

## Enhancing Adherence to Recommended Micronutrient Supplements during Pregnancy through Pharmacist Intervention

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### ABSTRACT

**background:** Pregnant women have a greater risk of having nutritional deficiencies since their requirements for vitamins and minerals rise by 20-100%. Prenatal micronutrient supplements such as folic acid, iron, calcium and vitamins reduce nutrition deficits and unfavorable pregnancy and birth outcomes at a low cost. Poor adherence, on the other hand, remains a possible barrier to the successful implementation of these supplementation programs.

**Aim:** to improve by pharmacist intervention the knowledge and adherence of pregnant regarding micronutrient supplements

**Materials and Method:** The pre-post interventional study was conducted in obstetrics and gynecology teaching hospital in Karbala with 100 pregnant women at the second trimester, Data were collected using two questionnaires, one about knowledge and other about adherence to iron-folic acid and any micronutrient supplementation, laboratory tests were used to determine the levels of Hemoglobin and plasma level of calcium, and vitamin D.

**Results:** At baseline the overall adherence rate to supplement medication among pregnant women was low in spite of good knowledge score. Pharmacist intervention had a role in improve adherence rate and this was evident when the study repeated two month later. At end line, there is a significant increase in Haemoglobin level ( $p = 0.00028$ ) and 1,25-OH D3 level ( $p = 0.00001$ ).

**Conclusion:** The present study revealed that the pharmacist mediated intervention with education tools produced a pronounce significant improvement in adherence and knowledge scores.

**Keywords:** pregnancy, knowledge, adherence, pharmacist intervention , micronutrient supplementation.

### BACKGROUND

Pregnancy is a crucial stage in woman's life, and in order to provide for the needs of the growing , the mother's body goes through profound changes throughout this time. During a pregnancy, abnormalities may result in additional challenges for both mother and fetus. According to World Health Organization (WHO), "every pregnant woman and newborn receives quality care during pregnancy, delivery, as well as postpartum period (1). Nevertheless, There were thousands of deaths among pregnant women and adolescent girls as a result of issues associated to childbirth and pregnancy (2). Around 99 percent of all maternal deaths take place in countries with limited resource, and the majority can be avoided (3). there is proof that inexpensive, efficient interventions exist to avoid or treat almost each life-threatening pregnancy problems (4). For pregnant women,

WHO developed antenatal care (ANC) guideline to create evidence-based recommendations to enhance the quality of care for women and their newborns along the prenatal, intra partum, and postnatal continuum; Nutritional interventions are the first part involved in the guideline (5). To meet consideration of maternal and neonatal requirements throughout pregnancy, a healthy eating must include an adequate supply of protein, minerals, and vitamins. The health of both the mother and the newborn might be affected by these nutrients after delivery, as well as during pregnancy and the postpartum period. Additionally; WHO recommends that pregnant women take daily supplements of 30–60 mg of elemental iron, 400 Mg of folic acid, and daily calcium supplementation to reduce the risk of preeclampsia in pregnant women with low dietary calcium intake. The use of nutritional supplements by pregnant women is influenced by several factors, like awareness, socioeconomic level, and access to antenatal care (6, 7). Reduced adherence to iron supplement among pregnant women in developing countries is directly related to inadequate awareness about anemia and a medical delivery system that is insufficient to meet the health demands of the entire population (8). As well as many studies revealed that the awareness and adherence level of pregnant about Calcium and vitamin D supplements was low (9,10). The pharmacist is one of the main links in a chain that aims to involve the patient in his medication and push him to take part in important decisions about his treatment (11). Many researches in Iraq and other countries proven that the pharmacist's intervention was an influential factor in improving the level of adherence and patient's attitude to words different medications (12,13,14). In addition to providing pregnant with recommended Micronutrient supplements ( folic acid, iron, calcium, and vitamin D). a pharmacist should provide education and follow up to assess the results in order to prevent and deal with any side effects . The aim of this study was to improve knowledge and adherence of pregnant towards recommended supplements during pregnancy.

## MATERIALS AND METHOD

**Study Design and Duration:** This study was a pre-post interventional study, between the periods of October 2022 and February 2023.

**Ethical approval:** The study received approval from the Scientific Committee of Researches of Karbala Health Department (reference number 20220178).

**Study Population, and Sampling:** pregnant women attending obstetrics and gynecology teaching hospital in Karbala, who were at second trimester and took iron-folic acid supplement or any recommended supplements for pregnancy at least a month prior to the data collection. A total of 129 pregnant women were interviewed to participant in the study. Pregnant women were informed about the study and then asked to participate. Only 100 of them underwent the biochemical tests required of them and complete the questionnaire. Those with chronic disease or had an obstetric emergence were not joined.

**Study Variables, and Data Collection Tools:** The dependent variables were a Biochemical test, knowledge, and adherence to iron, folic acid, calcium and other micronutrient supplementation, while the independent variables were the socio-demographic and obstetric characteristics.

Data was collected using a pretested interviewer administered structured questionnaires. The structured questionnaires were created in English then translated into the Arabic, knowledge questionnaire about requirement of supplements and its importance at pregnancy was taken from previous studies (9,10,15) while MARS-5 questionnaire was used to assess the adherence of pregnant women toward supplements (16).

**Study arms:** the study was done by working on two arms: observational phase and pharmacist led-intervention phase with the purpose of determine the role of pharmacist in improving the antenatal care. During observational phase the Scio-medical data of pregnant were collected and their knowledge , adherence, and biochemical test were assessed at baseline, While during interventional phase the service was offered by the pharmacist and provided health education by face to face interview in addition with supporting material ( informative leaflet) contain instructions about diet, the important supplements and the direction of use quoted

from WHO guideline on antenatal care. Two months later, pregnant return to follow up and repeated the biochemical test to assist the result at end line.

**Data Management and Analysis:** The data analysis for this work was generated using version 28.0 of SPSS and Excel 2016. The data from each group was analyzed through descriptive statistics. Values were illustrated by n (%) for categorical and scale variables were presented by mean  $\pm$  standard deviation. Chi square was used to measure the association between categorical variables. Paired t test was used to compare result before and after intervention phase. Results of all hypothesis tests with p-values  $<0.05$  (two-side) were regarded significant statistically.

## RESULT

### *Socio-demographic and Obstetric Characteristics of Study participants:*

participants were divided into subgrouping based on age range using class interval table. The clinical demographic characteristics and laboratory parameters of pregnant women groups were summarized in Table 1. The highly participant age range was (63%) for ages (21-30) years, while the lowest participation (15%) was for those who were less than 20 years. The descriptive table also shown the number of pregnancies, mostly of the participants were reporting to have 2-4 times previously. Furthermore, about 71% of the pregnancy women were in the early period of second trimester. Research questionnaire was also included the occupation and education level of the participants, about 60% of the participants were employee, 47% were reporting to have a Bachelor degree and only 7% were illiterate.

**Table 1: The frequency of demographic characteristics of studied participants**

Variables	Groups	Frequency
Age Groups	$\leq 20$ Years	15
	21 – 30 Years	63
	31 – 40 Years	22
Gravidity	One time	40
	2 - 4 times	44
	More than four times	16
Gestational Age	Less than 20 weeks	71
	More than 20 weeks	29
Occupation	House wife	40
	Employee	60
Education level	illiterate	7
	primary school	17
	high school	29
	university	47
Gestational DM	Yes	4
	No	96

Gestational HT	Yes	5
	No	95

**Knowledge, Adherence and biochemical tests at baseline:** Pregnant women were divided into two groups based on the knowledge questionnaire, a score of  $>10$  has previously been used as good knowledge while a score  $\leq 10$  was intermediate/ poor knowledge. Also, pregnant women were divided into two groups based on MARS-5, a score of  $\geq 20$  has previously been used as a good adherence, while  $< 20$  was indicated to be a poor adherence. laboratory tests include Hb, plasma 1,25-hydroxyD3, total Calcium of all pregnant were determined and mean value then used

**Table 2: The frequency of Pregnant Knowledge about anaemia, iron, folic acid, calcium and vitamin D supplements**

Variables	Yes	No	I don't know
	N(%)	N(%)	N(%)
Anaemia is more prevalent in pregnant women.	89	1	10
Risk of anaemia increase if pregnant women are not taking iron supplement in their second trimester.	88	2	10
Iron and folic acid requirement for pregnant is higher than women who are not pregnant.	92	1	7
Pregnant women can develop complications due to anaemia.	89	2	3
Severe iron deficiency anaemia in pregnant can affect growth of foetus	80	1	19
Pregnant women should take iron supplementation in spite of taking healthy diet	75	3	22
Folic acid supplement reduces the risk of neural tube defect NTD	82	0	18
Calcium deficiency in pregnant associated with preeclampsia	17	3	80
Inadequate calcium and vitamin D intake cause poor foetal growth	39	1	60
Women need to change her food habit after becoming pregnant	93	0	7
Vegetable and fruit are a source of minerals and vitamin	93	0	7
Red meat is a source of iron	74	0	26
Milk and dairy products are a source of calcium	84	1	15
Consuming supplement tablets after meal reduce their side effect	51	5	44

Regular antenatal check-up and blood test are essential during pregnancy	97	0	3
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Table 3: The frequency of pregnant adherence towards recommended supplements (iron, folic acid, calcium and vitamin D supplement)

Variables	Always	Often	Sometimes	Rarely	Never
	N(%)	N(%)	N(%)	N(%)	N(%)
I forget to take my supplement tablets.	15	9	38	36	2
I miss out a dose from my supplement tablets.	0	0	3	4	93
I alter the dose of my supplement tablets?	12	4	16	19	49
I stop taking my supplement tablets for a while	13	7	27	21	32
I take my supplement tablets less than instructed	18	6	30	21	25

Table 4: Mean score of Knowledge and Adherence and mean level of biomarkers

Parameters	Mean $\pm$ SD
Knowledge	11.43 $\pm$ 2.69
Adherence	18.61 $\pm$ 4.35
Hemoglobin	10.53 $\pm$ 1.32
1,25-OH vitamin D	19.78 $\pm$ 15.08
Calcium(total)	8.99 $\pm$ 0.67

**Knowledge, Adherence and biochemical tests after pharmacist intervention:** the results from questionnaires and laboratory tests then obtained two months later, and only forty-nine percent came to follow up as scheduled. Paired t-test used to show the differences and compare parameters before and after pharmacist intervention. It was found that there is high significant differences after and before interventional study.

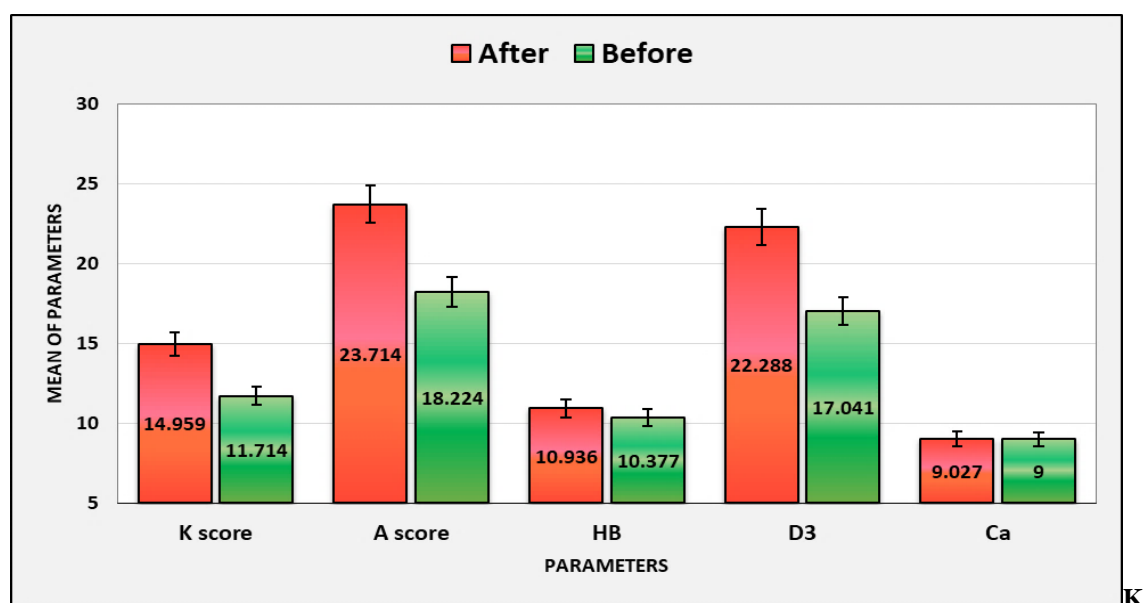
Table 5. Comparison between different variables after and before pharmacist intervention

Parameters	Before (mean $\pm$ SD)	After (mean $\pm$ SD)	T test	P value
Knowledge score	11.714 $\pm$ 2.637	14.959 $\pm$ 0.285	8.447	<0.001 <sup>HS</sup>

Adherence score	18.224±3.906	23.714±2.179	8.834	<0.001 <sup>HS</sup>
Hemoglobin	10.377±1.328	10.936±0.833	3.914	0.000286 <sup>HS</sup>
1,25-OH vitamin D	17.041±8.073	22.288±8.953	5.615	0.000001 <sup>HS</sup>
Calcium(total)	9±0.643	9.027±0.696	0.236	0.814 <sup>NS</sup>

\*HS, highly significant \*NS, non-significant

Figure 1. Comparison between different parameters mean after and before pharmacist intervention



\*K, Knowledge \*A, adherence \*HB, hemoglobin \*D3, 1,25-OH vitamin D \*Ca, Calcium

## DISCUSSION

In the present study, The majority of pregnant ages of 21-30 years and most of them were a house wife. Most participants had been pregnant more than once. At baseline The overall knowledge score was good. However, knowledge about supplemental calcium and vitamin D and their effects on maternal health and fetus development was poor. This is similar to the results shown by previous studies in two separated countries (9,10). Socio-demographic characteristics like age group, occupation, and education level were associated with knowledge level of participants. Additionally, Adherence to recommended supplements was low, with forgetfulness, fear of side effects, low income, and lack of availability as reported reasons for non-Adherence and these finding was in accordance with previous studies (17,18,19). Poor adherence negatively affected levels of hemoglobin, calcium, and vitamin D in the body so the results were indicated that more than half of the participants were suffering from anemia, and most of pregnant were confirmed to have deficiency of Vitamin D. These insufficiency resulting in negative outcomes in which low hemoglobin level associated with increased risk of preterm birth, low birth weight and small for gestational age infants (20) while preeclampsia and gestational diabetes may resulting from Hypocalcaemia during pregnancy (21) as well as low vitamin D

levels in pregnant women increasing the child's risk of developing chronic diseases like rickets in infancy (22). In order to educate, create awareness, and include pregnant women in the monitoring of their hemoglobin and vitamin d level pharmaceutical action is crucial in this situation. The pharmacist should look for possible cases of anemia and deficiency in vitamins and try to make changes towards more effective nutrition as well as how to take the recommended supplements in order to get positive outcome during pregnancy. With respect to the recommendations on diet and the education about the importance of iron, folic acid, calcium and others supplement it has been observed that thanks to the pharmaceutical intervention there is a significant increase in the case of knowledge score ( $p < 0.001$ ), and adherence score ( $p < 0.001$ ). In addition, there is a significant increase in Hemoglobin level ( $p = 0.00028$ ), 1,25-OH D3 level ( $p = 0.00001$ ), with non-significant difference in calcium level ( $p = 0.814$ ). These findings were in accordance with previous studies regarding interventions to increase adherence to micronutrient supplementation (23). The study has limitations in that it was conducted in just one center and does not provide data for the entire pregnant population.

## Conclusion

This study offers valuable insight into the degree to which pregnant women in Iraq adhere to recommended health practices. While the pregnant women had a good knowledge about the nutrient and the importance of supplements during pregnancy, adherence to recommended supplementation like IFA, calcium, and vitamin D was low. The present study also revealed that the pharmacist mediated intervention with education tools produced a pronounced significant improvement in adherence and knowledge scores.

## Recommendation

More large-scale and multicenter research would be required to assess adherence to recommended supplementation.

We recommend in the healthcare center that all pregnant women undergo biochemical tests, which should be easily accessible.

We recommend that essential supplements like folic acid, iron, calcium, and vitamin d be dispensed free in health care center.

## Competing interests

According to the authors, no conflicts of interest exist.

## Funding

According to the authors, no conflicts of interest exist.

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