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Sanaa Abujilban, Reem Hatamleh & Sahar Al- Shuqerat

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The impact of a planned health educational program on the compliance and knowledge of Jordanian pregnant women with anemia

Sanaa Abujilban, PhD[a], Reem Hatamleh, PhD[b], and Sahar Al- Shuqerat, MsC[c]

[a]Department of Maternal, Child and Family Health Nursing, Hashemite University College of Nursing, Zarqa, Jordan; [b]Department of Nursing, Jordan University of Science and Technology, Irbid, Jordan; [c]Department of Nursing, Al-Hussein Bin Talal University, Ma'an, Jordan

ABSTRACT

Iron deficiency anemia is a major public health problem among pregnant women in developing countries. This study aimed to use a randomized controlled trial to evaluate the effectiveness of a health information package in Jordanian anemic pregnant women's knowledge regarding anemia, compliance with iron supplementation, and hemoglobin level. Two hundred pregnant anemic women were recruited and randomly assigned into intervention or control group from April to July 2016. The intervention group received a video presentation of the Health Information Package Program (HIPP), narrated by a midwife, combined with PowerPoint slides to educate women about anemia in pregnancy. The participants in the control group received standard care in antenatal clinics, including iron supplementation. No significant differences were observed between the groups in age, gestational age, health problems, and total income. Only education and source of information differed significantly between the groups. Women in the intervention group had higher scores on the compliance checklist, knowledge, food selection ability, and hemoglobin level than women in the control group. The health information package program was effective. Policymakers should adopt a health information package program and apply it as a comprehensive national strategy for the prevention of anemia during pregnancy.

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Introduction

Iron deficiency anemia (IDA) is the single most prevalent nutritional deficiency worldwide (Charles 2012; Kumar 2014; WHO 2011). It is a major public health problem (Kumar 2014), particularly among pregnant women in developing countries, with adverse effects on the mother and the newborn (Erhabor et al. 2013). WHO defined anemia in the second trimester of pregnancy, as "a condition when blood hemoglobin level is below 10.5 gm/dl" (WHO 2011). The global prevalence of anemia among pregnant women was 38.2 percent (WHO 2011), with 52 percent of anemic pregnant women in developing countries and 23 percent in the developed world (WHO 2011). In Jordan, the prevalence of anemia among pregnant

CONTACT Sanaa Abujilban abujelban@yahoo.co.uk; sanaa.abujilban@hu.edu.jo Faculty of Nursing, Department of Maternal, Child and Family Health Nursing, Hashemite University, P.O. Box 330127, Zarqa 13133, Jordan

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women has increased over the past decade from 26 percent in 2002 to 34 percent in 2012 (Al-Mehaisen et al. 2011; Department of Statistics [Jordan] and ICF International, 2013).

Anemia during pregnancy has negative consequences for mother, fetus, and newborn. Affected mothers have a higher risk of developing perinatal infections, pregnancy-induced hypertension, (preeclampsia, eclampsia), poor weight gain, preterm labor, placenta previa, accidental hemorrhage, premature rupture of membranes, postnatal sepsis, subinvolution, embolism, postpartum cognitive impairment, and behavioral difficulties (Murray-Kolb 2013; Patra et al. 2005). In addition, the worldwide rate of maternal death due to anemia during pregnancy is 27 percent (WHO 2015).

Furthermore, anemia adversely affected the fetal well-being, and it was associated with an increase in the morbidity of the fetus (Abu-Ouf and Jan 2015). For instance, it increased the risk for prematurity, low birth weight, intrauterine growth retardation, poor Apgar score, fetal distress, neonatal distress, and neonatal anemia (Abu-Ouf and Jan 2015; Bhutta et al. 2005; Patra et al. 2005). Moreover, newborns who were born to anemic mothers have a higher prevalence of failure to thrive, poor intellectual development, developmental difficulties (for example, cognitive, social-emotional, and adaptive function), and a higher rate of morbidities and mortalities (Abu-Ouf and Jan 2015; Patra et al. 2005).

Despite Jordan having policies to tackle anemia by providing pregnant women with iron as a supplement starting from the second trimester, maternal anemia prevalence is still high (34 percent) (Department of Statistics [Jordan] and ICF International 2013). For that, we can understand that providing pregnant women with iron supplements alone is apparently inadequate and there might be other potential associated factors. These factors might be the lack of patient knowledge and inappropriate attitude toward maternal anemia by both pregnant women and healthcare providers (Salahat and Ibrahim 2012).

One of the strategies recommended by WHO to prevent, control, and treat anemia was behavior modification of an individual through health educational programs (WHO 2001). Health educational programs showed a significant improvement of knowledge, compliance, and in decreasing the prevalence of anemia among pregnant women (ElHameed, Mohammed, and Abd El Hameed 2012). Health information package program (HIPP) is a structured and validated educational program, which was developed by Noronha et al. (2013). It showed effectiveness in helping the pregnant women in improving their knowledge regarding anemia in pregnancy, improving their ability to select food rich in iron, protein and vitamin C, and increasing their hemoglobin level (Noronha et al. 2013).

Significance of the study

Proving the positive effect of an educational program on decreasing anemia would convince policymakers, health administrators, and professionals (doctors, nurses, and midwives) to implement various strategies and techniques to promote health and preventive behaviors for anemic women. This would be reflected in strengthening the health literacy and improving the quality of health services, which in turn would improve the health behavior of individuals and the community at large.

Problem statement

In Jordan, the prevalence of anemia is still high, and it has been associated with negative impacts on the mother and her baby's health (Abu-Ouf and Jan 2015; WHO 2011). Adoption of a health information program as an additional policy to tackle anemia might lead to a significant decline in the prevalence of anemia during pregnancy (Noronha et al. 2013). In Jordan, researchers noted that a lack of studies that assess the effectiveness of implementing the planned health educational program on anemic pregnant women. So, this study aimed to evaluate the effectiveness of a health information package on Jordanian anemic pregnant women's knowledge regarding anemia, compliance with iron supplementation pills, and hemoglobin level.

Available literature about anemia during pregnancy in Jordan were mainly from other disciplines, for instance, nutritionists and physicians. The literature mainly explored the prevalence of anemia during pregnancy, associated risk factors with anemia, perception and iron dietary practices of Jordanian pregnant women (Al-Mehaisen et al. 2011; Jarrah et al. 2007; Salahat and Ibrahim 2012). The effect of applying an educational program for anemic pregnant women has not been well-studied in Jordan. One old interventional study conducted by nutritionists in Jordan evaluated the impact of a nutrition educational intervention program on the prevention of iron deficiency anemia in a group of Jordanian pregnant women. The findings showed that the intervention group had increased nutritional knowledge, an adequate nutrient intake, normal weight gain, and better iron status than the control group who received only the usual care, including limited nutrition counseling (ElMasri and Yonus 1998).

Study hypothesis

Jordanian anemic pregnant women who will receive the health information package program will experience a higher level of knowledge regarding anemia, compliance with iron supplementation pills and a higher hemoglobin level than those who do not receive the planned health educational program.

Methodology

Design

A randomized controlled trial, with pre-, posttest design with two groups (intervention and control group) was used.

Setting

The study sample was derived from an antenatal clinic of a major, large, teaching, maternity, referral hospital in the North of Jordan. This hospital is controlled by the government and directed by the Ministry of Health, and it provided health-care services free of charge for all pregnant women. Nearly 2,500 women visited its antenatal clinics each month, and around 30,000 women through all of 2015.

Sample and sampling

The population for this study was anemic pregnant women, and the accessible population was the anemic pregnant women who were in the antenatal clinic in Northern Jordan during the study period. The inclusion criteria were: pregnant women diagnosed with anemia, aged 18–45 years, in their second trimester of pregnancy from 13 to 28 gestational weeks, with hemoglobin levels below 10.5 mg/dl, and who had smart phones with access to social media (WhatsApp application) The total number of women approached for screening for eligibility was 4,969 women; the proportion of those who were screened for eligibility was 99 percent (n = 4,919); the proportion of screened women who were found to be eligible was 4 percent (n = 216); and the participation rate among those found to be eligible was 96 percent (n = 208) (Figure 1). Data collection took place for 3 months from the 1st of April 2016 to 4th July 2016. Pregnant women who were illiterate or had a history of obstetric, medical or psy,chological problems were excluded.

Based on a sample-size calculation, with a two-sided α of 0.05, a beta of 0.20, and a medium effect size of 0.5 (Cohen 1988), the total sample size was calculated to be 128

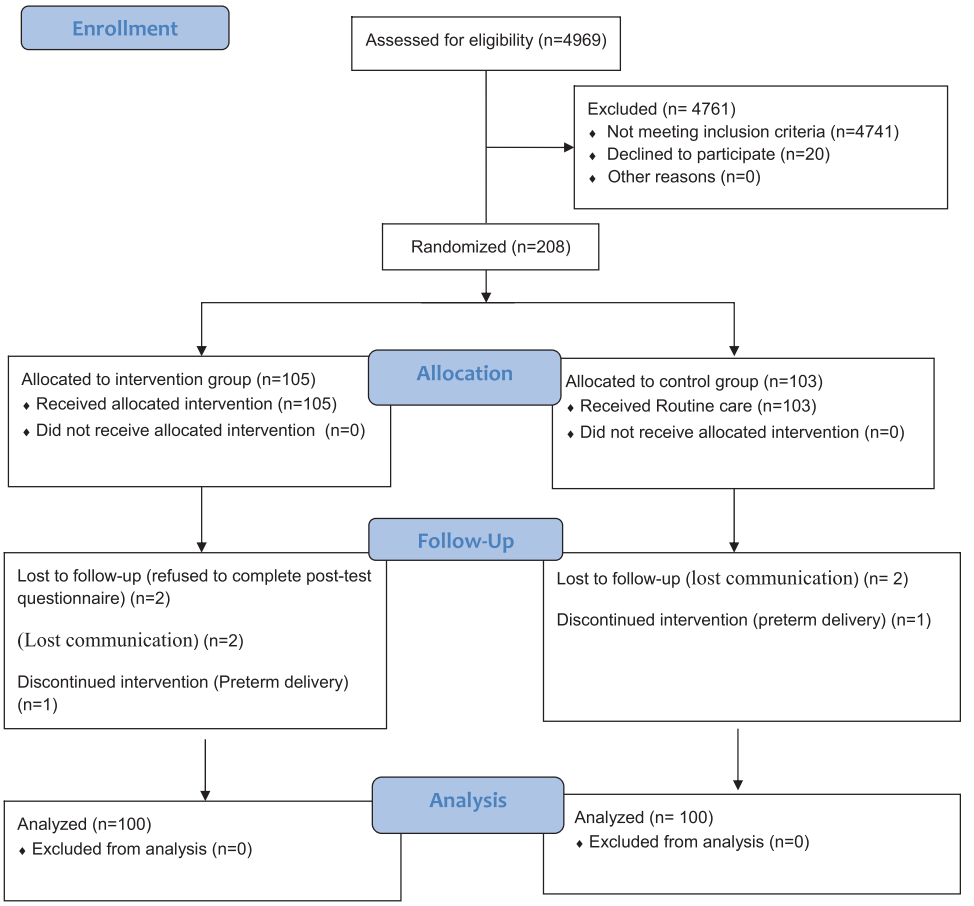

Figure 1. CONSORT flow diagram 1 (Schulz, Altman, and Moher 2010).

anemic pregnant women. We increased the sample size up to 200 participants to allow for dropouts and potentially to enhance the statistical power of the study.

Random assignment was used to divide the women into one of two groups. Each participant was given a number from 1 to 200 and randomly assigned into one of the two groups with the aid of a computer-generated table of random numbers. Participants who had a number for the intervention group were placed in that group, and participants who had a number for the control group were placed in that group. Eight participants withdrew from the study for different reasons: two of them refused to complete the posttest questionnaire; two participants were delivered preterm, and we lost the communication with four participants.

Intervention and control

Health Information Package Program (HIPP) was used to educate anemic women. The adopted draft was translated from English to Arabic and from Arabic to English, with some modifications to make it simpler, clearer, and suitable for Jordanian culture. This written draft was converted to a single video of 15 minutes duration to heighten the educational experience for women and raise their level of engagement and commitment. The information was narrated by a specialist midwife in combination with PowerPoint slides and it was recorded as a video. The areas covered in the video records were: introduction to pregnancy, anemia during pregnancy, causes and predisposing factors of iron deficiency anemia during pregnancy, effect of anemia on pregnancy, signs and symptoms, prevention of anemia during pregnancy, management of iron deficiency anemia, which includes: iron therapy, iron supplementation, dietary management. The video and its content were validated by specialists in the field of obstetric health nursing. Participants in the intervention group also received individualized teaching and the video from the researcher via the WhatsApp application on their smart phones. To make sure that the participant adhered to the intervention and that all of them watched the video, the WhatsApp application showed two blue check marks next to the sent messages.

The participants in the control group received standard care in antenatal clinics, (weight, vital signs, urine test, blood test, physical examination), and iron supplementation.

Instruments

A structured interview questionnaire was used for collecting data. This instrument was developed by Noronha et al. (2013) in India. It was used in this study with email permission from Noronha. Its Cronbach alpha was 0.938, which is considered high internal reliability.

The questionnaire consisted of four parts. The first part of the questionnaire consisted of two sections: section one asked about sociodemographic data, and the second section asked about health-related information.

The second part of the questionnaire was about compliance with iron supplementation and included two sections. Section one was about the extent of compliance with iron supplements during pregnancy, while section two included questions about the reasons for compliance/noncompliance with iron supplements during pregnancy.

The third part of the questionnaire was about food selection ability, which consisted of three checklists asking participants to identify food items which were rich and poor sources of iron (17 items), protein (21 items), and vitamin C (15 items). Out of these 53 items only 30 were correct. The total score of food selection ability was 30.

The fourth part of the questionnaire was the Structured Knowledge Interview Schedule (SKIS). This was an interview table that contains questions about concept of pregnancy and anemia in pregnancy, causes of iron deficiency anemia in pregnancy, effect of anemia in pregnancy, signs and symptoms of anemia in pregnancy, management of iron deficiency anemia, and prevention of iron deficiency anemia. The researcher asked the questions and placed a tick mark in front of each answer provided by each woman. Each correct answer was assigned one point. The upper limit of the total possible points was 86.

The instrument was translated from English to Arabic and translated back from Arabic to English by experts. Some modifications (adding, deleting, and rephrasing of certain questions) were made to the instrument to suit Jordanian culture. Validity of content was measured by five experts in the field of obstetric health nursing to test the relevance and completeness of the tools. Content validity index CVI was 0.91, which was considered highly valid. A Cronbach's alpha for the Arabic version of the adopted instrument was 0.938. A Pilot study was conducted on 20 anemic pregnant women (10 percent) to test the tool content, applicability, clarity, and time needed to complete the interviewing questionnaire.

Ethical considerations

Ethical approvals from the Institutional Review Board at Jordan University of Science and Technology and the Ministry of Health were obtained before conducting the study. Signed informed consent was obtained from all participants after providing adequate information about the purpose of the study. Researchers used a special informed consent form for each group. The researcher assured the participants that no harmful effects were anticipated from their participation. The researcher explained to the participants that their participation would assist with the development of a new strategy to counter anemia during pregnancy, and would increase their knowledge about anemia during pregnancy. Mothers who agreed to participate were assured that their privacy as well as the confidentiality of their response was protected. In addition, pregnant women who agreed to participate were assured that their participation in this study was voluntary and that they could withdraw from the study at any time, without bearing any consequences.

Data collection procedure

After the approval was obtained from the Jordanian Ministry of Health, the third researcher scheduled a meeting with the director of the hospital and explained the purpose of the study and data collection procedures. Arrangement was made to use a private room in the antenatal clinics, where the participants were asked to answer the instruments of the study. A team of three trained nursing midwives who were working at antenatal clinics at the hospital were responsible for identifying and inviting mothers who met the eligible criteria and were willing to participate in the study. After randomized assignment and signing of consent, a pretest was administered to the intervention and control groups.

Questions and concerns of the participants were answered. The pretest included the assessment of knowledge, food selection ability, compliance for iron supplementation, and hemoglobin level. The interview questionnaire took approximately 10–15 minutes to be completed. The results of blood test hemoglobin level were obtained from pregnant women's medical records for pretest value. The posttest blood hemoglobin level was repeated for each participant in both groups four weeks after recruitment at the hospital laboratory.

A posttest on knowledge, food selection ability, and compliance for iron supplementation was administered to both groups 4 weeks after recruitment. Anemic pregnant women were recruited in each data collection day for 3 months from the 1st of April 2016 to 4th July 2016.

Data analysis

The data were analyzed using the Statistical Package For Social Sciences, SPSS, for Windows, version 20. Descriptive statistics were used to demonstrate demographic characteristics of participants. A chi-square analysis was used to compare the study groups for categorical demographic variables. An independent sample t-test was used to compare the two groups for continuous demographic variables and the main study variables. Analysis of covariance (ANCOVA) was performed to identify potential effects of the health information package program but did not use an intent-to-treat approach. A p value of 0.05 or less was considered as statistically significant. The correlations between covariates were examined and found to be weak. Moreover, preliminary checks were conducted to ensure no violation of the assumptions of normality, linearity, homogeneity of variance, and homogeneity of regression slopes (assessed by histograms, Levene's test, Cronbach's alpha, correlation coefficients, and scatterplots). The independent variable was the study group, and the dependent variables consisted of posttest scores on woman's compliance, knowledge, and food selection ability checklist and hemoglobin levels. The dependent variables were tested in a separate model. For each dependent variable (posttest value), the covariates were: the pretest scores of that variable (Polit and Beck 2011), the educational level and source of information (Pallant 2005; Tabachnick and Fidell 2001). These variables were included and retained in the ANCOVA because of potential effects on the outcome and because education level and source of information differed significantly between the two study groups. Model fit of the ANCOVA was assessed using R-squared.

Results

The final total sample was 200 pregnant women, aged between 17 and 45 years (mean = 29, SD = 6.61 years) (Table 1). Mean gestational age was 23 (SD = 4) weeks. Gravidity of participants ranged from 1 to 13 (mean = 4, SD = 2.49). More than half of participants had a high school education (53 percent, n = 105), whereas less than one-tenth of the participants had a bachelor degree (8.5 percent, n = 17). Doctors were considered the main source of health information regarding to health in general and more specifically for pregnancy for pregnant women (57 percent, n = 114). Most of the women were housewives (n = 191, 95.5 percent), and their total household monthly income ranged from 100 to 900 Jordanian Dinars (JD) (140–1,268 US Dollars) (mean = 324.45 JD (457.30 US Dollars), SD = 134.14 JD (189.06 US

Table 1. Sociodemographic characteristics of the participants by study group.

Demographic variables		Control group		Intervention group		*p*	Total	
Age in years		29.6		28.4		0.2	29	
Gestational age		23		22.5		0.3	23	
Total household income		312		336		0.2	342.5	
		n	%	*n*	%	*p*	*n*	%
Educational level	Basic	34	34	15	15		49	24.5
	Secondary	47	47	59	59		106	53
	Diploma	15	15	13	13		28	14
	Bachelor	4	4	13	13	0.003**	17	8.5
Employment	House wife	97	97	94	94		191	95.5
	Employed	3	3	6	6	0.49	9	4.5
Place of residency	City	43	43	44	44		87	43.5
	Village	57	57	56	56		113	56.5
Source of information about health	Nurse	1	1	4	4		5	2.5
	Friends	0	0	1	1		1	0.5
	Family member	27	27	28	28		55	27.5
	Doctors	66	66	48	48		114	57
	Internet	6	6	19	19	0.01**	25	12.5
Health problems during pregnancy	Vomiting	11	11	15	15	0.5	26	13
	Bleeding	3	3	6	6	0.5	9	4.5
	Gestational diabetes	1	1	0	0	1.00	1	0.5
	Urinary tract infection	51	51	62	62	0.15	113	56.5
Menstrual History	Irregular	6	6	7	7		13	6.5
	Regular	94	94	93	93	1.00	187	93.5
Menstrual bleeding nature	Little	2	2	1	1		3	1.5
	Normal	85	85	91	91		176	88

Dollars). More than half of participants lived in a village (56.5 percent, n = 113) with the remaining living in a city (43.5 percent, n = 87). None of the women had any medical problems before pregnancy. The majority of participants had a history of regular menses (93.5 percent, n = 187), with normal bleeding during menstruation (88 percent, n = 176). The most frequent problem appearing among participants during the antenatal period was urinary tract infections (56.5 percent, n = 113), whereas the less frequent problem was bleeding (n = 9, 4.5 percent). No significant differences were observed between the intervention and control groups in terms of age, gestational age, health problems, and total household income. Only education and source of information were differed significantly between the two groups with the intervention group being more highly educated and tending more to get information from the Internet than the control group which reported greater tendency to obtain information from doctors (Table 1), so that these two variables were controlled by statistical analysis (ANCOVA). The proportion of women in the control group who depended on doctor as a source of health information was 66 percent, (n = 66) and depending on family members as a source of health information was 27 percent, (n = 27), depending on the Internet was 6 percent, (n = 6), which was significantly different (p = 0.014) from the proportion of women in the intervention group, 48 percent of whom depended on doctors as a source of information, 28 percent depending on family members, and 19 percent depending on the Internet (n = 19).

An independent sample t-test conducted to compare the study groups on the main study variables of pretest scores of compliance, knowledge, food selection ability, and hemoglobin level showed no significant differences (Table 2).

Table 2. Mean, SD, adjusted mean (adjusted for the three variables), standard error for knowledge check, compliance check, food selection ability, and hemoglobin level test among pregnant women in the pre- and posttest measurements, by study group.

	Control group (n = 100)			Intervention group (n = 100)				
Outcome variable	Test	Unadjusted mean (standard deviation	Adjusted mean (standard error)	Test	Unadjusted mean (standard deviation)	Adjusted mean (standard error)	T test for the pretest	p value
Compliance	**Pretest**	11.45 (2.39)		**Pretest**	12.04 (2.44)		−1.7	0.09
	Posttest	11.45 (3.02)	11.66 (0.229)	**Posttest**	14.13 (2.68)	13.92 (0.229)		0.01*
Knowledge	**Pretest**	16.18 (9.00)		**Pretest**	17.73 (7.58)		−1.3	0.19
	Posttest	18.74 (9.55)	19.365 (0.684)	**Posttest**	35.33 (9.55)	34.705 (.684)		0.01*
Food selection	**Pretest**	12.62 (5.82)		**Pretest**	15.52 (6.24)		−3.4	0.01*
ability	**Posttest**	12.93 (5.60)	13.766 (0.362)	**Posttest**	21.35 (4.27)	20.514 (0.362)		0.01*
Hemoglobin level	**Pretest**	9.55 (0.86)		**Pretest**	9.66 (0.70)		−0.97	0.33
	Posttest	9.71 (1.08)	9.723 (0.099)	**Posttest**	10.56 (0.96)	10.54 (0.099)		<.01*

Variables included to obtain the adjusted means: study group, and the woman's preintervention compliance, knowledge, and food selection ability and hemoglobin levels.

Effectiveness of health information package program

To identify any potential effect of the health information package program on anemic pregnant women's compliance, knowledge, and hemoglobin levels, a one-way between-groups ANCOVA was conducted. After adjusting for pretest scores on the compliance checklist, education, and source of information the control group's mean score on the posttest was significantly lower than that of the intervention group on the compliance checklist test [$F = 48.279$, $p < .01$, partial Eta squared = 0.197, control group mean = 11.45 (3.02), intervention group mean = 14.13 (2.68)] (Table 2). Furthermore, after adjusting for pretest scores on the knowledge checklist as well as education and source of information, the posttest knowledge score was significantly lower in the control group than in the intervention group [$F = 250.608$, $p < .01$, partial Eta squared = 0.560, control group mean = 18.74 (9.55), intervention group mean = 35.33 (9.55)]. Also, after adjusting for pretest scores on food selection ability and education and source of information, the control group scored significantly lower than the intervention group on the posttest scores for food selection ability [$F = 168.566$, $p < .01$, partial Eta squared = 0.461, control group mean = 12.93 (5.60), intervention group mean = 21.35 (4.27)]. Moreover, after adjusting for pretest hemoglobin levels and education and source of information, the control group had significantly lower posttest hemoglobin levels [$F = 34.105$, $p = 0.00$, partial Eta squared = 0.148, control group mean = 9.71 (1.08), intervention group mean = 10.56 (0.96)].

A chi-square test was conducted to compare the proportions of anemia after the educational intervention. Findings showed that 24 percent of the control group had no anemia, while 54 percent of the intervention group had no anemia.

Discussion

This study found that women in the intervention group scored higher on the posttest compliance checklist, knowledge check, food selection ability check, and hemoglobin level than women in the control group. This suggests that the health educational package program was effective. By implementing the HIPP, women's awareness about anemia, its significance as a problem, and the importance of iron supplementation during the

pregnancy might increase, and women might modify their health-seeking behavior (Gebremedhin et al. 2014). Furthermore, through education, women might identify different sources of iron-rich foods, remember better to take their iron supplementation pills, regulate their time to take it in the correct way, and overcome its side effects (a barrier for taking the pills) (Mithra et al. 2013; 2014; Thirukkanesh & Zahara, 2010; Thirukkanesh & Zahara, 2010).

Furthermore, educating women with appropriate dietary information helped them to be more familiar with food classifications, improved their ability to select food rich in iron, protein, and vitamin C, which would further help in increasing their hemoglobin levels. Another explanation was the use of WhatsApp. The WhatsApp application is a new technology which might increase the effectiveness of the health educational package program by motivating pregnant women to be more adherent to the intervention by keeping the teaching material available as a reference for them at any time they need.

The findings of the current study were consistent with those of previous studies carried out in India (Anuradha 2014; Noronha et al. 2013), Kuwait (ElHameed, Mohammed, and Abd El Hameed 2012), Sri Lanka (Senanayake et al. 2010), and Saudi Arabia (Habib et al. 2009). They found significant increments in women's knowledge, compliance, food selection ability, and a lower prevalence of anemia after education.

Our study results have implications for research, policymakers, and practice. Further research should explore the educational needs of health-care providers to enhance their health-promotion care for pregnant women. Further research is also needed to understand why health-care providers do not provide an effective teaching for pregnant women. For policymakers, the findings of the study provided a basis for them to suggest and implement various strategies and techniques to promote health and preventive behaviors among care providers to combat anemia during pregnancy. Policymakers should motivate nurses to enroll in continuity educational programs to improve their education and counseling skills to provide appropriate and effective messages for anemic women.

We recommend that policymakers and administrators adopt our health information package program and apply it as a comprehensive national strategy for the prevention of anemia during pregnancy. In addition, policymakers should consider the use of the new and simple social media technology, such as the WhatsApp application. Adding teaching materials for women on WhatsApp might increase women's awareness of different major health problems during pregnancy and improve their adherence to the education.

Some limitations should be considered when interpreting the results of this study. First, our study was conducted only in one governmental hospital and did not include any private hospitals. This might reduce the generalizability of our findings. In addition, we included primigravid and multigravida women because of the limited number of anemic primigravida women. This did not permit us to examine data from primigravida separately, and the inferences might differ between primgravida and multigravida women. Further limitations could be the self-reported nature of compliance, which might reflect a response bias, and the lack of information about the effectiveness of the intervention in prevention of anemia in nonanemic pregnant women (who were not included), which requires future research to be identified.

Conclusion

The health information package program was effective. It helped the pregnant women to improve their knowledge regarding anemia in pregnancy, as well as improve their ability to select healthy foods, increase their compliance with iron supplementation, and raise their hemoglobin levels. Application of the health information package program by policy could contribute to strengthening of the health-promotion activities of pregnant women and stimulate a change in their health-seeking behaviors. Furthermore, this could prevent one of the most prevalent health problems affecting the pregnant women. Educating women with appropriate dietary information could help them to include these food items not only in their diet but also in their family's diets, which would increase their family hemoglobin level in turn.

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