

# The effect of a Maternal Mentoring Programme on Pregnancy Readiness among Indonesian Women: Results of a Cluster Randomised Control Trial

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## Abstract

Many Indonesian women are not properly prepared for pregnancy prior to conception. The goal of the present study was to test the effect of a maternal mentoring programme on Indonesian women's pregnancy readiness before conception. The maternal mentoring programme was expected to increase pregnancy readiness among this population. A cluster randomised control trial (CRCT) involving preconception women was conducted in three sub-districts of Special Region of Yogyakarta, Indonesia. There were 122 clusters with a total of 384 eligible participants who were randomly allocated to either the intervention group ( $n = 189$ ) or the control group ( $n = 195$ ). The maternal mentoring programme provided preconception health education; health monitoring; and text message reminders for the intervention group. The control group received standard care. Pregnancy readiness was measured using a pregnancy readiness score consisting of 15 indicators adapted from the National Preconception Health and Health Care Initiative. The data was collected using a structured questionnaire including: pregnancy readiness, age, parity, level of

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education, employment status, income, body mass index (BMI) and time spent preparing for pregnancy. Statistical tests included the independent *t*-test, and multilevel mixed effects logistic regression was used to measure effect of the programme. The results demonstrated that the intervention group had a significantly higher average pregnancy readiness score change from pre-intervention to post-intervention (4.5) than the control group (1.0) ( $p < 0.005$ ). The intervention group was almost 12 times more likely (OR = 12.5; 95% CI: 6.6–23.6) to be prepared for pregnancy compared to the control group adjusting for age, parity, employment status, level of education, BMI and income. The study concluded that the maternal mentoring programme improved readiness for pregnancy among a cluster sample of Indonesian women.

**Keywords:** preconception; pregnancy readiness; maternal mentoring; maternal and child health; Indonesia

## Introduction

Maternal and child health is a pressing health challenge worldwide. In Indonesia, the maternal mortality rate (MMR) and infant mortality rate (IMR) have been on the decline, but still remain relatively high. The MMR in particular decreased from 390 per 100 000 live births in 1990, to 305 per 100 000 live births in 2015 (BKKBN 2014; 2018). Yet, the current MMR is still far from the 2015 Millennium Development Goals target of only 102 deaths per 100 000 live births (WHO 2016).

Preconception health services – including a maternal mentoring programme – involve a series of interventions aimed at identifying and modifying behaviours pertaining to biomedical and social risks in order to improve maternal and child health before, during and after pregnancy (Dean et al. 2014; Robbins et al. 2014). It has been documented that preconception health services improve childbirth and pregnancy outcomes, thus reducing the likelihood of maternal and infant mortality (Farahi and Zolotor 2013). Likewise, poor preconception health can lead to poor pregnancy outcomes (Das, Devi and Kim 2014; Genuis and Genuis 2016).

Many women do not realise the importance of adopting healthy behaviours prior to becoming pregnant. Preconception health services allow pregnant women to get adequate health services before the period of foetal organogenesis at which point the foetus begins development (Ricks et al. 2017). Importantly, most of the potential dangers that can arise during pregnancy occur in women who are unaware of the risks associated with not being properly prepared for pregnancy.

Efforts to reduce the MMR have primarily focused on pregnancy care and intervention during childbirth. However, these efforts have been unsuccessful at decreasing the MMR over the last two decades (BKKBN 2014). Thus, there is a gap in interventions targeting the pre-pregnancy period. The potential for health complications in the early stages of pregnancy makes it essential that maternal mentoring or preconception

counselling be integrated into pregnancy care. Previous literature demonstrates that preconception counselling may improve women's knowledge of preconception health (Lassi et al. 2014). The present study sought to examine the effect of a maternal mentoring programme on pregnancy readiness among preconception women. The study hypothesised that the intervention group would demonstrate higher pregnancy readiness than the control group.

## Methodology

The present study was conducted under the Community Alma Ata Partnership through Updated Research and Education (CAPTURE) project. A cluster randomised control trial (CRCT) design was used ( $N = 122$  clusters) consisting of preconception women residing in either the Sedayu Sub-district, Pajangan Sub-district, or Pleret Sub-district of Special Region of Yogyakarta, Indonesia.

There were 122 clusters with a total of 384 women, who were randomly allocated to either the intervention group ( $n = 189$ ) or control group ( $n = 195$ ). The data was obtained using a questionnaire conducted at two time points: pre-test and post-test. Pre-tests occurred during the period before pregnancy, while post-tests occurred three weeks after the pre-tests. The 122 clusters included in the study were coded from 1 to 122. Cluster allocation into research groups was done randomly using Computed Generated Random Allocation (Kim and Shin 2014). Clusters 1–61 were included in the intervention group, and clusters 62–122 were included in the control group. Thus, the intervention and control groups each consisted of 61 clusters.

Recruitment was conducted using marriage registration data. Members of the research team met with preconception women and explained the process of research activities, as well as the potential benefits and disadvantages of participating. If willing and able to participate, the women were asked to sign an informed consent form. Inclusion criteria included: (1) being a woman of childbearing age (but not currently pregnant) who was currently registered for marriage; (2) planning to remain in the research area for at least the next two years; and (3) willing to sign an informed consent form. Women were excluded from the study if they: (1) became pregnant at the beginning of the study; (2) planned to move in the next two years; or (3) planned to delay pregnancy. Out of a total of 1 281 preconception women recruited, 384 met the inclusion criteria and were willing to participate and sign the informed consent form. The data was collected from the final sample ( $N = 384$ ) using the CAPTURE data system from March 2019 to March 2020.

In the present study, the mentors consisted of students enrolled in the midwifery diploma programme, nutrition undergraduate programme, nursing undergraduate programme, pharmacy undergraduate programme, and hospital administration undergraduate programme and involved in maternal and child health surveillance activities conducted by the CAPTURE project. The CAPTURE team trained counsellors to ensure that they were competent in their role as a preconception health counsellor. Once trained, the

mentors were responsible for providing mentoring to participants in the intervention group during one home visit. The control group receive standard care. There was no blinding in the mentoring intervention because it was impossible to avoid direct interaction between the mentors and respondents. A standardised preconception education booklet and worksheet were used to ensure intervention quality and validity (Nurunnayah et al. 2021).

Before receiving the mentoring intervention, the participants were pretested on their pregnancy readiness. Two weeks after the end of the pregnancy readiness mentoring intervention, the participants were given a post-test regarding pregnancy readiness. The data collected and used in the study included pregnancy readiness, treatment status (intervention or control), age, gestational age, parity, level of education, employment status, monthly income, and pregnancy preparation length. Pregnancy readiness was measured using 15 indicators adapted from the consensus recommendations of the Clinical Workgroup of the National Preconception Health and Health Care Initiative (Frayne et al. 2016). These indicators included: (1) pregnancy planning; (2) timing of motherhood; (3) wanting to have a baby soon; (4) discussing pregnancy with partner; (5) preparing for pregnancy; (6) consuming folic acid supplementation; (7) consuming iron supplementation; (8) maintaining a healthy diet; (9) controlling sugar intake; (10) avoiding smoking and cigarette smoke; (11) having pregnancy health care insurance; (12) avoiding drugs; (13) seeking information about pregnancy health; (14) following early detection of sexually transmitted diseases; and (15) managing stress. Each indicator was rated 1 if done by the participant or rated 0 if not done by the participant. Readiness was measured by the number of scores based on the 15 indicators (Frayne et al. 2016). The indicators were asked in closed question format with a possible answer of “Yes” or “No”. The highest score was 15, and the lowest score was 0. The structured interview data was stored in CommCare, a paperless IT-based application created by Dimagi Inc. and available to the public (Dayalu et al. 2015).

The data was analysed using Stata 16 and included constructing a frequency distribution data to determine the participants’ characteristics, and conducting bivariate and multivariable analyses. The average difference test between treatment groups was performed using a *t*-test and mixed effect *t*-test. Multilevel mixed effects logistic regression was used to explore the effect of a maternal mentoring programme on pregnancy readiness, controlling for age, parity, level of education, employment status, income, and time spent preparing for pregnancy.

## Ethical Considerations

The study received ethical approval from the Medical and Health Research Ethics Commission of Gadjah Mada University on March 1 2019, under approval number KE/FK/0219/EC/2019.

## Results

The participants' characteristics, such as age, parity, level of education, employment status, income, and time spent preparing for pregnancy, were collected at baseline (see Table 1). No statistically meaningful differences were found among socioeconomic or demographic characteristics between the intervention and control groups.

**Table 1:** Participants' characteristics of the at the beginning of the study

Variable	Intervention group		Control group		<i>p</i> -value
	Total ( <i>n</i> = 189)	Percentage (%)	Total ( <i>n</i> = 195)	Percentage (%)	
<i>Age</i>					
Healthy reproductive age	173	91.5	174	89.2	0.064
No	12	8.5	21	10.8	
<i>Parity</i>					
Nulliparous	182	96.2	189	97	0.187*
Multiparous	7	3.8	5	3	
<i>Education level</i>					
≤ 12 years	153	81	166	85.1	0.275
> 12 years	36	19	29	14.9	
<i>Employment status</i>					
Yes	140	74	138	71.1	0.445
No	49	26	56	28.9	
<i>Income</i>					
≤ Regional income	143	75.7	142	72.8	0.525
> Regional income	46	24.3	53	27.2	
<i>Time for pregnancy preparation</i>					
≤ 6 months	166	88.3	160	85.1	0.362
> 6 months	22	11.7	28	14.9	

### Notes:

*p*-value from the chi-squared test

\**p*-value from Fisher's exact test

The majority of the participants fell in the categories of being of a healthy reproductive age; being nulliparous; having less than 12 years of education; being employed; having an income below and equal to the regional income; and having prepared for pregnancy for less than six months. The participants' income was obtained by asking how much they earned per month, then dichotomising it as less than, equal to, or greater than, the Bantul Regency Regional Minimum Wage (equivalent to Rp.1,649,000 or 115 US\$ per month).

## The Effect of Maternal Mentoring on Pregnancy Readiness Intervention and Control Groups

The readiness of pregnant women to face their pregnancy was measured using a pregnancy readiness score ranging from 0 to 15, with a score of 15 representing strong readiness. The effect of maternal mentoring can be seen from the difference in pregnancy readiness scores between the intervention and control groups (see Table 2).

**Table 2:** Differences in average intervention and control groups

Variable	Individual analysis		<i>p</i> -value <sup>a</sup>	Cluster adj. analysis		<i>p</i> -value <sup>b</sup>
	Intervention group ( <i>n</i> = 189)	Control group ( <i>n</i> = 196)		Intervention group ( <i>n</i> = 53)	Control group ( <i>n</i> = 56)	
Pre-test mean	5.6 ± 2.3	5.8 ± 3.4	0.121	5.6 ± 2.1	5.8 ± 3.0	0.100
Post-test mean	10.1 ± 2.4	6.6 ± 2.3	0.001	10.1 ± 2.4	6.6 ± 2.4	0.002*
Δ Pre-post-test	4.5 ± 2.8	1.1 ± 2.5	0.001	4.5 ± 2.6	1.0 ± 2.6	0.002*

### Notes:

<sup>a</sup> independent *t*-test

<sup>b</sup> independent *t*-test adjustment for clustering

\* significant at  $p < 0.05$

SD = standard deviation

The average pregnancy readiness score (mean ± SD) before intervention in the two study groups was (5.8 ± 2.3) for the control group and (5.6 ± 2.4) for the intervention group and was not statistically different. After the intervention was done, the average pregnancy readiness score (mean ± SD) in the intervention group rose to (10.96 ± 2.1), while in the control group, it only rose to (6.6 ± 2.3). The increase in pregnancy readiness scores in the intervention and control groups was statistically significant ( $p < 0.05$ ) (see Table 2).

## The Effect of Preconception Counselling on Participants' Behaviour Changes

The effect of preconception counselling on participants' behaviour changes can be seen in Table 3. Behaviour changes in the intervention and control groups differed significantly on all indicators except pregnancy planning ( $p$ -value = 0.85; OR = 0.67; 95% CI: 0.18–2.4) and wanting to have a baby soon ( $p$ -value = 0.19; OR = 0.71; 95% CI: 0.30–1.66).

**Table 3:** Pregnancy readiness indicators in intervention and control groups

Pregnancy readiness indicator	Intervention group		Post-test		Control group		Post-test		OR	p-value
	(n = 189) n	%	n	%	(n = 195) n	%	n	%		
<i>Pregnancy planning</i>										
Yes	150	79.3	172	91	154	80	177	90.7	0.67 (0.18–2.4)	0.85
No	39	20.7	17	9	41	20	18	9.3		
<i>Preparing for pregnancy</i>										
Yes	105	55.6	170	89.8	107	54.8	151	77.4	2.33 (2.12–2.91)	0.001
No	84	44.4	7	4.6	88	45.2	45	24.5		
<i>Wanting to have a baby soon</i>										
Yes	148	78.3	169	89.4	150	76.9	171	87.6	0.71 (0.30–1.66)	0.19
No	41	21.3	20	11.6	45	23.1	34	13.4		
<i>Timing of motherhood</i>										
Yes	145	76.7	168	88.8	145	74.3	169	86.7	1.39 (1.58–3.42)	0.03
No	44	23.3	21	12.2	50	25.7	26	14.3		
<i>Discussing pregnancy with partner</i>										
Yes	115	60.8	167	88.3	113	57.9	152	77.9	1.78 (1.08–2.95)	0.01
No	74	39.2	22	11.7	82	42.1	43	22.1		
<i>Consuming folic acid supplementation</i>										
Yes	57	30	140	74	60	31.1	75	38	4.52 (2.42–6.75)	0.001
No	132	70	59	26	135	68.9	120	62		
<i>Seeking health information</i>										
Yes	65	34.4	140	74	70	36	80	41	5.8 (1.98–8.81)	0.001
No	124	65.6	59	26	125	64	115	59		
<i>Consuming iron supplementation</i>										

Yes	45	23.8	135	71.4	43	22	97	51.3	2.83 (1.25– 3.74)	0.001
No	144	76.2	54	28.6	152	78	92	48.7		
<i>Maintaining a healthy diet</i>										
Yes	80	42.3	115	60	72	37	89	45.6	4.37 (3.45– 7.72)	0.001
No	109	57.7	74	40	123	63	106	54.4		
<i>Avoiding smoking</i>										
Yes	33	17	113	59	30	15.3	38	19.4	4.47 (2.75– 8.17)	0.001
No	156	83	76	41	165	84.7	161	78		
<i>Controlling sugar intake</i>										
Yes	40	21.3	106	56	44	22.5	48	24.6	2.36 (1.44– 3.87)	0.001
No	149	78.7	83	44	151	77.5	147	75.3		
<i>Avoiding OTC and herbal drugs</i>										
Yes	35	18.5	97	51.3	39	18.8	50	25.7	5.2 (2.21– 6.42)	0.001
No	154	81.5	92	48.6	156	81.2	145	74.3		
<i>Having health care insurance</i>										
Yes	20	10.5	95	50.2	24	12.3	50	25.7	5.2 (2.21– 6.42)	0.001
No	169	89.5	94	49.8	171	87.7	145	74.3		
<i>Managing stress</i>										
Yes	33	17.3	91	48.1	35	17.9	72	36.9	5.0 (2.37– 7.12)	0.001
No	156	82.7	98	51.9		82.1	127	63.1		
<i>Following early detection of STDs</i>										
Yes	16	8.4	41	21.6	19	9.7	20	11.4	3.1 (1.32– 3.85)	0.001
No	173	91.6	148	78.4	176	90.3	175	89.7		



**Note:** OR = odds ratio

Pregnancy readiness among women who received preconception counselling showed significant improvement. The highest percentage of readiness in the intervention group was sequential, namely: pregnancy planning; preparing for pregnancy; wanting to have a baby soon; timing of motherhood; discussing pregnancy with partner; consuming folic acid supplementation; seeking health information; consuming iron supplementation; maintaining a healthy diet; avoiding smoking and cigarette smoke; controlling sugar intake; avoiding herbal medicine and over-the-counter drugs; having health care insurance; managing stress; and following recommended screening for sexually transmitted diseases (STDs).

### Multilevel Mixed Effects Logistic Regression Analysis

A multilevel mixed effects logistic regression analysis was conducted to examine the effect of a maternal mentoring programme on pregnancy readiness, controlling for other variables. Women who received maternal mentoring were almost 10 times (OR = 10.02; 95% CI: 6.18–17.04) more likely to be ready to conceive than women who did not receive maternal mentoring (OR = 12.5; 95% CI = 6.6–23.6) for logistic regression adjusting for clustering (Table 4).

**Table 4:** Determination of pregnancy readiness

Variable	Pregnancy readiness		Crude OR (95% CI) <sup>a</sup>	Cluster adjusted OR (95% CI) <sup>b</sup>
	Ready	Not ready		
<i>Treatment</i>				
Intervention group	121 (64.0)	44 (22.2)	10.2 (6.18–17.04)*	12.5 (6.6–23.6)*
Control group	68 (36.0)	151 (77.8)	1	1
<i>Parity</i>				
Nulliparous	182 (96.3)	191 (97.4)	1	1
Multiparous	7 (3.7)	5 (2.6)	0.53 (0.18–2.39)	0.53 (0.18–2.39)
<i>Age (years)</i>				
< 20	15 (14)	13 (12)	1.19 (0.42–3.41)	1.16 (0.38–3.56)
20–35	201 (75.5)	165 (77)	1	1
> 35	11 (10.5)	10 (11)	1.127 (0.27–4.61)	1.24 (0.28–5.47)
<i>Level of education</i>				
≤ 12 years	144 (72)	142 (64)	1.04 (0.5–1.9)	1.05 (0.5–1.9)
> 12 years	65 (28)	47 (36)	1	1
<i>Employment status</i>				
Working	69 (74.2)	82 (73.2)	1	1
Not working	24 (25.8)	30 (26.8)	0.95 (0.51–1.78)	1.01 (0.51–2.03)
<i>Income</i>				

≤ Regional minimum wage	122 (56.7)	93 (43.3)	1	1
> Regional minimum wage	53 (53.3)	46 (46.7)	1.65 (0.92–2.95)	1.75 (0.95–3.24)
<i>Nutritional status (BMI)</i>				
Underweight	28 (14.8)	35 (17.9)	1.62 (0.83–3.15)	1.56 (0.77–3.15)
Normal	117 (61.9)	134 (68.4)	1	1
Overweight	44 (23.3)	27 (13.8)	1.92 (1.03–3.58)*	1.95 (1.02–3.79)*

**Notes:**

BMI = body mass index; OR = odds ratio; CI = confidence interval

<sup>a</sup> Analysed using logistic regression

<sup>b</sup> Analysed using multilevel mixed effects logistic regression adjusting for clustering ( $n$  cluster = 109)

\* Significant at  $p < 0.05$

**Discussion**

The maternal mentoring programme under study is one of the preconception intervention trials to be conducted among Indonesian women with the aim of improving prenatal care. The present study continued from a previous study that has been published and registered at ISRCTN14448533 (Paratmanitya et al. 2021). The present study found that women who participated in a maternal mentoring programme demonstrated higher pregnancy readiness than women who did not receive maternal mentoring. In fact, among a sample of Indonesian women, those who participated in a maternal mentoring programme were 10 times more ready to have a healthy pregnancy than their counterparts.

The present study found that women who received maternal mentoring or preconception counselling demonstrated higher pregnancy readiness than women who did not receive preconception counselling. In fact, among a sample of Indonesian women, those who received preconception counselling were six times more ready to have a healthy pregnancy than their counterparts. Importantly, a recent study conducted in China found that women who do not have adequate pregnancy readiness tend to present with risk factors associated with poor pregnancy health in a dose-response relationship (Zhou et al. 2016).

Furthermore, the study showed some novelty in that there was randomisation at the cluster level. The CRCT has advantages that can avoid intervention contamination and ethical issues because all the participants in a cluster receive the same treatment. The CRCT design can also gain respondent obedience for long-term measurement. The study results were analysed by individual and cluster adjustment to make sure there was no contamination between inter-cluster variation (Girard and Olude 2012).

The following findings were of note:

1. Women who received maternal mentoring were more likely to consume folic acid supplementation than women who did not receive the counselling intervention. This finding is supported by previous research which found that preconception counselling was associated with a 2.65 times increase in folic acid consumption among a sample of Chinese women (You et al. 2015). Maternal folic acid supplementation was found to have a protective effect for children against diseases such as acute lymphoblastic leukaemia (Ismail et al. 2019).
2. Women who received maternal mentoring were more likely to consume iron supplementation than women who did not receive the counselling intervention. This finding is supported by a previous study which found that maternal mentoring increased daily multivitamin consumption among women planning to become pregnant (Cline 2010; Hardianti et al. 2020; Williams et al. 2012). Adequate iron supplementation is vital during the preconception period due to the heightened risk for anaemia during pregnancy, which can result in babies being born with low birth weight (Mackeen et al. 2013). Importantly, anaemia is easily preventable with proper supplementation and a healthy diet during preconception.
3. Women who received maternal mentoring had better control over their diet and weight than women who did not receive the counselling intervention. Previous research conducted in the Netherlands and Iran suggests that preconception counselling can increase women's self-efficacy to consume healthier foods (Bastami 2012; Hillemeier et al. 2009; Ramakrishnan et al. 2012). Striving for a healthy body mass index (BMI) before pregnancy is critical, as is consuming proper nutrition before and during pregnancy (Das, Devi and Kim 2014; Nurhayati 2016; Petrika, Hadi and Nurdianti 2014).
4. Women who received maternal mentoring were more likely to avoid cigarette smoking than women who did not receive the counselling intervention. This finding is in line with that of a previous study, in which women who participated in the maternal mentoring programme were more likely to avoid and reduce smoking (Williams et al. 2012).
5. Women who received maternal mentoring were more likely to seek information about pregnancy preparation and care than women who did not receive the counselling intervention. Similarly, Elsinga et al. (2008) found that preconception services can increase women's activity in seeking out health information.
6. Women who received maternal mentoring had more early detection of STDs than those who did not receive the counselling intervention. This is in line with a previous study which found that preconception counselling may help women to screen against various diseases, including STDs (Dean et al. 2012). The World

Health Organization (WHO 2013) states the importance of preconception counselling for reducing the potential for sexually transmitted infections (STIs), particularly those experienced by pregnant women.

7. Women who received maternal mentoring were more likely to avoid taking drugs and herbal medicines, as recommended by the WHO (2016) in order to prevent congenital disabilities prior to pregnancy.
8. Women who were in the maternal mentoring programme intervention group were more likely to have health insurance than those who were in the control group. Having health insurance plays a large role in a woman's ability to attend necessary pregnancy medical appointments. It is well-documented that ensuring proper health examination from the beginning of pregnancy can improve pregnancy and childbirth outcomes (WHO 2016). Paratmanitya et al.'s (2021) study showed that maternal mentoring can affect the timing of the first antenatal visit among pregnant women.
9. Women who received maternal mentoring had better control and management over stress than women who did not receive the counselling intervention. Stress in pregnant women can impact their pregnancy negatively as well as the women's motivation to properly care for their pregnancy (Fancourt and Perkins 2018).

When all the factors were analysed using multilevel mixed effects logistic regression, level of education was the only factor besides preconception counselling that was found to be significantly associated with pregnancy readiness. This indicates that education inevitably affects women's ability to accept new knowledge and behaviour changes.

It is important to note that the present study was disadvantaged because the researchers were unable to use blinding due to the intervention allowing for active interaction between the researchers and participants.

## Conclusion

The study has concluded that participating in a maternal mentoring programme is effective in improving pregnancy readiness among preconception women. Therefore, maternal mentoring programme should be administered to women of reproductive age routinely in order to improve maternal and child health outcomes. To our knowledge, this is the first CRCT that has investigated Indonesian women's pregnancy readiness based on participating in a maternal mentoring programme. Further research is needed to examine how other variables, such as couples' roles, support, and knowledge, play a role in pregnancy readiness for both women and men.

The key messages from the study are: firstly, a maternal mentoring programme is effective in improving pregnancy readiness among preconception women; and,

secondly, women who receive maternal mentoring are almost six times more likely to be prepared for pregnancy compared to women who do not receive maternal mentoring.

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## Authorship Conflict of Interest Statement

All the authors have read and given their agreement to publish this article. All the authors have met the authorship requirements and approved the order of authorship. The article represents the honest work of the authors. The authors declare that they have no conflicting interests.

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