehensive approach to antenatal care**

According to the nurse-midwives, in some cases the women and families prefer to visit a traditional healer rather than to visit the nurse-midwives for antenatal check ups. The reasons of choosing traditional healer because they do not have to pay more to the traditional healer, easy to be accessed, the myth of traditional healer, and they will be helped for household chores. Health workers’ attitudes, delay in providing care, substandard care, and unavailability of skilled attendant are some factors that raise dissatisfaction with the antenatal care services.

Anaemia in pregnancy needs immediate attention by combining some strategies that can comprehensively combat the disease. A combination of strategies could include the women’s health knowledge improvement, husbands or family members participation in antenatal care programme, positive beliefs and practices stimulation, professional attitudes and adequate antenatal treatment.

**Limitations and strengths**

Our study presents data on those who carry out family health policy relating to the management of pregnant women with anaemia at Public Health Centre level. Due to the qualitative nature of this study, the results represent the situation in Yogyakarta Special Province. However we did succeed in including a group of nurse midwives who represent a broad representation of the Public Health Centres in the Districts, from junior to senior level, from non-coordinator to coordinator. Therefore we assume that our findings are
applicable to health care systems with similar conditions in other regions and countries as well.

**Conclusions**

The management of anaemia during pregnancy in Public Health Centres in Yogyakarta Special Province is constrained by three factors. First factor is the nurse-midwives’ competencies in communication and clinical skills to manage pregnant women with anaemia. The second is the husband and family involvement in antenatal care was constrained by the strength of cultural beliefs and lack of health information and the last is unfavourable work environment of the Public Health Centres made it difficult to apply antenatal care the pregnant women’s’ need.

The success of a maternal health care programme not only depends on the nurse-midwives skills, but should also be supported by the organisation where the nurse-midwives work. A healthy and supportive organisation knows its employees, understands their needs and maintains and improves their level of competence by providing a combination of facilities, learning resources and training for their employees.47

Based on our research findings, we conclude that pregnant women with anaemia need to be cared for by using a more comprehensive approach which can empower nurse-midwives and pregnant women in order to improve maternal and child well being.

**Acknowledgements**

We would like to thank the participants, the nurse-midwives in Yogyakarta Special Province and the staffs of the Districts and Provincial Health Offices, our colleagues and field assistants helping us during the study.
References


CHAPTER 3

A randomised controlled trial on the Four Pillars Approach in managing pregnant women with anaemia in Yogyakarta-Indonesia: a study protocol

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Hans Bor
Rukmono Siswishanto
Jeroen van Dillen
Antoinette LM Lagro – Janssen

BMC Pregnancy and Childbirth 2014, 14:163
Abstract

Background
Anaemia is a common health problem among pregnant women and a contributing factor with a major influence on maternal mortality in Indonesia. The Four Pillars Approach is a new approach to anaemia in pregnancy, combining four strategies to improve antenatal and delivery care. The primary objective of this study is to measure the effectiveness of the Four Pillars Approach. The barriers, the facilitators, and the patients’ as well as the midwives’ satisfaction with the Four Pillars Approach will also be measured.

Methods
This study will use a cluster randomised controlled trial. This intervention study will be conducted in the Public Health Centres with basic emergency obstetric care in Yogyakarta Special Province and in Central Java Province. We will involve all the Public Health Centres (24) with emergency obstetric care in Yogyakarta Special Province. Another 24 Public Health Centres with emergency obstetric care in Central Java Province which have similarities in their demographic, population characteristics, and facilities will also be involved. Each Public Health Centre will be asked to choose two or three nurse-midwives to participate in this study. For the intervention group, the Public Health Centres in Yogyakarta Special Province, training on the Four Pillars Approach will be held prior to the model’s implementation. Consecutively, we will recruit 360 pregnant women with anaemia to take part in the study to measure the effectiveness of the intervention. The outcome measurements are the differences in haemoglobin levels between the intervention and control groups in the third trimester of pregnancy, the frequency of antenatal care attendance, and the presence of a nurse-midwife during labour. Qualitative data will be used to investigate the barriers and facilitating factors, as to nurse-midwives’ satisfaction with the implementation of the Four Pillars Approach.

Discussion
If the Four Pillars Approach is effective in improving the outcome for pregnant women with anaemia, this approach could be implemented nationwide and be taken into consideration to improve the outcome for other conditions in pregnancy, after further research.

Keywords: Four Pillars Approach, Healthy life style, Social support, Nurse-midwives’ competencies, Professional behaviour, Pregnant women, Anaemia, Antenatal care
**Background**

Anaemia is a significant health problem among pregnant women in Indonesia with a major impact on maternal mortality. The World Health Organization (WHO) defines anaemia as a condition where the level of haemoglobin (Hb) in the blood is less than 11 g/dl. Nutritional anaemia in pregnancy is found to be the most prevalent in Indonesia. Other factors causing anaemia such as HIV, malaria and hookworm infection are also found in several areas in Indonesia. One of the endemic areas for malaria is Kulonprogo, one of the districts in Yogyakarta Special Province.

The 2007 Indonesia Demographic and Health Survey reported the prevalence of anaemia in pregnancy of 44%. A similar prevalence was found in Yogyakarta in 2009. Concerning maternal health indicators in Indonesia, only 59.8% of births are attended by skilled birth attendants and less than 70% of pregnant women attend no more than four antenatal care visits. The antenatal care use is also influenced by the knowledge of patients and other family members.

Studies on maternal health services and the quality of nursing-midwifery care in Indonesia, found that nurse-midwives have a lack of knowledge and skills to identify the risk factors in pregnant women, and that their professional behaviour is sub-standard. Also the antenatal care attendance of pregnant women is low, resulting in a poor quality of antenatal care. The studies suggested that antenatal care training for nurse-midwives be improved, as an important strategy to help solve these problems. One of the studies showed that women have negative perceptions about the quality of maternity care, caused by the nurse-midwives’ impolite, negligent behaviour and intentional humiliation of the women (such as verbal abuse).

Studies from other low-income countries suggested the importance of counselling and health education for pregnant women with anaemia to improve their knowledge and awareness about a healthy pregnancy. One study advised that booklets should be given to increase women's knowledge about Iron Deficiency Anaemia (IDA) and mother and child health. All studies expressed an urgent need for training programs for nurse-midwives to improve the quality of health services, including the detection of anaemia risk during pregnancy.

The WHO stressed the importance of antenatal care visits to maintain the health status of the mother and the wellness of the foetus. A study which evaluated the effectiveness of an early antenatal health promotion workshop found that a healthy lifestyle during pregnancy correlated with maternal and infant health outcomes. The support of the
husband or other family members, and a caring attitude from the nurse-midwife proved to motivate pregnant women to attend the available antenatal care services. 22-24

Based on the result of these studies, experts’ opinion and indepth interviews with nurse-midwives, we designed a Four Pillars Approach to synergize the empowerment between pregnant women and nurse-midwives. These four pillars are: a healthy lifestyle during pregnancy, social support from the husband or other family members, adequate knowledge and skills of the nurse-midwives, and the nurse-midwives’ professional behaviour.

The first and second pillars (healthy lifestyle and the strengthening of social support) represent patient empowerment. The nurse-midwives empowerment is represented by the third and fourth pillars: adequate knowledge and skills, and the professional behaviour of nurse-midwives.

In this study, we will evaluate the effect of the Four Pillars Approach on pregnant women with anaemia.

**Objectives**

**Primary objective**
To measure the effectiveness of the Four Pillars Approach in the management of pregnant women with anaemia.

**Secondary objective**
To investigate the barriers and facilitating factors of the implementation of the Four Pillars Approach, as well as nurse-midwives’ satisfaction with the approach.

**Methods**

**Study design**
This study will use a cluster randomised controlled trial design measuring outcomes on individual level of the included pregnant women with anaemia. 25 Individual outcomes between intervention and control group will be compared.

The nurse-midwives involved in the intervention group will be trained in the Four Pillars Approach prior to the implementation of this model. The nurse-midwives will follow a refresher course on current management of anaemia in pregnancy, therapeutic
communication (counselling) and professional behaviour. They will also have practical guidance in the skill laboratory phase where they have to demonstrate their knowledge and skills to manage pregnant women with anaemia such as taking laboratory tests, carry out physical examination on the signs and symptoms of anaemia, and communication in terms of giving health education to patients.

Then, the trained nurse-midwives in Public Health Centres with emergency obstetric care in the intervention group will provide antenatal care services based on the Four Pillars Approach to the pregnant women with anaemia. Meanwhile, in the control group all Public Health Centres with emergency obstetric care will provide their usual antenatal care services to the pregnant women with anaemia.

In an intervention study, the effectiveness of antenatal care given by trained nurse-midwives to pregnant women with anaemia, following the Four Pillars Approach, will be compared to the usual care given. The usual care is the routine antenatal care carried out by nurse-midwives with a three year diploma in nursing-midwifery education.

Setting

The Yogyakarta Special Province has a total of 24 Public Health Centres with emergency obstetric care which we will use in our study. Based on the population criteria’s (such as the prevalence of anaemia in pregnancy, cultural background, health insurance), demographic characteristics (such as accessibility and location of the Public Health Centre), and facilities (such as laboratory, medical devices, and emergency kit) available in the Public Health Centre with emergency obstetric care, we will choose another 24 Centres (the same number as are in Yogyakarta) for our control group. Central Java Province has many similarities with Yogyakarta Special Province. The Provincial Health Offices of Central Java Province gave us the information about the Public Health Centres with obstetric emergency care in some districts of Central Java Province which surround Yogyakarta Province, and which we could use as research fields. Based on this information, we will randomly choose the 24 Public Health Centres for our control group. In total, we will involve 48 Public Health Centres as our research fields. Generally, there are about seven to ten nurse-midwives in every Public Health Centre eligible, according to the inclusion criteria. Considering the other health services that should be handled by the nurse-midwives in Public Health Centre and the activities that should be conducted by the nurse-midwives if they are involved in the study, the head of Public Health Centres permitted to involve only two or three nurse-midwives in this study. These are the nurse-midwives who will be trained and who will treat all pregnant women with anaemia according to the study protocol. The nurse-
midwives who have been selected, still have the right not to participate in our study. We estimate 90% of nurse-midwives will join our study.

Participants

Nurse-midwives
The inclusion criteria’s for the nurse-midwives in the intervention and control groups are: they hold a three year diploma in nursing-midwifery education, and they work on a daily basis in Public Health Centres with basic emergency obstetric care. All participants will be required to sign a consent form.

Study population
The women who attend antenatal care in the Public Health Centres will be included consecutively by the selected nurses and will be treated by them. Their inclusion criteria are: pregnant women with a Hb of less than 11 g/dl in the first trimester of pregnancy and who are living with their husband or other family members. The pregnant women with severe anaemia (Hb less than 7 g/dl), would first be referred to a doctor, then she could be included, if she does not need to be hospitalized. Pregnant women over twelve weeks of gestation will be excluded. Regarding to the agreement of patient management in our country, the pregnant women who infected by HIV, malaria, or hookworm should get the medical treatment from the specialist doctor. Therefore, women who are infected by HIV, malaria or hookworm will also be excluded.

Based upon the number of participants needed, the selected nurse midwives will be asked to recruit eligible pregnant women with anaemia. All participants will be required to sign a consent form to agree to participate in the study.

Intervention

Training of the Four Pillars Approach
This training will be given to the nurse-midwives in order to introduce the new concept of the Four Pillars Approach in managing pregnant women with anaemia, and training them how to implement this model in Public Health Centres with emergency obstetric care. Based on international literature and experts’ opinion, we will develop a training module for the Four Pillars Approach in managing pregnant women with anaemia. At the end of this training, the nurse-midwives will have the knowledge and skill to manage pregnant women with anaemia based on the Four Pillars Approach.

The training will last eight hours, and consist of two sessions. The first session will be held in-class, and the second session will take place in the skills laboratory of the Nursing School.
of the Universitas Gadjah Mada Yogyakarta. A specialist in obstetrics and gynaecology, a
senior teacher and a senior nurse will take part as teachers during the in-class session.
Different educational methods will be used, such as power point slides, video and role play.
In the skills laboratory session, training participants will be divided into six groups; each
group consisting of ten to eleven participants. Every group will be directed by one tutor and
one “simulated patient” (a person who acts like a pregnant women with anaemia). Case
scenario, drama, demonstration and role play will be used to capture a real-life situation.
All participants will be assessed and are required to pass this. The tutor will observe the
competency of each nurse-midwife, and give an assessment to each participant based on
the observation check list. There are four items to be observed by the tutor: procedure of
treatment, communication, professional behaviour, and data registration. Those items are
scored by using a Likert scale 1 – 3. Score 1 will be given if the performance of the nurse-
midwife is unsatisfactory, score 2 if the performance is reasonable but could still be
improved upon, and score 3 if the performance of the nurse-midwife is excellent and
complete according to the protocol. All the nurse-midwives are required to pass this
assessment exam with a minimum score of 60%.

Training module and booklet
A training module will be given to every nurse-midwife involved in the training programme.
The training module consists of general information about the training, training materials
(such as: physiological changes during pregnancy, anaemia in pregnancy, laboratory testing,
the concept of the Four Pillars Approach, and professional behaviour for the nurse-
midwife), the Four Pillars Approach protocol, and samples of reporting and Case Report
Forms (CRF).

The booklets will be given to all pregnant women with anaemia in the intervention group,
in order to increase their knowledge on the prevention of anaemia in pregnancy. The
booklet will be designed with text and pictures to improve understanding of the
information. It will also include a check list table to monitor and record the intake of iron
tablet supplements, folic acid and vitamins. The husband or family member will be asked to
remind the pregnant woman to take the tablets and record this in the check list.

Parenting Class
In the intervention group, the husband or other family member will be asked to attend the
antenatal care visits together with the pregnant woman and to accompany the pregnant
woman to two parenting classes. During the first parenting class, the trained nurse-
midwives will explain the content of the booklet. In the second parenting class, the trained
nurse-midwives will offer the opportunity to the pregnant women and her companion to share their experiences. The duration of each parenting class will be one hour.

**Data collection**

**Characteristics of pregnant women**

The nurse-midwives will collect the data of patient’s individual characteristics (such as: age, parity, job, the distance to the Public Health Centre from the patient’s house, and the availability of health insurance), medical history (such as: obstetric history, family health history), data about the current pregnancy (such as: Hb, antenatal examination results, parenting class attendance); and documentation relating to the number of antenatal visits, the number of non participants and reasons why, and the number of drop outs and reasons why.

**Outcome measures**

**Primary outcome**

Hb level, and the number of antenatal care attendances and skilled birth attendance at delivery of the included pregnant women with anaemia are the primary outcomes of this study.

The Hb level will be measured before the twelfth week of gestation (T0) and between week 35 and 37 of gestation in the third trimester (T1). The difference between T0 and T1 in the intervention group will be compared with the difference in the control group. The antenatal care attendance will be counted based on the documentation of the nurse-midwives at the end of pregnancy. Skilled birth attendance at delivery will be identified from the patient’s medical records in the Public Health Centre or hospital. All primary outcomes of the intervention group will be compared to those in the control group.

**Secondary outcome**

The barriers and facilitating factors of the implementation of the Four Pillars Approach, as well as nurse-midwives’ satisfaction with the approach are the secondary outcomes.

Focused group discussion will be conduct to investigate the barriers and facilitating factors. The trained nurse-midwives, and the nurse-midwives coordinators will be involved in the focused group discussion. The nurse-midwives’ and patients’ satisfaction about the implementation of the Four Pillars Approach will be measured concerning the quality of health services, procedural clarity, and communication between the nurse-midwives and patients, by using the questionnaire of Langer A with some modification to adapt it to the local situation.  

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Analysis plan

**Intervention model development**

Studying relevant literature, consulting experts in this field and in-depth interviews with the nurse-midwives will be conducted to evaluate the implementation of the current antenatal care standard and to investigate nurse-midwives experiences in managing pregnant women with anaemia in Public Health Centres. The result of those activities will be used as a knowledge base for designing the new model for managing pregnant women with anaemia in Public Health Centres.

**Monitoring of the study**

Firstly, we will invite nurse-midwives, the heads of Public Health Centres, and the coordinators of the family health programme from the Health District Offices in Yogyakarta Special Province, to attend a one day seminar. The aim of this seminar is to disseminate information, and to give the feedback, on the concept of the new model for the Four Pillars Approach in managing pregnant women with anaemia. Secondly, the revisions of the new model will be done when it is needed, based on the result of the seminar discussions. Thirdly, we will develop a team trainer for the Four Pillars Approach in managing pregnant women with anaemia, which will consist of one obstetric and gynaecologist, two maternity nurse specialists, and six senior nurses. Then, the team trainer will give a one day training course on the Four Pillars Approach in managing pregnant women with anaemia to the nurse-midwives. At the end of the training, the trainers will evaluate the nurse-midwives’ knowledge and skills to implement the Four Pillars Approach in managing pregnant women with anaemia. Finally, during the period of implementation of the Four Pillars Approach in Public Health Centres (data collection); the research team will periodically monitor and supervise this.

**Data analysis and model building**

Double entry of data will be performed in Epidata. Data will be transferred to SPSS and validated in SPSS (version 20) where all statistical analysis will be conducted.

Descriptive statistics will be used to describe the study population.

As the pregnant women are clustered within Health Care Centres, the intracluster dependence of the outcomes of the intervention will be assessed by calculating Intracluster Correlation Coefficients (ICC’s).

A non zero ICC will lead to using random intercept generalized mixed models for analyzing the results of the Four Pillar’s Approach: a multilevel logistic model for binary outcomes.
(skilled birth attendance in birthing process) and a multilevel linear regression analysis for continuous outcomes (Hb level). Count data (frequency of antenatal care visit) will be analyzed by multilevel linear regression analysis as an approximately normal distribution will be expected.

When the ICC equals zero logistic regression and a general linear model will be used to model the outcomes of the study.

The models will include intervention yes/no as well as patient characteristics as possible confounders. The baseline T0 Hb level will be entered when modelling the Hb level at T1.

The results will be expressed as difference at T1 for Hb level, odds ratio for skilled birth attendance and difference in number of antenatal care visits with 95% confidence intervals. Statistical significance is established at p-value = 0.05. Explained variance (R-squared) for the linear model and the multilevel logistic counterpart thereof will be reported as model fit statistics. Analyses will be performed according to the intention-to-treat principle.

ATLAS.ti will be used to support the analysis of the qualitative data from the semi-structured interviews on nurse-midwives’ perception of their experiences in managing pregnant women with anaemia, as well as the barriers and facilitating factors of the implementation of the Four Pillars Approach.

Power calculation
We need a total of 360 pregnant women with anaemia: (1) to detect a minimum difference of Hb = 0.5 g/dl between the intervention and control groups after assuming a standard deviation of 1.01, with α = 0.05, a power of 0.80, ICC of 0.10 and a dropout percentage of 20%; (2) to detect an increase of 20% points in skilled birth attendance in labour, with a baseline (control) percentage of 50% and an Intra Class Correlation Coefficient (ICC) of 0.10 with α = 0.05, power of 0.80 and a dropout of 20%; and (3) to detect a mean difference in antenatal attendances of one visit between the intervention and control groups with standard deviation 2.1, with α = 0.05 and power 0.80, ICC of 0.10 and a dropout of 20%. The sample size of 360 pregnant women with anaemia will consists of 180 pregnant women from intervention and other 180 pregnant women from control groups. The period of recruitment will be limited to three months, and every Public Health Centre will recruit at least seven pregnant women with anaemia consecutively.

Discussion
The high prevalence of anaemia in pregnancy in Yogyakarta Special Province requires adequate nursing-midwifery care to prevent the adverse effects of anaemia in the perinatal
period. Learning from the experiences of other low income countries in handling similar conditions, and considering the nurse-midwives’ views, we developed an innovative approach, called the Four Pillars Approach to antenatal care.

Our primary objective is to evaluate the effectiveness of the Four Pillars Approach in managing pregnant women with anaemia, indicated by a difference in haemoglobin level in pregnancy, improving the frequency of antenatal care attendance and skilled birth attendance during labour. In addition, the secondary objective of this study is to explore the barriers and the facilitating factors of the implementation of the Four Pillars Approach and to evaluate the patient’s and nurse-midwives’ satisfaction with the Four Pillars Approach.

The Four Pillars Approach will be implemented by the trained nurse-midwives in the Public Health Centres in Yogyakarta Special Province. It is expected that this approach will be effective in managing anaemia in pregnancy in order to prevent perinatal morbidity and mortality. If the Four Pillars Approach is effective in improving the outcome of pregnant women with anaemia, this approach could be implemented nationwide and be taken into consideration to improve the outcome for other conditions in pregnancy, after further research.

Acknowledgements

On behalf of the Directorate General of Higher Education, the Reviewer Team of Universitas Gadjah Mada has reviewed the first edition of this study protocol. To conduct this study, the Directorate General of Higher Education allowed us to use a part of the tuition fee budget from doctoral scholarship as one sources of funds (ref. no. : 369/E4.4/K/2011) during the study period (2011-2014); and provided financial support for one year from the Decentralization UGM DIPA (ref.no. : 00/9/E5.2/PL/2012) for 2013.
References


CHAPTER 4

The Effectiveness of a new model in managing pregnant women with iron deficiency anaemia in Indonesia: a non randomized controlled intervention study

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Jeroen van Dillen
Antoinette LM Lagro-Janssen

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Abstract

Background
Indonesia has a major problem with iron deficiency anaemia amongst pregnant women. A new model named the Four Pillars Approach was designed to improve antenatal care for these women. This study aimed to measure the effectiveness of the model in managing pregnant women with iron deficiency anaemia.

Method
We used a non randomised controlled intervention study. The study with the Four Pillars Approach as intervention versus usual care as control, was conducted in two provinces on Java Island during the period of March 2012 until May 2013. Main outcome measures were a difference of Hb level ≥ 0.5 g/dL, the number of women who attended five or more antenatal care visits, and birthing with a skilled birth attendant.

Results
354 were enrolled in the study. Participants in the intervention group had adjustment odds ratio of 25.0 [CI 95% [12.03,52.03], p=0.001] for increased haemoglobin of ≥0.5 g/dL at 35-37 weeks of gestation, compared with the control group. In the intervention group, 95.0 percent of women had five or more antenatal care visits, compared with 57.2 percent (p=0.001) in the control group. All births in both groups were assisted by skilled birth attendants.

Conclusion
The Four Pillars Approach is effective in increasing the haemoglobin level and the frequency of antenatal care visits of participants when compared with the usual care for pregnant women with anaemia.

Keywords: Anaemia, pregnancy, The Four Pillars Approach, antenatal care, Public Health
Background

Iron deficiency anaemia in pregnancy remains a major problem in Indonesia although its prevalence has slightly declined, from 44 percent in 2005 to 41 percent in 2011.\(^1\)\(^-\)\(^3\) In Yogyakarta Special Province, the prevalence of anaemia in pregnant women during the last five years has not changed much, and is currently 39 percent.\(^4\) Anaemia during pregnancy is associated with poor pregnancy and birth outcomes such as premature delivery, low birth weight, increased perinatal mortality and increases in the risk of maternal death during delivery and the postpartum period.\(^1\),\(^5\),\(^6\)

In 1970, a nation wide program to distribute free iron tablets to all pregnant women who attended antenatal care services was implemented to combat anaemia.\(^7\) Unfortunately, this program has not significantly reduced the prevalence of anaemia. The failure of this program was influenced by the lack of skills of those health care practitioners who cared for pregnant women with anaemia, such as failure to recognise early signs and symptoms of anaemia, to administer the correct dose of iron tablets, and to provide health education on anaemia prevention.\(^8\)\(^-\)\(^10\) In addition, the compliance of women with this iron treatment was only 33.3 percent, probably caused by side effects of the iron tablets, a lack of knowledge on the importance of treatment, or just by simply forgetting to take the tablets.\(^11\)

Studies from other low-income countries suggest that counseling and health education are important for pregnant women with anaemia, to improve their knowledge and awareness of how to maintain a healthy lifestyle during pregnancy.\(^12\)\(^-\)\(^16\) One study advised that booklets should be given to increase women’s knowledge about anaemia as well as information about mother and child health.\(^13\) All studies expressed an urgent need for training programs to improve nurse-midwives’ competencies and professional attitudes.\(^13\),\(^14\)

Based on the result of these studies, experts’ opinions and in-depth interviews with nurse-midwives, we designed the Four Pillars Approach to synergize the empowerment between pregnant women and nurse-midwives.\(^17\) The Four Pillars Approach was a new model, tailored only for managing pregnant women with anaemia in public health centers. These four pillars are a healthy lifestyle during pregnancy, social support from the husband or other family members, adequate midwifery treatment, and the improved nurse-midwives’ professional attitudes.

In this study, we evaluated the effect of the Four Pillars Approach for pregnant women with anaemia.
Methods
We conducted a nonrandomized controlled intervention study, originally planned as an RCT. It was situated in primary health care practices in two provinces in Java during the period from March 2012 until May 2013. The protocol has been described elsewhere but was changed, as randomization at practice level was not possible because of fear of contamination of the intervention between the practices, as they are situated very close to each other and collaborate in a geographical condensed area.

Study Setting
The public health centers in the intervention group were situated in Yogyakarta Special Province and public health centers in the control group were situated in Central Java Province. The latter Province was chosen because of the similarities in demographic characteristics of the population and the health system. The similarities are based on Human Development Index of population, the ratio of nurse-midwives to the local population, the percentage of pregnant women with a minimum of four antenatal care visits, the percentage of the iron tablets distribution, nurse-midwives’ educational background and facilities at the public health center for basic emergency obstetric and neonatal care.

Study population
Consecutive recruitment of pregnant women with anaemia, for both the intervention and the control group, was carried out by nurse-midwives with a three year diploma in nursing midwifery working in public health centers on a daily basis. Participants were included in the study if they were less than 12 weeks’ gestation age, and their haemoglobin level at this stage was less than 11 g/dL. The husband and/or family member were asked to join the parenting classes and other activities along with anemic pregnant women during the antenatal care program. Family support will improve the health status of pregnant women and their pregnancy outcomes. Therefore, we included the pregnant women with anaemia if they lived together with their husband and/or family members. Haemoglobin was measured using the Sahli method. Anaemia was classified into three categories: mild (≥9 g/dL - <11 g/dL), moderate (≥7 g/dL - <9 g/dL), severe (<7 g/dL). In the case of severe anaemia, the women could only be included if, after consultation by a doctor, they did not need specialist care.

Exclusion criteria were maternal infection with HIV, malaria or hookworm confirmed by laboratory tests. All participants signed a written consent at the start of the study.
**Intervention Group**

Pregnant women with anaemia who participated in the intervention group received care according to the Four pillars Approach. The focus of care was directed at the pregnant woman with anaemia, their husbands, and/or other family members.

At antenatal booking, the pregnant woman with anaemia received a booklet about anaemia in pregnancy and how to maintain a healthy lifestyle such as eating healthy and nutritious foods, a healthy balance between activity and rest, a healthy environment, and the important of taking iron tablets. Pregnant women with anaemia and their families were asked to attend two parenting classes in the public health center during pregnancy. The contents of the booklet on anaemia were discussed during the first parenting class conducted in the second trimester of pregnancy. The second parenting class was held in the third trimester of pregnancy wherein the pregnant women with anaemia shared their experiences of pregnancy and discussed birthing preparations. The husband or family member participated in reminding the pregnant woman with anaemia to take her daily iron tablets and in supporting her to follow a healthy lifestyle.

The 51 nurse-midwives who gave antenatal care in the intervention group attended a 1-day mandatory training on the Four Pillars Approach. The training focused on the management of anaemia during pregnancy at the level of public health center. The training consisted of lectures and a session in the practical training both facilitated by senior lecturers such as an obstetrician, a master of science in nursing, and a nurse-midwife specialist (Fig. 1). The nurse-midwives were encouraged to build a good relationship, to maintain adequate communication and interaction with participants and their families, as well as to collaborate with their colleagues. To prove their competences in managing anemic pregnant women, the nurse-midwives had to pass an examination.
**Figure 1. Content of Four Pillars Approach training for the treatment of anaemia, Java, Indonesia, 2012–2013**

Training objective: To improve the competencies of the nurse-midwives in managing pregnant women with anaemia based on the Four Pillar Approach.

<table>
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<th>Content</th>
<th>Objectives</th>
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<td>Multiple Choice Questions</td>
<td>To measure existing knowledge</td>
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<td><strong>In Class</strong></td>
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<tr>
<td>1. General introduction of the training on the Four Pillars Approach</td>
<td>1. Introduction</td>
<td>To give nurse midwives insight and encourage understanding and participation</td>
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<td></td>
<td>2. Anaemia in pregnancy: prevalence nationally and locally, the government programme concerning anaemia in pregnancy</td>
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<td></td>
<td>3. Goals of the training: In the in-class session, the nurse-midwives will be able to improve their knowledge on anaemia management in Public Health Centre. In the skills laboratory session, the nurse-midwives will be able to implement their knowledge in to practice and to perform their skills and professional attitude concerning anaemia management.</td>
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<td>4. Disciplinary training: this training is an obligation training for nurse-midwives in the intervention group who will be involved in the study. The nurse-midwives have to complete all the training sessions and pass the examination after the training. The nurse-midwife who does not complete and/or pass the examination on this training will not be able to involved in the study.</td>
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<tr>
<td>2. The concept of the Four Pillars Approach</td>
<td>1. The importance of healthy life-style for pregnant women with anaemia</td>
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<td></td>
<td>2. The importance of social support from husband and family member during pregnancy</td>
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<td>3. Appropriate treatments that are needed in pregnant women with anaemia</td>
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<td>4. The professional attitude of nurse-midwives and its relation to the quality of care</td>
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3. Anaemia management
   1. Physiological and Pathophysiological changes during pregnancy
   2. Common health problem in pregnancy
   3. Anaemia in pregnancy
   5. Referral system

4. Professional Attitudes
   Demonstration of professional attitudes of health provider (video)

Skills Laboratory

5. The Four Pillars Approach in skills laboratory practice
   Based on the Four Pillars Approach: we used a scenario and patient simulation
   1. Taking vital signs: taking blood pressure, measuring pulse rate, measuring respiratory rate, measuring temperature, and taking a blood test for Hb of the pregnant women
   2. Performing an identification of signs and symptoms of anaemia (anamnesis and physical examination)
   3. Giving health education and health counseling about healthy life style during pregnancy, social support for the pregnant women, and the antenatal care programme for pregnant women with anaemia: parenting class (using the booklet for pregnant women with anaemia)

Post test
   Multiple Choice Questions

To refresh and upgrade the knowledge on the anaemia management
To give an illustration of professional attitude in the practical setting
To measure the competence of nurse-midwives to manage pregnant women with anaemia based on the Four Pillars Approach
To assess knowledge gained.
Control group
Pregnant women with anaemia who participated in the control group received the usual care, carried out by 49 nurse-midwives at PHC in Central Java Province. These nurse-midwives were not trained according to the Four Pillars Approach. The usual care did not involve family members and only focused on the pregnant women with or without anaemia. Part of this care was the standard provision of iron tablets to all pregnant women, the testing of haemoglobin levels, mostly at booking and optionally in late pregnancy. The pregnant women with anaemia did not attend parenting classes of any sort, and a booklet or protocol of anaemia management was not used. A national protocol of anaemia during pregnancy at the public health center level was not available. We suppose that the quality of care might be different because the nurse-midwife in the intervention group is better trained than the control group. Moreover, the support from husband and/or family members also might be different if husbands and/or family members are more actively involved in the antenatal care program in the intervention group than the control group.

Data collection
In both groups, the following characteristics were recorded in a specific form: baseline haemoglobin (before 12 weeks of gestation, T0), the distance to the public health center, parity, age, and reasons for referrals if they occurred. The haemoglobin level was checked again between the 35th and 37th weeks of gestation (T1). The progress of health status during the pregnancy period was recorded and the completed data form was collected at the end of the study period. The nurse-midwives in both groups also recorded the data of participants who dropped out of the study, including the reasons as well.

Outcome measures
Primary outcomes were the difference in haemoglobin of ≥0.5 g/dL (in percentages) between intervention and control groups, the number of women with a normal haemoglobin level (in percentages), the percentage of women with ≥ 5 antenatal care visits, and the number of births attended by skilled birth attendants.

We used a difference in haemoglobin level at T1 ≥0.5 g/dL as an indicator of the effectiveness of the new model based on a study which found that women with a higher supplementation achieved an increase in haemoglobin level around 0.5 g/dL compared with those with a lower supplementation.\textsuperscript{21}

The number of antenatal care ≥ 5 visits was used as the other indicator of the effectiveness of the new model, because regular antenatal care attendance is important for all pregnant women to detect any possible problems as early as possible. Therefore, we considered that
pregnant women with anaemia probably need more than the regular antenatal care attendance to prevent the influence of anaemia on maternal and fetus health.  

**Power calculations**

Power was calculated on the basis of the detection of a minimum difference of 0.5 g/dL in the haemoglobin level between the intervention and control group at T1, assuming a standard deviation of 1.01 and on the basis of a difference in the number of antenatal care visit of one visit above the regular four visits between the intervention and control group; and an increase in 20 percent in skilled birth attendance during labour with a baseline (control) percentage of 50 percent, with \( \alpha = 0.05 \), a power of 0.80, an intraclass correlation coefficient (ICC) of 0.10 and a dropout percentage of 20 percent, resulting in a required sample size of 360 pregnant women with anaemia which consists of 180 pregnant women in both groups.  

**Data analysis**

For the description of the population characteristics at baseline we used means (standard deviations) and numbers (percentages). To assess the effectiveness of the Four Pillars Approach, we compared the outcome measurement between the intervention and control groups using means and percentages.

Taking into account the clustering of pregnant women within the public health centers, we used random intercept generalized mixed models for analyzing the results of the Four Pillars Approach. A multilevel linear regression analysis for continuous outcomes, and a multilevel logistic model was used for binary outcomes. Baseline haemoglobin level, parity, age, distance to the public health center were assumed to be potential confounders. Therefore, these variables were entered into the multivariable models. Results of these analyses were presented as adjusted odds ratios (AOR). The intracluster dependence of the outcomes of the intervention was assessed by calculating intracluster correlation coefficients (ICC’s).

Analyses were performed according to the intention-to-treat principle. All \( p \) -values were calculated taking into account the clustering of patient within public health centers. Statistical significance was established at \( p \) -value 0.05. All analyses were performed using SPSS 20.0. The Ethical Committee of the Faculty of Medicine, Universitas Gadjah Mada – Yogyakarta, approved the study (ref. no.: KE/FK/730/EC).
Results

We recruited 498 participants. Seventy-eight participants did not give their written consent in the intervention group and 21 in the control group. This resulted in 196 participants in the intervention group and 203 in the control group (Fig. 2). A total of 354 participants completed the study; 181 participants in the intervention group and 173 in the control group. During the study, 15 participants dropped out in the intervention and 30 left from the control group. Reasons for not completing participation in the study included referral to the hospital because of hypertension (n= 7), not attended parenting class (n= 1), miscarriage (n= 1), moving out of the study area (n= 5), and no reason or loss of contact (n= 21).

Baseline characteristics of both groups were similar for age, distance to the public health center, and parity (Table 1). Baseline haemoglobin level in the intervention group was 9.6 g/dL compared with 9.9 g/dL in the control group (p value= 0.011). Both groups were similar in terms of mild anaemia at baseline which occurred in more than 80 percent of the participating pregnant women.

<table>
<thead>
<tr>
<th>Table 1. Baseline characteristics of the study population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interven...</td>
</tr>
<tr>
<td>Age in years (SD)</td>
</tr>
<tr>
<td>Distance to PHC in km (SD)</td>
</tr>
<tr>
<td>Parity</td>
</tr>
<tr>
<td>Primips n (%)</td>
</tr>
<tr>
<td>Multips n (%)</td>
</tr>
<tr>
<td>Mean Hb g/dl (SD)</td>
</tr>
<tr>
<td>Anaemia categories: n (%)</td>
</tr>
<tr>
<td>Mild ≥9 - &lt;11 g/dl</td>
</tr>
<tr>
<td>Moderate/severe &lt;9 g/dl**</td>
</tr>
</tbody>
</table>

Notes:
* p=0.011 means that p < 0.05
** severe <7 g/dl n= 1 in the intervention group and none in the control group
Figure 2. Flow chart of the study population
498 pregnant women with anaemia

78 (15.6%) no informed consent

Intervention Four Pillars Approach

196

1 not attending parenting class
1 spontaneous abortion

194 (98.9%) attended ANC

3 without reason
3 loss of contact
3 moved to other place

185 (95.4%) attended ANC

4 hypertension referred

181 (92.3%) completed

Control Usual Care

203

21 (4.2%) no informed consent

399 (80.1%)

203 (100%) attended ANC

7 without reason
18 loss of contact
2 moved to other place

176 (86.7%) attended ANC

3 hypertension referred

173 (85.2%) completed

T0

T0

T1

T1
Change in haemoglobin level
An increase in ≥0.5 g/dL of haemoglobin level at T1 was found in 80.7 percent of participants in the intervention group and 16.8 percent in the control group (Table 2). In the intervention group, about 35.4 percent of the participants had a normal haemoglobin level at T1 compared with 11 percent in the control group (Table 2).

| Table 2. The effect of the Four Pillars Approach on Hb, ANC visits and skilled birth attendance |
|-----------------------------------------------|------------------|-----------------|-----------------|-----------------|
|                                              | Intervention group (N=181) | Control group (N=173) | p value        |
| Increase Hb level ≥0.5 g/dl n (%)             | 146 (80.7)           | 29 (16.8)        | 0.001          |
| Normal Hb level ≥11 g/dl at T1 (35–37 weeks of pregnancy) n (%) | 64 (35.4)           | 19 (11.0)        | 0.001          |
| ANC visits ≥ 5 n (%)                          | 172 (95.0)           | 99 (57.2)        | 0.001          |
| Skilled birth attendance n (%)                | 181 (100)            | 173 (100)        |                 |

p value<0.05

Multivariate random intercept logistic regression controlling for parity, haemoglobin at T0, age and distance to public health center, showed that the intervention group had AOR of 25.0 (95% CI 12.03-52.03; p=0.001) for an increased haemoglobin level of ≥0.5 g/dL at 35-37 weeks’ of gestation (Table 3) when compared with the control group. The intervention group showed an AOR of 18.1 (95% CI 6.96-46.92; p=0.001) and a normal haemoglobin level at 35 – 37 weeks’ of gestation (Table 3) when compared with the control group.

The Intra Class Correlation (ICC) of haemoglobin within health care units was 0.32, indicating a considerable homogeneity of haemoglobin score within the health care units.

Antenatal care visits
The effectiveness of the Four Pillars Approach was also assessed by looking at the number of antenatal care visits. The participants in the intervention group attended antenatal care more often than the pregnant women in the control group: 95.0 percent versus 57.2 percent (AOR 17.52, [95% CI 6.56-46.78], p= 0.001). Participants with a larger distance to travel to the public health center showed lower antenatal care attendance (AOR 0.8, [95% CI 0.69-0.91] p= 0.001) (Table 3).
Effectiveness of the Four Pillars Approach

<table>
<thead>
<tr>
<th>Table 3. The effect of the Four Pillars Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in ≥0.5 g/dl Hb level</td>
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<tr>
<td>AOR</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>The Four Pillars Approach</td>
</tr>
<tr>
<td>Parity (reference: control group)</td>
</tr>
<tr>
<td>Hb (g/dl) at T0*</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Distance to Public Health Centre (km)</td>
</tr>
</tbody>
</table>

*T0 = Hb test at less than 12 week of pregnancy
These are adjusted odds ratios, adjusted for all other variables in the table.

Skilled birth attendance in labour
We found no differences in skilled birth attendance between groups. All participants who completed the study were assisted by a skilled birth attendant during labor (table 2).

Discussion
To the best of our knowledge, this is the first controlled intervention study on improving the management of anaemia during pregnancy in Indonesia, showing an improvement in results which so far has not been achieved by regular antenatal care visits as stipulated.

The Four Pillars Approach not only involved pregnant women with anaemia in the antenatal care program but also their husbands and/or family members. Male partner involvement in antenatal care programs shows a positive influence on maternal health behavior as well as a better timing of antenatal care enrolment. When pregnant women and their husbands and/or family members increase their knowledge on anaemia in pregnancy, commitment to a healthy lifestyle for pregnant women improves.\(^{13,14,25}\) Moreover, pregnant women who are health illiterate and who have strong cultural beliefs need special attention from health
professionals in antenatal care programs.\textsuperscript{14} The Four Pillars Approach allows nurse-midwives to deal with those conditions.

A review article of Kalaivani et al noticed that an active antenatal care program at the primary level is effective in increasing haemoglobin levels in late pregnancy.\textsuperscript{26} Our study of the Four Pillars Approach has added to this body of knowledge by showing its effect in increasing and normalizing haemoglobin levels during pregnancy. Kalaivani also suggested that influencing the number of antenatal care visits could have an influence on the final haemoglobin outcome. It could be argued that the Four Pillars Approach provided women with sufficient motivation to be willing to attend antenatal care visits.

In Indonesia however, only four antenatal care visits are covered by government insurance. When additional antenatal care visits are required, pregnant women are expected to pay either directly themselves or through additional private health insurance. In this study, we found that most participants in the intervention group attended six to seven antenatal care visits. Although it is unclear why pregnant women attended more visits in our study, it could be argued that pregnant women felt more aware of the need for antenatal care.

Previous studies illustrated that fewer antenatal care visits lead to an increased risk for pregnant women with an increase in the occurrence of preeclampsia, severe postpartum anaemia, and untreated urinary tract infections.\textsuperscript{22}-\textsuperscript{24} Evidence highlighted that four antenatal care visits are the minimum that should be offered to low-risk pregnant women, including anaemia during pregnancy.\textsuperscript{27}

We believe that by putting the pillars together as part of regular antenatal care services results in a positive collaboration between professionals and pregnant women and their families with good results. Building a trusting relationship between nurse-midwives and pregnant women is essential to encourage women to attend the antenatal care program and to feel free to discuss their health problems with the nurse-midwives.\textsuperscript{18,19} The number of dropout participants in the intervention group is lower than in the control group which may also further support these arguments. However, these assumptions need further study.

Our study reveals that maternal age and parity have a weak effect on the increase in haemoglobin level and the number of antenatal care visits. Similar results were also found in a study in Uganda.\textsuperscript{28} However, we found that the distance to the public health center has a significant effect on the increase in haemoglobin level and on the number of antenatal care visits. In contrast, a study in rural Zambia reveals that distance to the public health
center has no effect on the antenatal care visits. We need an advanced study to explain this phenomenon.

Our study has several limitations. First, we were unable to conduct a randomised trial because of the risk of contamination between practices since most of them are in close proximity to each other and have to cooperate in a geographically condensed area. However, we felt a controlled intervention study, using a population with similar demographic characteristics in both the intervention and the control groups was an adequate compromise. Second, we could not control any bias caused by the so-called Hathorne effect or caused by the unequal number of women not wanting to participate in the intervention (n = 78) compared with the control group (n = 21). Third, we also could not control the supply of iron tablets in the public health centers. Fourth, our study did not measure patient satisfaction with the intervention, although an increase in antenatal care attendance would suggest that women and their families were happy with the service provided. However, we plan to explore both nurse-midwives’ and patients’ satisfaction with the Four Pillars Approach in the next study.

The strengths of this study are that almost all the public health centers with basic emergency obstetrics and neonatal care in Yogyakarta Special Province participated. Moreover, we succeeded in involving participants in a low-income country whose population is rarely involved in an intervention study and we achieved a low percentage of participants lost to follow-up.

**Conclusion and recommendations**

The Four Pillars Approach is effective in managing pregnant women with anaemia in public health centres. Considering the high prevalence of anaemia and its effects on the outcome of pregnancy in Indonesia, we therefore recommend that the Four Pillars Approach should be applied as the standard model for the antenatal care program at public health centers in Indonesia. The results of this study can be used by policy makers in Indonesia, as well as in other low-income countries, when reconsidering maternal health care policies. Involving the families of pregnant women and their relatives as partners of nurse-midwives in the antenatal care program is essential. Future studies are needed to find out the effect of the Four Pillars Approach on other pregnancy outcomes of the mother and especially of the newborns.
Acknowledgment

We thank the nurse-midwives; the research team: Sutarti Utomo, Elsi Dwi Hapsari, Wenny Artanty Nisman, Wiwin Lismidiati, Neni Fidyasari, and Anita Herawati; all family health program coordinators at districts Health Offices in the Yogyakarta Special Province and Central Java Province and a special thanks to all respondents for their participation and cooperation. We are also grateful to the Universitas Gadjah Mada and the Directorate of Higher Education for their financial support and scholarly guidance.
References


Perceived barriers and facilitators of a new model in managing pregnant women with iron deficiency anaemia: a qualitative study

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Wenny Artanti Nisman
Elsi Dwi Hapsari
Jeroen van Dillen
Antoinette LM Lagro – Janssen

Submitted to International Journal of childbirth, October 2015
Abstract

Background
Iron deficiency anaemia is a major health problem amongst pregnant women in Indonesia. A new model of managing women during pregnancy with iron deficiency anaemia, named the Four Pillars Approach, has been studied at Public Health Centres in Yogyakarta, Indonesia. The Four Pillars Approach consists of the pillars of a woman’s healthy life style, social support from husband and/or family members, adequate midwifery treatment, and midwife’s professional behaviour.

Objective
This study aimed to explore the facilitators and the barriers of the introduction of this new model of care.

Design and setting
Focus group discussion with nurse-midwives and nurse-midwife coordinators, who received training about the managing of the Four Pillars approach, working in Public Health Centres in Yogyakarta Special Province Indonesia.

Participants
Purposive sampling of trained nurse-midwives and nurse-midwife coordinators who provided antenatal care according to the Four Pillars Approach.

Method
Focus group discussions with 19 trained nurse-midwives and five nurse-midwife coordinators were conducted between November 2013 and April 2014. The moderator used an interview guide. Two researchers performed the analysis as an iterative process, based on verbatim transcripts and applying the technique of constant comparative analysis.

Results
The study revealed three facilitating and three inhibiting factors of the new model intervention as perceived by the nurse-midwives. The first facilitator was the training and an information booklet offered to the nurse midwives, which made them feel competent to provide health education to their patients. The other facilitating factors were the improved confidence in providing comprehensive care and adequate support from supervisors. The perceived barriers were lack of financial support and public transportation necessary to reach the optimum treatment according to the new model, limited health insurance coverage and shortage of staff and iron tablets.
**Conclusion**

The feeling of competence and confidence of the nurse-midwives in providing a new model are important facilitators. Facilitative supervision is needed to boost the commitment to maintain the sustainability of the intervention. The barriers, as perceived by the nurse-midwives, are limitations of resources. Similar barriers should be anticipated for further implementation. A lasting support of policy and decision makers therefore is essential.

**Keywords:** Iron deficiency anaemia, pregnancy, Public Health, The Four Pillars Approach

**Introduction**

Amongst members of the Association of South East Asian Nations (ASEAN), Indonesia ranks fourth in the prevalence of anaemia in pregnancy with a rate of more than 40 percent.\(^1\) (World Health Organization, 2005). Slightly below the national prevalence rate of anaemia in pregnancy, Yogyakarta Special Province has a rate of 39 percent.\(^2\) (Dinas Kesehatan Provinsi DIY, 2013). Iron-deficiency is the most common cause of anaemia in pregnancy in Indonesia, followed by hookworm and other related infectious diseases.\(^3\) (Nurdiati et al., 2001).

Anaemia during pregnancy can have adverse effects on the mother and the foetus, such as miscarriage, premature birth, low birth weight and less reserve capacity to adjust to post partum haemorrhage.\(^4,5\) (Allen, 2000; Haider et al., 2013). In 1970, an iron supplementation programme for all pregnant women in Indonesia was implemented to overcome these problems.\(^6,7\) (Schultink, 1993; Departemen Kesehatan RI 2012). However, constraints such as inadequate supply of iron tablets, poor quality of counselling by health care providers, lack of knowledge and concern about maternal anaemia by health care providers were reported, as well as low motivation and resistance among pregnant women to take iron supplements because of the side effects experienced.\(^6,8\) (Schultink, 1993; Galloway, 2002).

Involving the pregnant women’s husbands in antenatal care programmes has a positive influence on health care utilization during pregnancy.\(^9\) (Singh, 2014). However in Indonesia, this participation in antenatal care programmes is hampered by male perceptions of pregnancy; it is thought to be solely a woman’s domain. The man’s main responsibility is to provide financial support rather than accompanying his wife to attend the antenatal care programme.\(^10\) (Shefner-Rogers and Sood, 2004). But, even when the husband is present, health care providers mostly focus on interaction with their female clients.\(^10-12\) (Shefner-Rogers and Sood, 2004; Widyawati et al., 2015a; Erlindawati et al., 2008).
Based on these results and experts opinions, we designed a new model to manage the pregnant women with iron deficiency anaemia in Public Health Centres (PHCs). This new model was called the Four Pillars Approach. The content of the Four Pillars Approach is women’s’ healthy life style and husbands’ and/or family members’ social support as the first and second pillars to empower the women, and adequate midwifery treatment and nurse-midwives’ professional attitudes as the third and fourth pillars to empower nurse-midwives.\(^{13}\) (Widyawati et al., 2014).

The results of this new model show that the Four Pillars Approach is effective in increasing the haemoglobin level and the number of antenatal care visits.\(^ {14}\) (Widyawati et al., 2015). It is important to have insight into the barriers and the facilitators of this new model before this model is further implemented. This study aims to investigate the facilitators and barriers of the intervention of the Four Pillars Approach in PHCs in Yogyakarta Special Province, from the perspectives of nurse-midwives and nurse midwife coordinators.

**Methods**

**Study design**
We performed a qualitative study using focus group discussions with four groups of nurse-midwives working at PHCs in Yogyakarta Special Province. Focus groups are particularly suited to understand opinions and attitudes through generating discussion and interaction amongst participants in order to further develop their thoughts and opinions. For logistic reasons two focus groups took place in November 2013 and two in April 2014.

**Participants and procedure**
All the nurse-midwives invited were trained in the Four Pillars Approach, and work on a daily basis in a PHC which implemented the Four Pillars Approach. The nurse midwife coordinators of the family health programme from the five districts’ health offices were invited to participate in a separate group because they have different roles in the intervention of the Four Pillars Approach. Each focus group consisted of five to seven nurse-midwives. We informed all participants about the aim of the focus group and asked for informed consent.

A topic list based on the literature and expert opinion was developed in order to guide the discussions (Table 1). We adjusted the list after discussion by the researcher team at School of Nursing, Universitas Gadjah Mada. Experienced moderators from the School of Nursing, Universitas Gadjah Mada guided the discussions. The moderators were familiar with
obstetric care, as they had been working as senior lecturers in maternity nursing for more than 10 years. The focus groups were fully recorded and transcribed verbatim.

**Table 1. Interview guide**

<table>
<thead>
<tr>
<th>Participants</th>
<th>Topic</th>
<th>Discussions</th>
</tr>
</thead>
</table>
| *Coordinators of Family Health Programme* | The barriers on the implementation of the Four Pillars Approach in managing pregnant women with anaemia in Public Health Centres | • Could you tell us your experience in supervising the implementation of Four Pillars Approach in Public Health Centres?  
• Did the Four Pillars Approach has been implemented as you expected? Tell me....  
• As a programme coordinator, did you find any problems or difficulties to coordinated or facilitated the implementation of Four Pillars Approach? How did face it? |
| *Trained nurse-midwives*         | The barriers on the implementation of the Four Pillars Approach in managing pregnant women with anaemia in Public Health Centres | • Regarding to this study results, the Four Pillars Approach give the positive effect on the Hb increasing of the pregnant women with anaemia, what do you think about this? What was the supporting factors? Tell me... |
|                                  | The facilitators on the implementation of the Four Pillars Approach in managing pregnant women with anaemia in Public Health Centres | • Could you tell us your experiences in implementing the Four Pillars Approach to manage pregnant women with anaemia in Public Health Centre?  
• Did you find any problems or difficulties during the implementation of the Four Pillars Approach?  
• What was the biggest problems or difficulties you have faced? How did you handled it?  
• Based on your experiences, did you succeed in managing pregnant women with anaemia using the Four Pillars Approach?  
  o If yes, why....?  
  o If not, why...?  
• According to your opinion, why the Four Pillars Approach succeed (or not) to manage pregnant women with anaemia? Tell me...  
• Could you explain what is the supporting factors of this success? Tell me... |

**Data Analysis**

Three researchers (WW, WAN, EDH) analysed the transcript of each session. The researchers first independently attached codes to the themes emerging from the text. In discussion they reached consensus about the codes and the themes. According to the method of constant comparative analysis, these codes were compared with the text of the
transcript during an iterative process, adjusted and refined accordingly. Following the initial coding process, the three researchers discussed the findings and combined codes into broader categories. The software program ATLAS.ti version 6.1 was used to support data analysis.

**Ethical consideration**

The Ethical Committee of the Faculty of Medicine, Universitas Gadjah Mada – Yogyakarta, gave the ethical approval for this study on 15<sup>th</sup> December 2011 (ref. no. : KE/FK/730/EC)

**Results**

Nineteen trained nurse-midwives and five nurse-midwife coordinators participated in the focus group discussions (Table 2). The mean age of the trained nurse-midwives was 37.5 years (SD ±12.7) and of the coordinators 46.6 years (SD ±1.1). The majority of the nurse-midwives had more than ten years working experience in PHCs.

<table>
<thead>
<tr>
<th>Table 2. Participants’ Characteristics</th>
<th>N (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (in years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trained nurse-midwives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤30</td>
<td>4 (21.0)</td>
<td>37.5</td>
<td>±12.7</td>
</tr>
<tr>
<td>30–40</td>
<td>8 (42.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;40</td>
<td>7 (36.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse-midwife coordinators</td>
<td></td>
<td>46.6</td>
<td>±1.1</td>
</tr>
<tr>
<td>≤30</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30–40</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;40</td>
<td>5 (100)</td>
<td></td>
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<tr>
<td><strong>Working experience in Public Health Centre (in years)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Trained nurse-midwives</td>
<td></td>
<td>9.9</td>
<td>±4.9</td>
</tr>
<tr>
<td>≤5</td>
<td>4 (16.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6–10</td>
<td>4 (16.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>11 (66.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse-midwife coordinators</td>
<td></td>
<td>20.4</td>
<td>±1.1</td>
</tr>
<tr>
<td>≤5</td>
<td>0</td>
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<tr>
<td>6–10</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>5 (100)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Work location in Public Health Centres</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban area</td>
<td>5 (20.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>10 (41.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near by the city</td>
<td>9 (37.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Training experience in the last 3 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Four Pillars Approach</td>
<td>24 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk pregnancy management</td>
<td>6 (25.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Counselling</td>
<td>7 (29.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Three main themes emerged as facilitators of the new approach: improved nurse-midwives’ competences, improved nurse-midwives’ confidence in providing midwifery treatment and adequate support from supervisors. As barriers the following three themes came up: financial and transport obstacles to achieve a healthy lifestyle or to attend parenting classes, limited health insurance coverage and limited resources such as staff shortage and unavailability of iron tablets. A thematic representation of the themes is presented in table 3.

Table 3. Thematic analysis of the data

<table>
<thead>
<tr>
<th>Topics</th>
<th>Themes emerge</th>
</tr>
</thead>
</table>
| Barriers | • This approach spent a lot of time  
• Need a more simple report forms  
• Difficult to make a schedule for parenting classes which can be attended by patients, husbands or other family member  
• The first pillar of Four Pillars Approach was difficult to be achieved, especially for patient’s eating pattern that influenced by financial constraints  
• Not all nurse-midwives in Public Health Centres have been trained on the Four Pillars Approach, therefore the management of pregnant women with anaemia highly dependent on the presence of the trained nurse-midwives  
• Geographical constraints and unavailability of public transportation to or from certain Public Health Centres at any time  
• National insurance has not covered the additional cost of Hb test  
• Long bureaucratic system to order the facilities that needed by the PHCs |
| Facilitators | • Very exciting with the new concept  
• Enjoy to be a counsellor in Parenting Classes  
• Curious to know the progress of patient’s health status  
• New experience in handling the cases comprehensively  
• Having close interactions not only with patient but also with the family  
• More challenging, the Four Pillars Approach has different procedures than the old one  
• More responsible to monitor the results of the programme in order to anticipate the unpredictable results (example: complaints on the programme or the treatments)  
• By using the booklet of Four Pillars Approach as a guidance, supervision became more easy  
• More confidence in giving a health consultation (the booklet and the four pillars approach guidelines were very helpfull)  
• Having good interaction with patient and husband as well as family member, so that nurse-midwives were easily to monitor the progress of patient’s health status  
• The supports from head of Public Health Centre  
• Financial allocation to conduct the parenting classes  
• The availability of learning resources (training modul and booklet) for the nurse-midwives and also for the patients  
• The commitment of the trained nurse-midwives in Public Health Centres to implement the Four Pillars Approach  
• Good communication between reseachers, programme coordinators and trained nurse-midwives |
Facilitators

Improvement of nurse-midwives competencies

All the trained nurse-midwives mentioned that they felt supported in their work by the training and the provision of a booklet to give to the women which offered information about a healthy lifestyle for pregnant women. They stated that both were very helpful in providing adequate health information. The booklet also made it easier for the trained nurse-midwives to understand the woman’s health condition in between antenatal visits as most women made notes in the booklet about the health problems they experienced. In addition, the nurse-midwives also mentioned that, because of the extra training, they felt better equipped to communicate adequately with their patients and their families. The training offered the opportunity to learn how to monitor patients’ health progress more easily.

...They (the patients) are encouraged to write down all their health complaints in the comments column of their booklet and I can follow their health status until their next antenatal visit) (nurse-midwife, 13 years’ experience)

The nurse-midwives found that social support from husbands and family members (the second pillar) brought them into closer contact with their patients and their families.

......many men (husbands) came together with their wives to the ANC clinic without feeling awkward...they were even asking some questions...(nurse-midwife, 12 years’ experience)

Confidence in providing comprehensive care

Improved competencies ensured that the nurse-midwives felt more confident in managing pregnant women with anaemia. They stated that a consultation was easy to carry out and they felt competent to offer adequate treatment which seemed to improve work satisfaction Furthermore, the nurse-midwives mentioned that they really wanted to know the effectiveness of the care they delivered.

...the Four Pillars Approach makes me more confident to provide health information and to monitor the health progress of each patient....(nurse-midwife, 4 years’ experience)

....I feel challenged by this approach (the Four Pillars), I am eager to handle the case to its conclusion and to know the outcome of the treatment that I have given....(nurse-midwife, 15 years’ experience)
Adequate support from supervisors

Supervision and advice from the nurse-midwife coordinators were helpful for the trained nurse-midwives to provide adequate guiding of pregnant women and their family according to the Four Pillars Approach.

The coordinators of nurse-midwives mentioned that some heads of PHCs gave moral support to the trained nurse-midwives and allocated the budget to conduct the parental classes at the PHCs.

...when I visited parenting classes in Puskesmas (PHC), I saw the head of Puskesmas (PHC) present giving advice not only to the trained nurse-midwives but also to the patients and family.... (nurse-midwife coordinator, 19 years’ experience).

He (the head of PHC) asked us (the trained nurses) to continue the programme of the Four Pillars Approach in Puskesmas (PHC) even though the intervention of the study has finished....and he gave his permission that parenting classes may use the BOK (the operational budget) funds...(trained nurse-midwife, 10 years’ experience)

Barriers

Obstacles to reach the aims of the new model

The trained nurse-midwives mentioned that sometimes the achievement of a patients’ healthy lifestyle was hampered by the patients that could not afford to buy food of animal origin such meat, milk or eggs. Some women also experienced minimal support from husbands or family members. They explained that patients’ husbands could not attend the classes during working hours. However, patients could be accompanied by another family member. The trained nurse-midwives also mentioned that women who did not live close to the PHC could not easily participate in parenting classes. Many patients used public transport to reach the PHC, which was not available at all times and in all situations. Patients who lived far away from the PHC, were visited by the nurse-midwife at their homes for a parenting class using the vehicle owned by PHC. Sometimes the nurse-midwife had to pay for the petrol.

....It is difficult for us (the nurse-midwife) to monitor the success of the first pillar for some patients when they said that they can not afford to buy food of animal origin, especially meat....because it is expensive....(nurse-midwife, 8 years’ experience)

....I used the Puskesmas’(PHC’s) vehicle to visit a patient at home for parenting classes, because she lives very far from Puskesmas (PHC) ....and angkot (public transportation) is rare...(nurse-midwife, 14 years’ experience)
Perceived barriers and facilitators

Limited health insurance coverage

Nurse-midwives felt hampered in providing optimum midwifery treatment because of the limited health insurance coverage for laboratory tests. National health insurance for pregnant women only covers the cost of laboratory tests twice during pregnancy. However, some pregnant women might need a haemoglobin test more than twice. In this situation, the women were expected to pay the additional costs themselves.

.....even all patients use a specific health insurance for antenatal and birth.....but some patients who need more laboratory tests, they have to pay for the additional costs....because the insurance only covered the first and second Hb tests...I’m afraid that I could not provide a proper treatment for them.... (trained nurse-midwife, 6 years’ experience)

Limited resources

Nurse-midwives appeared to be burdened by the results of an over-stretched system. They experienced shortages of staff and the unavailability of iron tablets preventing them from doing their work according to demands. They stated that they were responsible for the management of pregnant women with anaemia. Nevertheless, lack of time made it impossible to perform the tasks involved. They suggested that the number of trained nurse-midwives in every PHC should be increased.

...we are two (the number of trained nurse-midwives)...and we have to manage more than ten pregnant women with anaemia....I think.... we need more (trained nurse-midwife)...(nurse-midwife, 12 years’ experience)

...patients’ registration can not be stopped until 11 am, when the registration number is more than 25, it means that we need extra time to take care of all the patients that have been registered that day and half of them were anaemic women...(nurse-midwife, 7 years’ experience)

The nurse-midwives also mentioned that they thought the side effects of the free iron tablets supplied by the government were stronger than the non-generic iron tablets which can be bought from private drug stores. Those women who could afford to buy non-generic iron tablets preferred these over the free medication. Moreover, the nurse-midwives mentioned that free iron tablets were not always available and women sometimes had to wait for days before new supplies had arrived.

....It was almost a week that we did not have any iron tablet...finally we give prescription to the women to buy it (at the drug store)...(nurse-midwife, 7 years’ experience)
Discussion

We found three facilitators and three barriers of the intervention of the Four Pillars Approach as a new model in managing pregnant women with iron deficiency anaemia in PHCs in Yogyakarta. The three facilitators include the trained nurse-midwives being well equipped and feeling competent by the training, gaining confidence in providing comprehensive care and receiving adequate support from supervisors. The three barriers are the lack of financial and public transportation, necessary to reach the optimum treatment according to the Four Pillars Approach, limited health insurance coverage and limited resources.

The Facilitators

The trained nurse-midwives in our study experienced a lot of help by having training and an information booklet for their patients and family. They also felt competent to deliver high quality of care to pregnant women with iron deficiency anaemia. They were more confident and capable to communicate during interaction with the women and their family members as well as with their colleagues and supervisors. The commitment of nurse-midwives to carry out the Four Pillars Approach and to provide continuity of care was remarkable but is supported by others findings which show that confidence and commitment of health workers rise with increasing competencies. In addition, well informed health care workers feel increased commitment to the duties assigned to them.15-17 (Hagbaghery, 2004; Banchani and Tenkorang, 2014; Hajbaghery, 2005).

The theory of “organizational readiness for change” states that positive interaction and adequate supervision represent the readiness for change and the readiness for change will develop commitment to get the work done.18,19 (Weiner, 2009; Nancarrow et al., 2013). In our study the nurse-midwife coordinator represented a facilitative supervision, whereby supervisors focus to observe the needs of their staff.20 (Aikins et al., 2013). The essential role of the facilitative supervisor was to enable staff to manage the quality improvement process, to meet the needs of their patients, and to implement organisation goals.

A study in low income countries reveals that the efforts in health system strengthening were characterised by increasing birthing facility, increasing the number of midwives, decreasing financial barriers, and late attention for improving the quality of care. Furthermore, respectful woman-centred care has received little or no attention.21 (Lerberghe, et.al., 2014).
However, the Four Pillars Approach emphasizes monitoring, joint problem solving, and two-way communication between the supervisor and those being supervised, just the way as the five nurse-midwife coordinators in our study act.

The Barriers

The failure to achieve the optimal treatment of the first and the second pillars of the Four Pillars Approach was perceived by some nurse-midwives as being a result of patients’ financial difficulties and public transportation limitations. However, this condition might only be found in certain areas in Yogyakarta Special Province which are situated in mountainous areas and in locations which difficult to reach by public transport.

Limited health insurance coverage was perceived as a constraint to provide adequate treatment. The coverage of health insurance for pregnant women is important, especially when the pregnant women need more than regular antenatal care visits and laboratory tests, such as those with anaemia or hypertension during pregnancy.\(^{22}\) (Mathai, 2011). A study reveals that adequate antenatal care services are influenced by health insurance coverage.\(^{23,24}\) (Montgomery, 2001; Comfort, 2013).

Another perceived barrier was staff shortage. The staff shortage might have implications in terms of a reduction in the quality of services, increased workload, and reduced time for patients.\(^{25}\) (Bangdiwala, et.al., 2010). In our study, the trained nurse-midwives mentioned that, because of the limited number of trained nurse-midwives, they have to work overtime to manage all the patients.

During the period of intervention of the Four Pillars Approach, lack of availability of iron tablets for several days in some PHCs was mentioned by the trained nurse-midwives. However, improving access to maternal health logistics is an essential component of strengthening maternal health programmes and outcomes.\(^{26-29}\) (Lule, 2005; Bergeson, 2010; Madsen et al., 2010; Heywood and Choy, 2010). If a well designed programme is not backed up by adequate resources and support at a higher level, resulting in lack of a guaranteed supply of iron tablets at PHC, and limited insurance coverage, then the successful implementation of the programme could be at risk.

Limitations and strengths

We focused on nurse-midwives as the prime health care provider in the intervention of the Four Pillars Approach in PHC. The trained nurse-midwives from every PHC and the nurse-midwife coordinators from five district health offices participated in the focus group discussions. Our study represents all Public Health Centres which were involved in the intervention of the Four Pillars Approach in Yogyakarta Special Province. However, this
study does not incorporate the opinions of heads of PHCs and policymakers about the implementation of the Four Pillars Approach. As a consequence, our study findings lack feedback from these leaders which is also important for the improvement and continuity of a new model in PHC.

Lastly, as qualitative study is designed to identify themes, results cannot be generalized. We cannot presume that our findings are applicable for as we interviewed only the nurse midwives and nurse-midwife coordinators, who were very dedicated to the new model.

**Conclusion**

Facilitators of the Four Pillars Approach in PHC are the feeling of competence and confidence by the nurse midwives in addition to adequate supervision. The barriers, as perceived by the nurse-midwives, are limitations regarding resources (finance, transport and treatment) and staff shortage.

Concerning the sustainability of the Four Pillars Approach in PHC, District Health Offices (DHO) and the Provincial Health Office (PHO) need to be aware of these barriers in order to give better antenatal care services, especially for pregnant women with anaemia. In addition, DHO and PHO should facilitate training and learning resources for nurse-midwives in PHC. Crucially, the future implementation of the Four Pillars Approach needs the support of policy and decision makers.
References


CHAPTER 6

Nurse-Midwives’ and Patients’ Satisfaction with a New Model for Managing Iron deficiency anaemia during Pregnancy in Public Health Centres in Yogyakarta – Indonesia

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Abstract

Background
Nurse-midwives’ and patients’ satisfaction are essential for the further improvement of iron deficiency anaemia management in Indonesia. Based on four important maternal care areas, a new model called the Four Pillars Approach was developed to improve iron deficiency anaemia management during pregnancy at Public Health Centers in Indonesia. This study assessed nurse-midwives’ and patients’ satisfaction with the new model.

Methods
We used quantitative and qualitative methods to investigate the participants’ satisfaction with the new model. Forty-nine nurse-midwives from 19 Public Health Centres filled in a questionnaire. Three focus group discussions with nurse-midwives (n=24) and three focus group discussions with patients (n=25) were conducted in November 2013 and in April 2014.

Results
Majority, the nurse-midwives were fully satisfied with the new model. Most of the nurse-midwives felt an improvement on building a relationship with their patients and families, and mentioned increased competencies. However, they reported a lack of time and resources. The patients were in particular satisfied with the support from their husbands, the friendly attitude of nurse-midwives, the improved awareness of the signs of iron deficiency anaemia, and the benefits of the parenting classes. However, they also expressed a mismatch of expectations about the parenting classes.

Conclusion
The nurse-midwives and patients are satisfied with the new model and suggest that this new model could replace the existing management of pregnant women with iron deficiency anaemia in Public Health Centres in Indonesia. Better educational material and more time to conduct parenting classes are needed to increase patient’s health literacy.

Keywords: a new model; iron deficiency anaemia; pregnant women; nurse-midwives’ satisfaction; patients’ satisfaction
Introduction

Over the last two decades, iron deficiency anaemia during pregnancy has been one of the top-ranking maternal health problems in Indonesia. Iron deficiency is the most common cause of iron deficiency anaemia amongst pregnant women, followed by hookworm and other infectious diseases (Nurdiati, 2001). At the level of Public Health Center evidence about the effectiveness of iron deficiency anaemia management during pregnancy is lacking (World Health Organization, 2001).

Our previous study on nurse-midwives’ experiences in the prevention of iron deficiency anaemia among pregnant women in Public Health Centers revealed that the lack of communication and clinical skills of the nurse-midwife, cultural beliefs and low participation by family members in the antenatal care programme, as well as insufficient facilities were experienced as barriers to perform an effective prevention of iron deficiency anaemia (Widyawati et al., 2015). Studies about the barriers in providing adequate antenatal care in other low-middle income countries have shown similar barriers (Finlayson and Downe, 2013; Bohren et al., 2014; Nair et al., 2014). Based on previous national and international studies, we designed a new model to improve management of iron deficiency anaemia in pregnant women (World Health Organization, 2001; Finlayson and Downe, 2013; Nair et al., 2014). We called the new model the Four Pillars Approach to emphasize the four specific areas in which we aimed to improve antenatal care, ensuring a more comprehensive approach. The first pillar consists of information and education about a healthy lifestyle, provided by the nurse-midwives to the pregnant women and their family. In order to improve information for patients and relatives, nurse-midwives were provided with a simple booklet to use as information material. The second pillar focuses on social support for the pregnant women by their husbands and/or family members. The third pillar aims to provide adequate treatment of the iron deficiency anaemia in pregnant women. The fourth pillar focuses on a professional behaviour by nurse-midwives towards patients and their families (Widyawati et al., 2014). The nurse-midwives received a specific training to improve their competencies in all four areas.

In 2012, we carried out a controlled intervention study in order to investigate the effect of the Four Pillars Approach. The results of this study showed that the intervention group had significantly more often an increased haemoglobin level of more than 0.5 g/dL (OR 25.0 [CI 95% [12.03,52.03], p=0.001]) and a normal haemoglobin level at 35-37 weeks of gestation (OR 18.1 [95% CI (6.96,46.92), p=0.001]) compared to the control group (Widyawati et al., in press).
Considering the important roles the nurse-midwives and patients play in sustaining the implementation of this model, we like to gain more insight into aspects of their satisfaction with the new model. Therefore, we explored satisfaction of both nurse-midwives and patients with the Four Pillars Approach in Public Health Centres in Yogyakarta-Indonesia.

**Methods**

We made use of quantitative methods by questionnaires and of qualitative methods by focus group discussions.

**Participants**

All 49 nurse-midwives who participated in the intervention group of the study, filled in a questionnaire after the completion of the study (February until May 2013). In order to get a more in-depth understanding of some aspects of their satisfaction, we carried out six focus group discussions. We invited the 19 nurse-midwife coordinators of the Four Pillars Approach programme. We considered that the nurse-midwife coordinators have the most information about the Four Pillars Approach. In addition, five nurse-midwives also joined the focus groups.

In total, 19 nurse-midwife coordinators and five nurse-midwives participated voluntarily in the focus group. We also invited three patients from each Public Health Center to voluntarily participated, and 25 of the 57 patients agreed. We divided the 24 nurse-midwives into three focus groups, ensuring that each group consisted of eight nurse-midwives. Similarly, we also divided the 25 patients into three focus groups of eight or nine patients. The focus groups were conducted during November 2013 and April 2014.

**Data collection**

To assess satisfaction, we developed a questionnaire which consisted of 15 items about the quality of the health services provided, procedural clarity and communication between nurse-midwives and patients. The answers were given on a 5-point Likert scale, ranging from very dissatisfied (0) to fully satisfied (5).

The topic list for the focus group discussions was developed on the basis of the questionnaires’ findings and the supervising committee’s expertise (TLJ, SJ, JvD). The most important question put to the patients was: are you satisfied with the antenatal care approach you received from the nurse-midwife, and why? The most important question put to the nurse-midwives was: are you satisfied with the antenatal approach you offered to the patients, and why? Especially if the questionnaire, completed by the nurse-midwives,
revealed unsatisfactory issues, for example with the parenting classes, the relationship experienced between the nurse-midwives and their patients, and the booklets used, we elaborated on these in the focus groups.

The discussion took place in School of Nursing, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta. Baseline characteristics were recorded of all participants: such as age and number of years of clinical experience of nurse-midwives and age, parity and education background of the patients. No new themes emerged after the three group discussions with the nurse-midwives, and the three group discussions with the patients, meaning that saturation was reached.

The group discussions were led by an experienced moderator, who was supported by an assistant. The discussions lasted one to two hours, were fully recorded and anonymously transcribed ad verbatim. Before the data collection started, we informed the participants about the aim of the study and asked them to give their written consent.

Data analysis
The data from the questionnaires were entered into a computer using Epidata and exported to SPSS version 20.0 for analysis. Data were analysed using descriptive statistics.

All focus groups were transcribed by an assistant. Three researchers (WW, WAN, EDH) analysed the transcripts using the software program ATLAS.ti version 6.1. The researchers first independently attached codes to the themes emerging from the focus groups. We ensured the reliability of our results by comparing the results they obtained. Consensus was reached by discussion. According to the method of constant comparative analysis, these codes were compared with the text of the transcript during an iterative process, adjusted, and refined accordingly. Following the initial coding process, the three researchers discussed the findings and combined the codes into broader categories. The final analyze were discussed by all the authors. The COREQ criteria list for qualitative research was used to guide the report (Tong et al., 2007)

Ethical considerations
The Ethical Committee of the Faculty of Medicine, Universitas Gadjah Mada – Yogyakarta, gave ethical approval for this study on the 15th of December 2011 (ref. no.: KE/FK/730/EC).
Results

The quantitative study

All 49 nurse-midwives filled in the questionnaire (100% response). Their mean age was 36.0 years (SD ±8.8), and 65% of them had more than ten years’ clinical experience. The majority of the nurse-midwives were fully satisfied with the Four Pillars Approach and considered this approach as an appropriate alternative model for managing pregnant women with iron deficiency (Table1). Especially, the patient monitoring aspect, training-based understanding of clinical treatment, and communication with patients and their families were all top-ranking items. Almost half the nurse-midwives answered neutrally to the question about the ease of implementation of the Four Pillars Approach. One in four nurse-midwives were dissatisfied with the time available to build a trusting and open relationship with patients and their families.

Table 1. Nurse-midwives’ satisfaction with the intervention of the Four Pillars Approach n=49 (%)

<table>
<thead>
<tr>
<th>Items of satisfaction</th>
<th>Fully satisfied</th>
<th>Satisfied</th>
<th>Neutral</th>
<th>Dissatisfied</th>
<th>Very dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The content of the concept of the Four Pillars Approach</td>
<td>23 (47)</td>
<td>26 (53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The process of the intervention</td>
<td>26 (53)</td>
<td>23 (47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The easiness of implementation of the concept</td>
<td>12 (24)</td>
<td>15 (31)</td>
<td></td>
<td>22 (45)</td>
<td></td>
</tr>
<tr>
<td>4. Contents of the booklet</td>
<td>14 (29)</td>
<td>33 (67)</td>
<td></td>
<td>2 (4)</td>
<td></td>
</tr>
<tr>
<td>5. Husband’s and families’ involvement</td>
<td>23 (47)</td>
<td>26 (53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The ability to provide health education</td>
<td>22 (45)</td>
<td>27 (55)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Patient monitoring</td>
<td>30 (61)</td>
<td>19 (39)</td>
<td></td>
<td>1 (2)</td>
<td>12 (24)</td>
</tr>
<tr>
<td>8. Have time to build interaction with the patient and family</td>
<td>35 (72)</td>
<td>1 (2)</td>
<td></td>
<td>12 (24)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>9. Confidence to deliver important information related to iron deficiency anaemia management</td>
<td>26 (53)</td>
<td>23 (47)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Competent to provide clinical treatment related to iron deficiency anaemia management</td>
<td>29 (59)</td>
<td>20 (41)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. The result of the Four Pillars Approach implementation</td>
<td>20 (41)</td>
<td>29 (59)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Communication with patient and family</td>
<td>27 (55)</td>
<td>22 (45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Regard to patient’s privacy</td>
<td>23 (47)</td>
<td>26 (53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Confidence in providing consultation</td>
<td>19 (39)</td>
<td>30 (61)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. The Four Pillars Approach as an alternative model</td>
<td>15 (31)</td>
<td>34 (69)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The qualitative study

The mean age of the 25 patients was 31.2 years (±5.7); the majority of them were multipara (84%), and 76% had had less than nine years of formal education (Table 2). The mean age of the 24 nurse-midwives was 37.6 years (±8.6), and the majority of them (71%) had had more than ten years clinical experience (Table 2).

Table 2. Characteristics of the focus groups patients (n=25) and trained nurse-midwives (n=24) (percentages)

<table>
<thead>
<tr>
<th>Characteristics of participants</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patients</strong></td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td></td>
</tr>
<tr>
<td>≤30 years</td>
<td>44.0</td>
</tr>
<tr>
<td>31 – 40 years</td>
<td>48.0</td>
</tr>
<tr>
<td>&gt;40 years</td>
<td>8.0</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>31.2 (±5.7)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>76.0</td>
</tr>
<tr>
<td>Middle</td>
<td>24.0</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
</tr>
<tr>
<td>Primipara</td>
<td>16.0</td>
</tr>
<tr>
<td>Multipara</td>
<td>84.0</td>
</tr>
<tr>
<td><strong>Trained nurse-midwives</strong></td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td></td>
</tr>
<tr>
<td>≤30 years</td>
<td>25.0</td>
</tr>
<tr>
<td>31 – 40 years</td>
<td>33.3</td>
</tr>
<tr>
<td>&gt;40 years</td>
<td>41.7</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>37.6 (±8.6)</td>
</tr>
<tr>
<td>Clinical Experience (in years)</td>
<td></td>
</tr>
<tr>
<td>≤5 years</td>
<td>16.7</td>
</tr>
<tr>
<td>6 – 10 years</td>
<td>12.5</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>70.8</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>15.2 (±7.8)</td>
</tr>
</tbody>
</table>

Patients

Five themes emerged from the discussions with the patients: they were satisfied with their husbands’ support and with the nurse-midwives’ friendly attitude, the improved awareness of the signs of iron deficiency anaemia and the benefits from the parenting classes. However, they also expressed a mismatch of expectations about the parenting classes.
Husbands’ support
The patients expressed great satisfaction with the attention their husbands paid in guiding the antenatal care schedule, helping them with their domestic duties/work, and reminding them to take the iron tablets.

For me, taking the iron tablet requires an extra motivation because of its side effects, but he [my husband] always prepared the tablet for me every day and reminded me to take it. Something he never did before my pregnancy is that he now wants to help me to clean the house. (Parity2, 30 years, group 1)

My husband always accompanied me to the Public Health Centre, and he wants to join in the parenting classes. (Parity1, 27 years, group 2)

Friendly attitude of the nurse-midwife
The patients explicitly stated that they had been treated politely and well by the nurse-midwives.

She [the nurse-midwife] explained clearly what I had to do and what not to do regarding my health and facilitated us [patient and husband] to discuss our health problems. I felt comfortable. (Parity1, 21 years, group 2)

When we met with my nurse-midwife, it seemed like we met our best friend. We felt we didn’t need to hesitate to contact her every time we needed her [nurse-midwife’s] advice. (Parity3, 35 years, group 3)

Improved awareness of the signs of iron deficiency anaemia
Most patients mentioned that their awareness of the importance of their health status increased when they learned from the booklet that an anaemic condition might have such a negative impact on the outcome of their pregnancy. Their commitment to improve their health was also stimulated by the booklet.

We read the booklet and we learned that we should not ignore the signs of iron deficiency anaemia that are felt during pregnancy. After that, my husband and I were eager to participate in this study because we really wanted a healthy baby. (Parity1, 21 years, group 2)

This booklet gave me a broader awareness of the importance of being free from an anaemic condition. I do not want to have another small baby: my previous baby was born prematurely. (Parity2, 34 years, group 3)
Regarding the design, most patients suggested using more illustrations in the booklet and using a bigger font size to make it easier to read.

**Benefits of parenting classes**

Some multipara patients mentioned that the parenting classes of the Four Pillars Approach was a new experience compared with the mother classes, they were accustomed to when attending the usual care. The parenting classes gave them specific information about iron deficiency anaemia during pregnancy which they had not been informed about in their previous pregnancies. Moreover, shared experiences among the pregnant women and their husbands made them more enthusiastic to join in the classes.

*I’m eager to join in the parenting classes, and so is my husband even if this makes him late for his office because he wants to attend the parenting classes which were conducted during the working hours….we have many benefits from these classes which we did not have before…..*(parity3, 35 years group 1)

*I just know from the parenting classes that iron deficiency anaemia could also have an impact on my baby…the nurse-midwives explained clearly about this…and now I know that may be why my first child had low birth weight because I had untreated iron deficiency anaemia….because I did not understand it…* (parity2, 25 years group 2)

**Mismatch of expectations**

Some patients complained about the schedule of the parenting classes, which were only held twice during pregnancy and lasted only one hour. This schedule did not meet everybody’s expectations.

*We came late, and the parenting class had already started 20 minutes earlier. We missed some important information and we could not ask for some additional time because the nurse-midwives had to do something else. (Parity2, 34 years, group 1)*

*It was a pity that I did not have an opportunity to ask my questions during the classes; one hour seems not to be enough for a group of almost 12 patients plus our husbands. The explanation took too long and we only had 15 minutes for discussion. Moreover, it was conducted only twice during my period of pregnancy. (Parity1, 30 years, group 3)*

**Nurse-midwives**

Three themes emerged from the discussions with the nurse-midwives: building a partnership with patients and families, increased competencies and the lack of time and resources.
Building a partnership

The results of the questionnaire showed that one in four nurse-midwives was dissatisfied with their interaction with the patients and families because they did not have time to build a relationship. In the focus group, therefore, we specifically asked the nurse-midwives about their experiences with this issue. In contrast to the findings in the questionnaires, most nurse-midwives mentioned the many opportunities the Four Pillars Approach offered to build a relationship with the patients and their husbands. They spoke about the patients and their patients’ husbands as their partners in care. Moreover, the nurse-midwives realized that building a partnership with the patients and their husbands was the best way to improve the quality of care and to treat iron deficiency anaemia properly.

*When I met the patients’ husbands in ANC visits and in parenting classes, I never forgot to ask them to cooperate with us in order to optimize the treatment so their wives would be free from their anaemic condition. I’m satisfied with the results: all of my patients have increased their Hb levels (haemoglobin).* (NM2, 34 years, group 2)

*We knew that some of them [patients and family] felt unhappy with our old behaviour (before we were trained). We tried to improve our mindset. I think being a good partner for our patients was a good start to improve our quality of care.* (NM7, 31 years, group 1)

Increased competencies

All nurse-midwives expressed their satisfaction with their increased competencies to manage pregnant women with iron deficiency anaemia. They felt more confident and skilled in delivering health education, and in holding consultations with their patients and families.

*I felt confident in my tasks [related to the intervention of the new model]. I did not experience any difficulties in giving the treatment or in explaining the health information to the patients and families. Previously [before the new model] I felt sort of blank and did not know what I was supposed to discuss with the patients.* (NM6, 24 years, group 1)

The satisfaction with the new model was also illustrated by the nurse-midwives’ experiences that the new model gave them an easy way to monitor any treatment’s progress.

*The systematic approach of the Four Pillars made it easier for us to find out the results of our treatment by checking the physical and laboratory assessment results in the monitoring form and by reading the patient’s comments in the booklet. Then I knew what I had to do next.* (NM coordinator4, 37 years, group 3)
Lack of time and resources

Running out of time was mentioned by many nurse-midwives as a reason for feeling dissatisfied with the parenting classes. In addition, the limited available numbers of the booklets was also an obstacle in getting the patients to read all the information before the parenting class started.

One hour seems not enough for us to conduct a parenting class. We ran out of time before we could answer all the questions. They [patients and families] seemed eager to ask many things related to the topics. (NM coordinator5, 36 years, group 2)

I could not give the booklet to one of my patients at the time when I recruited her because there weren’t enough booklets. This was a pity because I think giving the booklet before the classes started would have made it easier to provide the health information. It would be clearer if they [the patients] had read it first. (NM coordinator3, 37 years, group 1)

Discussion

Nurse-midwives and patients are satisfied about the Four Pillars Approach. We found three main findings related to the satisfaction of the patients and nurse-midwives with the Four Pillars Approach: partnership between patients and nurse-midwives, the confidence of the nurse-midwives to provide health education, and women’s empowerment by education and involvement of husband and/or family.

Partnership between patients and nurse-midwives

Nurse-midwives and patients are satisfied with building a partnership with the patients and their husbands. Partnership and communication between the healthcare providers and their patients and families are essential (Deresa et al., 2014; Johnson et al., 2008). Women and families should be assured that they will not only receive appropriate information and be able to interact with their healthcare provider, but should also have an opportunity to obtain the information in relation to make a decision on their health care (Say et al., 2011). Nurse-midwives in our study improve their mindset to be a good partner for their patients even actually they have lack of time to answer all the questions from their patients. Some conditions that encourage patients’ participation and partnership are not using power to control over the patients, offering two-way interaction with the patients, and improving professional behaviour (Portela and Santarelli, 2003; Both et al, 2006; Longtin et al, 2010; Srivastava et al, 2015).
Partnership between nurse-midwives and patients is strongly related to the communication competences (Fong Ha and Longnecker, 2010). Communication is the heart and art of caring. Effective nurse-midwives – patients communication is a central clinical function in building a therapeutic nurse-midwives – patients relationship. To create and maintain the relationship between nurse-midwives and patients not only basic communication skills are needed, but also interpersonal skills (Henrdon and Pollick, 2002).

In our study, patients feel that they do not need to hesitate to contact the nurse-midwife every time they needed. Patients reporting good communication with their nurse-midwives are more likely to be satisfied with their care, and especially to share pertinent information for adequate midwifery treatment, follow advice, and adhere to the prescribed iron tablets (Levinson et al., 2010; deNegri et al., 1999). When nurse-midwives and patients have different values, beliefs and education background this might influence mutual interaction and communication and therefore the outcomes of midwifery care (deNegri et al., 1999; Tongue et al., 2005; Diette and Rand, 2007).

**The confidence of the nurse-midwives to provide health education**

Nurse-midwives also feel confident in providing health education to their patients and families, which they felt as a huge problem expressed in our previous study. Professional confidence, and consequently competences in patient communication and clinical skills are two components vital to the profession. Professional competence can be conceptualized in terms of knowledge, abilities, skills and attitudes displayed in the context of a set of realistic professional tasks, whereas confidence in oneself symbolizes the belief that one has to do things well or deal with situations successfully (Hecimovich and Volet, 2009). When the patients trust the nurse-midwives’ competences, their confidence in providing health education will increase (Mogren et al., 2010).

**Woman empowerment by education and involvement of husband and/family**

Our study reveals that not only the patients, but also their husbands are willing to join in the parenting classes. Antenatal classes are informative and highly recommended for expectant parents (Tongue et al., 2005). Important benefits of antenatal classes are the possibility to share knowledge and transfer skills, as well as to socialize with other expectant parents (Portela and Santarelli, 2003; Renkert and Nutbeam, 2001; Brixval et al., 2015). An active involvement of husband and/or family in antenatal care programmes positively contributes to the utilization of antenatal care services. Men’s knowledge about pregnancy-related care and a positive gender attitude enhances maternal health care utilization and women’s decision-making about their health care, while their presence
during antenatal care visits markedly increases the chances of women's birth in health care services (Chattophadyay, 2012).

However, some of the nurse-midwives and patients express their dissatisfaction with the limited time in parenting classes. To date, research on learning processes parents use and prefer during pregnancy and early parenthood is scarce (Renkert and Nutbeam, 2001). Most parents prefer to a small-group learning environment in which they can talk to each other as well as to the educator and can relate information to their individual circumstances (Svensson et al., 2008; Nolan, 2009).

Lastly, informative booklets are an important media for health education aimed at improving health literacy and promoting healthy behaviour (McKinney and Rossi, 2006; Wilkinson and McIntyre, 2012; Reberte et al., 2012). For the less educated patients, the production of booklets with easily understood vocabulary and clear illustrations is necessary to make the information more accessible (Wilkinson and McIntyre, 2012).

Limitations and strengths

Our study has some limitations. Firstly, we can not rule out the possibility that the participants in the focus groups gave socially desirable answers. Nevertheless, both the moderator and the observer had the impression that a sufficient climate for open communication was created during the focus group discussions. Secondly, qualitative studies are always subjective in their interpretation. To avoid this as much as possible, we use triangulation and involve other experts (WAN and EDH) in our data analysis (Fetters et al., 2012). Thirdly, we used a non validated questionnaire on satisfaction. Nevertheless, we based the questionnaire on the validated Langer questionnaire and adopted this after discussion in the supervising committee (SJ, WAN, EDH, JvD, ALM LJ) (Langer A et al., 2002). Lastly, we did not explore the satisfaction of the nurse-midwives and patients in the control group. However, the multipara patients expressed the benefits of joining in the parenting classes and the friendly attitude of the nurse-midwives which they have not felt during their previous pregnancy. One of its greatest strengths is that our study involves participants from all the Public Health Centers in the five districts of Yogyakarta Special Province.

Implications for practice and research

Better educational materials for patients and their families about pregnancy-related problems such as iron deficiency anaemia and a re-assessment of the amount of time needed to conduct effective parenting class sessions are necessary to improve health information about iron deficiency anaemia. Having more time to conduct parenting classes
and giving more frequent parenting classes can be achieved by increasing the number of trained nurse-midwives.

A future study on satisfaction with a new model must include a measurement of satisfaction in a control group. Also a study to explore privacy issues in parenting classes and the involvement of husbands and families of the pregnant women would be very interesting.

**Conclusion**

Both patients and nurse-midwives are satisfied with the new model for managing pregnant women with iron deficiency anaemia in Public Health Centres. Improvements must be made about the lack of time allocated to conduct parenting classes and the lay-out of the booklets. This new model can replace the existing model for managing pregnant women with iron deficiency anaemia in Public Health Centers Indonesia.

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CHAPTER 7

General discussion
Overview of this thesis

We conducted four studies to address the research questions we mention in Chapter 1. The first study aimed to explore the experiences of the nurse-midwives in Yogyakarta Special Province in carrying out antenatal care for pregnant women with iron deficiency anaemia, as well as to provide insights into their perceived competences in the prevention of anaemia (Chapter 2). Then we used the study results of Chapter 2 as the basic concepts for developing a new model for managing iron deficiency anaemia in pregnant women at the PHCs (PHCs) described in the study protocol (Chapter 3).

Next, a non-randomised controlled intervention study was used to evaluate the effectiveness of the new model, called the Four Pillars Approach, for managing iron deficiency anaemia during pregnancy (Chapter 4). We continued our study to investigate the facilitators for, and barriers to, the intervention of the Four Pillars Approach in the PHCs in Yogyakarta Special Province, based on the perspectives of nurse-midwives and nurse midwife coordinators (Chapter 5). The last study, which meant to assess the nurse-midwives’ and their patients’ satisfaction with the Four Pillars Approach in the PHCs in Yogyakarta, is discussed in Chapter 6.

The answers to the four research questions have been presented in the previous chapters. In this final chapter, we discuss the studies in relation to each other and we examine the main results, set in a wider context. We also address the methodological considerations and the implications for practice. Finally, we present the overall conclusions of the complete study and make some recommendations for future research.

Main findings

Nurse-midwives’ experiences in preventing iron deficiency anaemia during pregnancy

This qualitative study (Chapter 2) revealed that the nurse-midwives experienced three main barriers in their work to prevent iron deficiency anaemia at the PHCs in the Special Province of Yogyakarta: a lack of competences and clinical skills, the cultural beliefs of pregnant women and low participation of the family in the antenatal care programmes, and the insufficient facilities and lack of skilled support staff at the PHCs. These barriers prevented the nurse-midwives from providing an adequate antenatal care programme to pregnant women with iron deficiency anaemia at the PHCs. On the basis of these results, we recommend a more comprehensive anaemia management approach which synergises the available resources and empowers the nurse-midwives and pregnant women.
The development of a new model for managing iron deficiency anaemia during pregnancy

On the basis of our qualitative study results in Chapter 2, previous studies, and expert opinion, we designed a new model called The Four Pillars Approach (Chapter 3). The Four Pillars Approach has been designed as an integrative approach to empowering both patients and nurse-midwives. The four pillars of this new model are: patient’s healthy lifestyle, social support from husband and/or family members, adequate midwifery treatment, and professional behaviour.

The first and second pillars, a healthy lifestyle and the strengthening of social support, represent patient empowerment. Patient empowerment is stimulated by involving the pregnant women and their husbands or family members in parenting classes during pregnancy and by providing them with a booklet explaining how to deal with anaemia during pregnancy. The third and fourth pillars, adequate midwifery treatment and professional behaviour of the nurse-midwives, represent the nurse-midwives’ empowerment.

The effectiveness of the Four Pillars Approach in managing iron deficiency anaemia in pregnant women

A non-randomised controlled intervention study (Chapter 4) to evaluate the effectiveness of the new model was conducted in two provinces at Java Island from March 2012 until May 2013. The non-randomised controlled intervention study was carried out in some PHCs in Yogyakarta Special Province (the intervention group) and Central Java Province (usual care given to the control group).

This study revealed a significant increase of ≥0.5 g/dl of haemoglobin level in 80.7 per cent of participants in the intervention group and 16.8 per cent of those in the control group. In the intervention group, 35.4 per cent of the participants had a normal haemoglobin level compared to 11 per cent of participants in the control group. The participants in the intervention group attended at least five antenatal care visits, which was significantly more than the pregnant women in the control group: 95.0 per cent versus 57.2 per cent. Participants who needed to travel a greater distance to a PHC showed a significantly lower number of antenatal care attendance. All participants who completed the study in both groups were assisted by a skilled birth attendant during labour. In conclusion, the Four Pillars Approach was effective in increasing haemoglobin levels and frequency of antenatal care visits.
Barriers and facilitators in implementing the new model as perceived by the nurse-midwives

A qualitative study, involving focus group discussions with 19 trained nurse-midwives and five district-level nurse-midwife coordinators of family health programmes, was conducted (Chapter 5) to explore barriers and facilitators of the new model. The training made the nurse-midwives feel competent in providing health education to their patients, which resulted in their improved confidence in delivering comprehensive care. The adequate support of their supervisors, furthermore, facilitated the implementation process.

The perceived barriers were the lack of financial resources to replicate the booklets, the lack of public transport for home visits patients when they could not attend parenting classes at the PHCs, the absence of health insurance coverage, staff shortage, and the non-availability of iron tablets at some PHCs.

Nurse-midwives’ and patients’ satisfaction with the new model

To examine the nurse-midwives’ and patients’ satisfaction, we used questionnaires and focus group discussions (Chapter 6). The majority of the nurse-midwives were fully satisfied with the Four Pillars Approach and considered it an appropriate alternative model for managing anaemia during pregnancy. Particularly the patient-monitoring aspect, the training-based understanding of clinical treatments, and the communication with patients and their families were all top-ranking items in the questionnaire. Almost half the nurse-midwives gave a neutral answer to the question whether the Four Pillars Approach had been easy to implement. One in four nurse-midwives was dissatisfied with the time available for building a trusting and open relationship with their patients and families.

The patients expressed their satisfaction with their husband’s support and with the nurse-midwives’ friendly attitude, with their improved awareness of the signs of iron deficiency anaemia, and with the benefits from the parenting classes. However, the patients also mentioned that there had been a mismatch of expectations with regard to the parenting classes.

Reflections on the findings

In 2000, the Millennium Summit of the United Nations established eight international development goals: the so-called Millennium Development Goals (MDGs), and Member States committed themselves to reaching specific targets in 2015 to improve their results in the eight MDGs. MDG 5, to improve maternal health, is one of the goals that has received the least attention and, therefore, has made the least progress both worldwide and in
The global MDG 5 target for 2015 is to reduce the maternal mortality rate by 75 per cent from its 1990 level.

In order to support MDG 5, the World Health Organization (WHO) developed a programme called Making Pregnancy Safer, which was adopted in 2002 as the key strategy for maternal health in Indonesia. However, the translation of this policy into an effective implementation strategy and, hence, into improvements in maternal and neonatal health, has suffered from some serious shortcomings. Specifically, the government did not set up an adequate system to implement this programme at the Provincial and District levels, resulting in unclear roles and responsibilities between the central and local governments. Moreover, the design of this vertical programme was not based on the social and cultural determinants of health in local communities. The health programme will be more effective if it addresses the social and cultural determinants of health in local communities.

By 2012, Indonesia succeeded in increasing the proportion of child births aided by trained health workers from 40.7 per cent (1991) to 81.25 per cent. However, this increased percentage of trained health workers attending births is not directly related to a reduction in maternal mortality rates, which went from 390 (1991) to 359 per 100,000 live births in 2012. While the national percentage of pregnant women who received at least four antenatal care visits is more than 80 per cent, only 20 per cent of these women received complete and standard antenatal care during their antenatal visits. The United Nations Children’s Fund (UNICEF) reported that substandard antenatal care is a major problem in all regions in Indonesia. Many studies into the efficacy of antenatal care services reveal that pregnant women are driven by their social, culture, and beliefs to choose Traditional Birth Attendants (TBAs) as their caregiver during pregnancy and child birth rather than skilled health workers.

It is well known that many health problems in pregnant women can be prevented, detected, and treated during antenatal care visits. Antenatal care is also crucial in ensuring the mothers are healthy during pregnancy. Especially for pregnant women with anaemia in Indonesia, it is important to convince mothers to deliver in a health facility to make sure that they receive appropriate medical treatment and to prevent any possible perinatal risks.

With regard to the management of iron deficiency anaemia during pregnancy, the PHCs in Indonesia are facing nurse-midwives’ substandard competences in detecting early signs and symptoms of anaemia, insufficient facilities in the PHCs, and poor accessibility of health facilities due to geographical and financial barriers. The percentage of iron tablet
distribution is high, but patients’ compliance with iron tablet medication is low, a circumstance that is strongly correlated with social and cultural beliefs prevalent amongst the women and their communities, such as health illiteracy, food taboos, and other dietary habits.9,13-15 The side effects of iron tablets also contribute to low patient compliance.16-18

In conclusion, therefore, even if antenatal care coverage is relatively high, the quality of antenatal care for pregnant women with iron deficiency anaemia needs attention, as anaemia contributes to 20 per cent of the maternal mortality rates in Indonesia.16,17

Common antenatal care is based on the Safe Motherhood programme. Anaemia is mentioned in the WHO training module as a health problem during pregnancy that should be managed by midwives in antenatal care services.19 In Indonesia, however, there is no special programme available within the common antenatal care programme for pregnant women with specific health problems, such as anaemia.

In order to involve husbands in birth preparedness, the Alert Husband scheme was launched by the government as part of the Safe Motherhood programme. However, the Alert Husband scheme only involved pregnant women’s husbands in birth preparations but did not actively involve them in antenatal care programmes. The Alert Husband scheme, therefore, has not changed much in the support given by husbands to wives throughout pregnancy, which is particularly important when women have health problems such as anaemia during pregnancy.20,21

Our study findings indicate that the Four Pillars Approach can be an alternative model for the Safe Motherhood programme, particularly in addressing iron deficiency anaemia during pregnancy, because the Four Pillars Approach addresses the nurse-midwives’ needs and the needs of patients and their families more successfully. Three factors might contribute to the success of the Four Pillars Approach: its patient-centeredness; the nurse-midwives’ feelings of competence and confidence; and the empowerment of both patients and nurse-midwives.

Patient-centred care

An important factor contributing to the success of the Four Pillars Approach is its focus on patient-centred care. Inspired by the Javanese local wisdom of ‘Nguwongke Wong’, we used this philosophy in our social interaction between the nurse-midwives and the patients. The philosophy of ‘Nguwongke Wong’ can be defined as a humanising belief about respecting people as they are: while everyone wants to be loved, heard, and appreciated, people are also different from each other and this difference should be respected, for example, by providing personalised treatments for healthcare needs.22-24
We applied this philosophy of humanising our patients by respecting three integrities in the Four Pillars Approach. First, we respect the factors that are culturally sensitive, such as food taboos. Second, there is no rigid or single solution to solving problems, and we respect each individual’s uniqueness. Thirdly, we believe that the concept of the Four Pillars Approach belongs to everyone who is involved in the model, as this model’s design is based on both the nurse-midwives’ and the patients’ needs.

The Four Pillars Approach involves not only pregnant women with anaemia in the antenatal care programme, but also their husbands and/or family members. A partner’s involvement in antenatal care programmes has a positive impact on maternal health. If knowledge of anaemia during pregnancy increases, the pregnant women’s commitment to a healthy lifestyle improves.25-27 Pregnant women who are health illiterate and have strong cultural beliefs need special attention from health professionals in the antenatal care programmes.26

Health literacy is defined as ‘the degree to which individuals have the capacity to obtain, process, and understand the basic health information and services needed to make appropriate health decisions’. 28 Health literacy is believed to be a stronger predictor of health outcomes than socio-economic status.29 Health illiteracy is one of the inhibiting factors among the pregnant women and families to acknowledge the needs to seek maternal healthcare services.30

The Four Pillars Approach allows nurse-midwives to deal with these issues. The Four Pillars Approach booklets help the nurse-midwives to provide easy-access health education to pregnant women and their husbands and to aid pregnant women and their families to learn more about anaemia during pregnancy. Cultural modification or negotiation allows the nurse-midwives to make sure that cultural practices are not harmful to the pregnant women and the foetus, for example, by advising a pregnant woman to substitute protein sources when she is forbidden to eat meat, or by specifying what rituals with her traditional healer do not have a negative impact on the pregnant woman and the foetus. As she is not being judged negatively by such an attitude, this would make a pregnant woman feel more comfortable and encouraged to attend regular antenatal care.

Open communication results in positive collaboration between professionals and pregnant women and their families. Building a trusting relationship between nurse-midwives and pregnant women is essential to encourage women to attend the antenatal care programmes and to feel free to discuss their health problems with the nurse-midwives.31,32 Patients may trust nurse-midwives for two reasons: because of their perceived medical
competence or because of their empathy and non-judgemental attitude.\textsuperscript{33} ‘With women’ and ‘in partnership with women’ are terms associated with good clinical results and a higher level of professional satisfaction, which increases the nurse-midwives’ self-confidence.\textsuperscript{34} In the Four Pillars Approach, both nurse-midwives and patients (and their husbands) have the opportunity to build a trusting relationship through mutual interaction. The nurse-midwives are taught to maintain open attitudes, good communication, and empathy, thus facilitating interaction. As one patient observed: ‘\textit{When we met with our nurse-midwife, it seemed like we met our best friend. We felt we didn’t need to hesitate to contact her every time we needed her advice.}’

\textbf{Nurse-midwives’ feelings of competence and confidence}

A second success factor is the nurse-midwives’ internal motivation to change. In the interviews before the new model was developed, the nurse-midwives said they were unhappy with the actual care they gave to pregnant women, when they complained about their lack of knowledge, competences, skills, and resources as the most important barriers to providing adequate antenatal care. Their dissatisfaction gave them a strong motivation to change their previous approach into a professional approach. Their feelings of competence were much enhanced by a training programme, information booklets on managing iron deficiency anaemia in pregnant women, and appropriate supervision by a nurse-midwife coordinator in each PHC.\textsuperscript{35} The nurse-midwives’ participation in the development of the new model engaged them in its implementation.\textsuperscript{36}

Our study results are supported by other studies which also recommend that training and continuous education for nurse-midwives are needed to improve and sustain their competences in the provision of antenatal care and care during delivery.\textsuperscript{9,10} In other low-income countries, insufficient training, shortage of resources, and lack of facilities have also been recognized as a barriers to providing adequate antenatal healthcare.\textsuperscript{37,38,39} Appropriate antenatal care treatment for pregnant women with anaemia can only be provided by skilled or competent nurse-midwives.

The International Confederation of Midwives (ICM) observes that the majority of midwives’ competences are considered to be basic and need to be supplemented with additional skills: basic competences are acquired in midwifery training; additional skills are defined as those that can be learned or performed by a midwife in either of two circumstances: either a midwife may elect to engage in a broader scope of practice and/or she may implement certain skills to make a difference to the maternal or neonatal outcome. This allows for variations in the education and practice of midwives throughout the world, depending on the needs of the local community or nation.\textsuperscript{40}
With regard to competences in anaemia management during pregnancy, the ICM mentions as one of the midwives’ basic competences that they should be able to provide high-quality antenatal care to maximise health during pregnancy, which includes the early detection and treatment, or referral, of selected complications.\textsuperscript{40} Our findings support the ICM policy that nurse-midwives need to improve their knowledge and skills relating to their scope of practice and the needs of local community.

The nurse-midwives’ commitment to carrying out the Four Pillars Approach and to providing continuity of care was remarkable and is supported by other findings that healthcare workers’ confidence and commitment rise with increasing levels of competence.\textsuperscript{41,42} Furthermore, self-confidence leads to better decision-making.\textsuperscript{42} The feeling of self-confidence is an essential factor in self-efficacy.\textsuperscript{43} Appropriately skilled nurse-midwives are better able to respond to maternal care needs and thus help to reduce maternal mortality.\textsuperscript{44}

The United Nations recognise the need to increase the presence of and the proportion of births attended by skilled healthcare providers to reduce maternal mortality rates as indicators of quality of care.\textsuperscript{45} As the key partners in global safe motherhood, therefore, the ICM and the International Federation of Gynaecology and Obstetrics (FIGO) are committed to promoting the health, human rights, and well-being of all women, especially those women who are at the greatest risk of death and disability associated with childbearing.\textsuperscript{46}

According to the WHO, a skilled healthcare provider is ‘an accredited health professional, such as a midwife, doctor, or nurse, who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth, and the immediate postnatal period, and in the identification, management, and referral of complications in women and newborns’.\textsuperscript{47,48}

By reinforcing the nurse-midwives’ feelings of competence and confidence in providing antenatal care to pregnant women with iron deficiency anaemia, the Four Pillars Approach has enabled them to contribute to reducing maternal mortality rates and to improving maternal health care quality in Indonesia. Based on our study results, this model may also be effective in dealing with other health problems during pregnancy.

**Empowerment of nurse-midwives and patients**

The Indonesian Midwives Association has set the target ratio at 100 nurse-midwives per 100,000 in 2015.\textsuperscript{49} In Indonesia, the 2012 ratio was 55 nurse-midwives per 100,000; in Yogyakarta Special Province, however, there were only 47 nurse-midwives per 100,000.\textsuperscript{50,51} Because of this limited availability of trained nurse-midwives in PHCs, nurse-midwives have
to work overtime to manage all their patients. The strategic planning of the Indonesian Midwives Association and the Ministry of Health is to improve the quality of maternal health care by increasing the midwives’ educational level and by increasing the number of midwifery schools. At present, there are about 679 midwifery schools in Indonesia, but less than 30 per cent of these are accredited by the National Board of accreditation because they are not offering compulsory educational modules. Most midwifery schools, moreover, are located on Java island.

In providing quality midwifery care to the community, it is not only the supply of nurse-midwives during labour that counts but also the needs of women during their pregnancies. This requires that supply and needs are balanced, as quality of care can only be established when health worker’s competences meet patients’ health care needs. In order to improve the nurse-midwives’ professionalism and the quality of maternity care, therefore, it is essential to pay attention to the academic process, the certification, and the accreditation system. With too many patients to look after, the nurse-midwives’ workload is too heavy and there is too little time to pay attention to cultural sensitivities and to build a professional relationship with patients. All of this affects the quality of antenatal care.

To decrease the barriers between nurse-midwives and pregnant women, both parties need to be empowered. Empowerment of nurse-midwives enables them to act and to exercise power, influence and control, which is important for their professional development and for the effectiveness of the health care they provide. In the context of the Four Pillars Approach, we emphasise the importance of empowering the nurse-midwives by improving their knowledge, skills, competences, and professional behaviour. To empower pregnant women, we enable them to understand their health condition and to opt for a healthy lifestyle so that they will gain optimum results from the midwifery care provided.

Empowerment can be developed at two levels: at the individual level and at the community level. At the individual level, empowerment efforts aim to increase resources such as knowledge, cognitive capacities, health competences, and the capacity and confidence to make healthy lifestyle choices. At the community level, efforts aim to apply those skills and community resources that serve to meet community needs. Empowerment, in sum, is the process of improving the ability of an individual and a community to make choices and to take actions for better conditions.
The supporting facilities offered by the Indonesian government such as health insurance coverage and free iron tablets do not work well in practice. Health insurance coverage is limited to normal pregnancy, and iron tablets are often not available in sufficient quantities in PHCs. Adequate health insurance coverage for pregnant women is important, especially when more than the regular antenatal care visits and laboratory tests are needed, as in the case of anaemia or other health problems during pregnancy. In order to make sure that every pregnant woman receives early and regular antenatal care visits, health insurance coverage is needed as health during pregnancy is known to be related to early and regular antenatal care, which can help pregnant women to identify their health problems at an early stage and prevent further complications.

Improving access to maternal health facilities is an essential component in strengthening maternal health programmes and outcomes. If a well-designed programme is not backed up by adequate resources or is not supported by a higher level decision-maker, the successful implementation of the programme can be at risk and might lead to the improper management of iron deficiency anaemia in pregnant women in PHCs.

Reflections on the methodology of the study
We were unable to conduct a randomised trial because all midwifery practices in Yogyakarta Special Province are in close proximity to each other and have to cooperate in a geographically condensed area. However, we feel that the controlled intervention study, involving pregnant women with similar demographic characteristics in both the intervention and the control groups, is an adequate compromise.

We could not control for bias caused by the so-called Hawthorne Effect, a change in the nurse-midwives' behaviour in consequence of this study, which could have influenced our study results.

We also had no data to control for bias caused by the unequal number of women not wanting to participate in the intervention (n = 78) compared to participation in the control group (n = 21).

In addition, this study has not incorporated the opinions of the heads of PHCs or policymakers about the implementation of the Four Pillars Approach. Our study findings lack feedback from these leaders, which is important for the continuity of a new model in PHCs.
We are aware that qualitative studies are always subjective in their interpretation. In order to avoid this as much as possible, therefore, we used triangulation and involved several experts in our data analysis. Unfortunately, we failed to measure satisfaction with the usual care in a control group. Finally, our results cannot be generalised because this study was conducted in only one province in Indonesia.

One of the greatest strengths of this study is that the Four Pillars Approach has succeeded in being implemented among patients and nurse-midwives in a developing country with a low level of infrastructure.

**Implications for practice and education**

Because the target of MDG 5 could not be achieved in 2015, Indonesia continues programmes to decrease the maternal mortality rate as encompassed in the Sustainable Development Goals (SDGs). For more than two decades, anaemia has been included in one of the targets of SDG 12 (nutrition) as one of the factors contributing to the high maternal death rate. However, the target of SDG 12 does not specifically address anaemia during pregnancy. Previous national programmes conducted to combat anaemia have not managed to solve the problem. The Four Pillars Approach, which is based on nurse-midwives and patients’ needs, may be considered a fit model for addressing anaemia during pregnancy. We recommend that this model should be adopted by the Ministry of Health as a substitute for the usual care, especially in managing iron deficiency anaemia during pregnancy in PHCs.

The 2013 ICM regulation on the essential competences for basic midwifery practice mentions that the ability to manage anaemia during pregnancy is one of the required competences in providing care during pregnancy. With respect to this regulation, therefore, better quality training and continuous education should be facilitated for nurse-midwives. Furthermore, more incentives and improved facilities for nurse-midwives to work in rural areas and appropriate facilities for PHCs might be the solution to offset the insufficient resources and inaccessibility of maternal health care services in rural areas.

Moreover, it is also important to develop a network between the PHCs, the district or provincial health offices, and the national health office with a view to improving the availability of iron tablets or food supplements and to shortening bureaucratic procedures.

The nurse-midwives’ training curriculum should be matched with these current health problems and should be based on evidence from the field. Knowledge and skills examinations should be taken upon licence renewal. Accreditation for midwifery education
should be conducted by an independent national board consisting of nurse-midwives. Since 1982, midwifery education in the United States has involved an accreditation programme conducted by the Accreditation Commission for Midwifery Education (ACME) to make sure that the education programme meets the core competences for basic midwifery practice. Nursing and midwifery education in several African regions collaborate to develop and accredit nursing and midwifery education in order to improve quality in education and healthcare services. Although rich and poor countries have a different focus, accreditation mostly focuses on the process of core curriculum implementation in order to achieve basic competences while allowing for differences.

Setting up parenting classes is one of the activities in the Four Pillars Approach that improves pregnant women’s knowledge and awareness of maternal health. Parenting classes, therefore, should be made available for all pregnant women in Indonesia. In addition, other health information sources such as booklets or leaflets should be provided, in sufficient quantity and of good quality, as learning media in every PHC. Improving patients’ and families’ health literacy is pivotal in empowering them to make decisions on their maternal healthcare. In order to improve patients’ health literacy, we also recommend the provision of a community health library in every PHC to give easy access to maternal healthcare information for the community, including pregnant women. Another possibility is to develop a friendly web-based programme on maternal health for pregnant women and their families, as Internet connections are available in every sub-district in Indonesia.

Implications for future research

We have shown that our model is successful in treating pregnant women with iron deficiency anaemia. It is likely that the model could be equally successful in improving care for other health problems that occur during pregnancy, such as pre-eclampsia or diabetes. Because Indonesia consists of many cultures and demographic settings, it is important to conduct a similar study in a different cultural setting to explore other essential factors of the new model. Our study has not yet explored the opinions of policymaking staff at the district and provincial level. Their opinions are needed to set up the political strategy that is essential to support the programme’s sustainability.

Future studies are needed to establish the effect of the Four Pillars Approach on other maternal and pregnancy outcomes, such as post-partum haemorrhage and low birth weight. A future study on peoples’ satisfaction with the new model should also include satisfaction measurement in a control group. A study to explore privacy issues in parenting...
classes that involve husbands and relatives of pregnant women would also be very interesting.

We did not study the cost effectiveness of the Four Pillars Approach, but this would also be eligible for assessment as cost effectiveness might be one of the main considerations in the future implementation of this new model.

**Conclusion**

Anaemia is one of the most common health problems in pregnant women in low and middle-income countries, and iron deficiency anaemia has contributed to the high maternal mortality rate in Indonesia for more than two decades. Barriers to providing adequate midwifery care to pregnant women with anaemia include lack of competences to detect early signs of anaemia, lack of family support, and insufficient facilities in PHCs.

The Four Pillars Approach is a new model aiming to empower nurse-midwives and patients to manage iron deficiency anaemia during pregnancy in PHCs. This new model offers a promising approach to managing iron deficiency anaemia by giving a specific training programme to nurse-midwives, providing information booklets to nurse-midwives and pregnant women, and conducting parenting classes for pregnant women and their families.

Our study shows that the Four Pillars Approach has been effective in treating iron deficiency anaemia in pregnant women. Furthermore, the training programme has proved to make the nurse-midwives feel competent to provide health education and confident to take care of the patients. They are satisfied with the Four Pillars Approach and recommend it for the future. We are confident, therefore, that the Four Pillars Approach is an effective model that might also be applied in other areas that face similar problems.
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Summary

Iron deficiency anaemia is one of the health problems amongst pregnant women that contributes to the high prevalence of maternal death in Indonesia. Though some national programmes have been developed to decrease the prevalence of anaemia, iron deficiency anaemia amongst pregnant women still remains a big problem. There is a lack of studies explaining why its prevalence remains so high and investigating the effectiveness of interventions in iron deficiency anaemia. Iron deficiency anaemia in pregnancy needs prompt response by combining strategic actions that treat the disease in a comprehensive manner.

This thesis addresses four research questions. Chapter two provides a qualitative study on barriers in the prevention of anaemia during pregnancy in Public Health Centres (PHCs). Based on the findings of this study, we developed a protocol of a new model, called the Four Pillar Approach, to manage pregnant women with iron deficiency anaemia in PHCs (Chapter 3). Chapter 4 describes the results of the Four Pillars Approach pilot study, which was conducted in two provinces. The facilitators and barriers of the new model are presented in Chapter 5. The last chapter of this thesis reflects on the patients’ and nurse-midwives’ satisfaction with the new model for managing pregnant women with iron deficiency anaemia (Chapter 6). Chapter 7 discusses the results of all studies.

Findings

The nurse-midwives’ perceptions of barriers in preventing anaemia during pregnancy revealed three main barriers: firstly, the nurse-midwives’ lack of competences and clinical skills; next, the patients’ cultural beliefs and their families’ low participation in antenatal care programmes; and lastly, insufficient facilities in PHCs (Chapter 2). Based on these study results, we recommend a more comprehensive anaemia management approach which synergises available resources and empowers nurse-midwives and pregnant women. We developed the Four Pillars Approach, a new model tailored to managing iron deficiency anaemia in pregnant women. The Four Pillars Approach includes the pillars of a healthy lifestyle during pregnancy, the husband’s and/or family’s social support, adequate midwifery treatment, and improved nurse-midwives’ professional attitudes. A study protocol of this new model is explained in Chapter 3.
Chapter 4 presents a non-randomised controlled intervention study on the effectiveness of this new model for managing pregnant women with iron deficiency anaemia. This study proves a significant increase of ≥0.5 g/dl of haemoglobin level in 80.7 per cent of participants in the intervention group and in 16.8 per cent of those in the control group. In the intervention group, 35.4 per cent of the participants reached a normal haemoglobin level compared to 11 per cent of participants in the control group. The participants in the intervention group attended at least five antenatal care visits, which is significantly more than the pregnant women in the control group (95.0 per cent versus 57.2 per cent, respectively). Participants who needed to travel a greater distance to a PHC showed a significantly lower level of antenatal care attendance. All participants who completed the study in both groups were assisted by a skilled birth attendant during labour.

A qualitative study on facilitators and barriers of the Four Pillars Approach (Chapter 5) reveals that the nurse-midwives’ feeling of competence and confidence in providing the Four Pillars Approach are important facilitators. Facilitative supervision is needed to boost their commitment to maintaining the sustainability of the intervention. The barriers perceived by the nurse-midwives are related to the availability of resources.

Chapter 6 reports on nurse-midwives’ and patients’ satisfaction with the Four Pillars Approach. The majority of the nurse-midwives were fully satisfied with the new model. Most nurse-midwives experienced an improvement in their ability to build relationships with patients and their family members, and in their competences to take care of pregnant women with iron deficiency anaemia. At the same time, they also reported lack of time and resources. The patients were satisfied with their husbands’ support, the nurse-midwives’ friendly attitude, the increased awareness of the symptoms of iron deficiency anaemia, and the benefits of the parenting classes. They recommended better educational materials and more time to conduct parenting classes to increase patients’ health literacy.

**Implication for policymakers**

The previous national programmes that were conducted to combat iron deficiency anaemia have not succeeded in solving the problem. The Four Pillars Approach, which is based on nurse-midwives and patients’ needs, can be considered a fit model for addressing iron deficiency anaemia during pregnancy.

The Four Pillars Approach adds value in the sense that it empowers nurse-midwives to be competent and confident in providing health education and proper midwifery treatment. Its additional value, moreover, lies in empowering patients and their husbands and/or
family members to be well-informed about iron deficiency anaemia during pregnancy and to make use of antenatal care programmes such as parenting classes, taking iron tablets, and attending antenatal care services.

We recommend, therefore, that the Ministry of Health should adopt this new model of managing iron deficiency anaemia. In order to optimise the impact of the new model, however, some conditions need to be satisfied. First, the training curriculum for nurse-midwives should be tailored to current health problems and should be based on practice-based evidence. In addition, good materials such as booklets or modules, used by the nurse-midwives to provide health education to patients and their families, should be available at every PHC. Moreover, the Ministry of Health should monitor the availability of free iron tablets and food supplementation at every PHC.

**Conclusions**

In an effort to reduce the high incidence of women with iron deficiency anaemia during pregnancy in Indonesia, this thesis provides a potential solution to managing this problem. A new model for empowering patients and nurse-midwives, the Four Pillars Approach, offers an effective approach to managing iron deficiency anaemia. This new model provides specific training to nurse-midwives, information booklets for nurse-midwives and pregnant women, and parenting classes for pregnant women and their families. Based on our findings, we recommend that the Four Pillars Approach be implemented in other areas with similar problems.
Samenvatting

IJzergebreksanemie in de zwangerschap is één van de gezondheidsproblemen die bijdraagt aan de hoge prevalentie van maternale sterfte in Indonesië. In het verleden zijn nationale programma's uitgevoerd om de prevalentie van anemie te verminderen, maar ijerobreksanemie bij zwangere vrouwen is nog steeds een groot probleem. Er is een gebrek aan studies die inzicht geven in waarom de prevalentie zo hoog blijft en aan studies die de effectiviteit van interventies bij ijeribreksanemie onderzoeken.

IJzergebreksanemie in de zwangerschap moet op de juiste manier worden behandeld door een combinatie van maatregelen. Deze maatregelen omvatten de verbetering van de gezondheidsgeletterdheid van de vrouw, het betrekken van hun echtgenoot of familieleden in de prenatale zorgprogramma's, het stimuleren van een gezonde leefstijl bij de vrouwen en hun families, het aanbieden van adequate prenatale zorg en het verbeteren van de professionele houding van de verloskundige.

Dit proefschrift richt zich op vier onderzoeksvragen. Hoofdstuk 2 beschrijft de belemmeringen bij de preventie van anemie tijdens de zwangerschap in Public Health Centers (PHCs). Er is vervolgens een nieuw model ontwikkeld voor de behandeling van zwangere vrouwen met ijeribreksanemie in de zogenaamde Four Pillars Approach (hoofdstuk 3). Hoofdstuk 4 beschrijft de resultaten van dit model dat uitgevoerd werd in twee provincies. De belemmerende en bevorderende factoren van het nieuwe model worden gepresenteerd in hoofdstuk 5. Tenslotte geeft het laatste hoofdstuk van dit proefschrift inzicht in de tevredenheid van patiënten en verloskundigen over het nieuwe model in de zorg voor zwangere vrouwen met ijeribreksanemie (hoofdstuk 6). Hoofdstuk 7 reflecteert op de uitkomsten van deze studie.

Resultaten

Dit proefschrift begint met een kwalitatieve studie naar de perceptie van de verloskundigen over de belemmeringen bij de preventie van anemie tijdens de zwangerschap (hoofdstuk 2). De belangrijkste belemmeringen zijn allereerst een gebrek aan competenties en klinische vaardigheden van de verloskundigen, in de tweede plaats culturele overtuigingen van de patiënten en beperkte participatie van de familie in het prenatale zorgprogramma,
en tenslotte onvoldoende voorzieningen in de gezondheidscentra. Op basis van deze studie adviseren we een meer complexe aanpak van de zorg voor zwangere vrouwen met anemie die gebruik maakt van de beschikbare middelen en die verloskundigen en zwangere vrouwen sterker maakt. Dit leidt tot een nieuw model in de zorg voor zwangere vrouwen met een ijzergebreksanemie. Dit nieuwe model wordt de *Four Pillars Approach* genoemd. Deze vier pijlers zijn een gezonde leefstijl tijdens de zwangerschap, sociale steun van de echtgenoot en/of familie, een adequate verloskundige behandeling en een verbeterde professionele houding van verloskundigen. Het studieprotocol van dit nieuwe model wordt uitgelegd in hoofdstuk 3.

Hoofdstuk 4 beschrijft een niet-gerandomiseerde gecontroleerde interventiestudie naar de effectiviteit van dit nieuwe model in de zorg voor zwangere vrouwen met ijzergebreksanemie. Deze studie toont bij 80,7 procent van de deelnemers in de interventiegroep een significante toename (≥0.5 g/dl) aan van het hemoglobinegehalte, in de controlegroep is dit het geval bij 16,8 procent van de deelnemers. In de interventiegroep bereikt 35,4 procent van de deelnemers een normaal hemoglobinegehalte, tegenover 11 procent van de deelnemers in de controlegroep. De deelnemers in de interventiegroep ontvangen ten minste vijf prenatale zorgconsulten, hetgeen significant vaker is dan de zwangere vrouwen in de controlegroep (95,0 procent versus 57,2 procent). Deelnemers die ver van een PHC wonen, hebben een significant lager aanbod prenatale consulten. De bevallingen werden in beide groepen begeleid door professioneel opgeleide verloskundigen.

Een kwalitatief onderzoek naar belemmerende en bevorderende factoren bij de *Four Pillars Approach* (hoofdstuk 5) laat zien dat een gevoel van competentie en zelfvertrouwen van de verloskundigen een belangrijke bevorderende factor is. Ondersteuning door het hoofd van de PHC is nodig om de motivatie te vergroten zodat men de interventie kan blijven uitvoeren. De door de verloskundigen ervaren belemmeringen hangen vooral samen met de beschikbaarheid van middelen.

Hoofdstuk 6 rapporteert een kwantitatieve en kwalitatieve studie over de tevredenheid van de verloskundigen en de patiënten met de *Four Pillars Approach*. We concluderen dat de meerderheid van de verloskundigen zeer tevreden is met het nieuwe model. De meesten vinden dat zij een betere relatie met hun patiënten en de familieleden kunnen opbouwen. Ze ervaren ook een toename van hun competenties om goede zorg te leveren aan zwangere vrouwen met ijzergebreksanemie. Anderzijds melden zij ook een gebrek aan tijd en middelen. De patiënten zijn tevreden met de steun van hun echtgenoot, de vriendelijke houding van de verloskundigen, het meer alert zijn op de symptomen van
ijzergebreksanemie en de voordelen van oudercursussen. Zij bevelen beter educatief materiaal aan en meer oudercursussen van langere duur.

**Gevolgen voor beleidsmakers**

De eerder uitgevoerde nationale programma's ter preventie van ijzergebreksanemie zijn er niet goed in geslaagd om het probleem op te lossen. De *Four Pillars Approach*, die gebaseerd is op de ervaringen van verloskundigen en patiënten, kan gezien worden als een geschikt model voor de aanpak van ijzergebreksanemie tijdens de zwangerschap.

De *Four Pillars Approach* bekrachtigt de verloskundigen zodat ze competent zijn en zichvertrouwen hebben bij het geven van gezondheidsvoorziening en goede verloskundige zorg. Een tweede waardevol resultaat is dat het patiënten en hun echtgenoot en/of familieleden in staat stelt om goed geïnformeerd te zijn over de ijzergebreksanemie en om te participeren in de prenatale zorgprogramma's (zoals deelname aan oudercursussen, het slikken van ijzertabletten en het nakomen van de prenatale controles).

Daarom is het belangrijk dat het Ministerie van Volksgezondheid dit nieuwe model gaat invoeren. Echter, om het effect van het nieuwe model te optimaliseren, moet het Ministerie van Volksgezondheid zorgen dat aan een aantal noodzakelijke voorwaarden is voldaan. Ten eerste moet het curriculum van de opleiding tot verloskundige afgestemd worden op de actuele gezondheidsproblemen en wetenschappelijk gefundeerd zijn. Daarnaast moet er goed materiaal (zoals voorlichtingsbrochures) beschikbaar zijn in ieder PHC, dat gebruikt kan worden door de verloskundigen om voorlichting te geven aan patiënten en hun families. Bovendien moet het Ministerie van Volksgezondheid gratis ijzertabletten en voedingssupplementen beschikbaar stellen in alle PHC's.

**Conclusies**

De *Four Pillars Approach* biedt een effectieve aanpak van ijzergebreksanemie tijdens de zwangerschap in Indonesië.
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List of publications

Peer-reviewed publications

Widyawati, Suze Jans, Hans Bor, Jeroen van Dillen, Toine Lagro-Janssen. The effectiveness of a new model in managing pregnant women with iron deficiency anaemia in Indonesia: a non randomized controlled intervention study (published in BIRTH 2015,42:4)


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Widyawati. Nursing leadership and communication skills. EGC. Jakarta. 2010.

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Widyawati, Kinuyo Matsumoto, Sakiko Kanbara, Naemi Kajiwara, Hiroshi Taniguchi. A Trial of Health Education for pediatric obesity in Yogyakarta (Research Collaboration with Japan in 2006)

Siti Mamnu’ah, Widyawati, Budi Hastuti. The affecting factors of breastfeeding weaning period decision in Yogyakarta (Local Journal 2006)

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In 1998, she moved to Yogyakarta and worked as a lecturer at School of Nursing, Faculty of Medicine Universitas Gadjah Mada and as a clinical supervisor at Obstetric and Gynecology Department in Sardjito Hospital. At the same time, she continued with a Master in Public Health majoring hospital management at Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta. After completing her Master degree, she was positioned as one of the structural officials at School of Nursing, Faculty of Medicine Universitas Gadjah Mada, Yogyakarta.

In 2004, she got a grant from Hyogo Perfecture and participated in an exchanged programme of lecturer and researcher to Kobe Women University, Japan. In 2005 to 2010, she also got a grant from Linneaus Palme and followed a teacher exchanges programme to Boras University, Linkjoping University and Gothenburg University, Sweden.

In 2011, she got a scholarship for doctoral programme from Indonesian Ministry of cultural and education, then she enrolled the PhD programme at Primary and Community Care, Gender and Women’s Health Department, Radboud University Medical Center Nijmegen, the Netherlands. During her PhD programme, Widyawati has been teaching in Master of Nursing Science majoring maternity nursing at School of Nursing, Faculty of Medicine Universitas Gadjah Mada and published three articles concerning iron deficiency anaemia management during pregnancy.