Amino acid chelated iron versus ferrous fumarate in the treatment of iron deficiency anemia with pregnancy: Randomized controlled trial

Thesis

Submitted For Partial Fulfillments of Master Degree In Obstetrics & Gynaecology

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2019

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to ***ALLAH,***
the Most Kind and Most Merciful.

I'd like to express my respectful thanks and profound gratitude to ***Prof. Dr. Ahmed Khairy Makled,*** *Professor of Obstetrics and Gynecology Faculty of Medicine - Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to ***Dr. Wessam Magdy Abuelghar,*** *Assistant Professor of Obstetrics and Gynecology Faculty of Medicine - Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to ***Dr. Ahmed AbdElshafy El-Shahawy,*** *Lecturer of Obstetrics and Gynecology Faculty of Medicine - Ain Shams University, for his great help, active participation and guidance.*

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Abb.	Full term
AACI	Amino acids chelated iron
ARR	Absolute risk reduction
BMI	Body mass index
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
CRH	Corticotropin-releasing hormone
ELISA	Enzyme-linked immunosorbent assay
Fe2+	Ferric iron
Fe3+	Ferrous iron
FF	Ferrous fumarate
GA	Gestational age
GIT	Gastrointestinal
GIT	Gastrointestinal
Hb	Hemoglobin
HMB	Hydroxy-beta-methylbutyrate
HPLC	High perfor-mance liquid chromatography
IAAC	Institute for Advanced Architecture of Catalonia
ID	Iron deficiency
IDA	Iron deficiency anaemia
ITT	Intention to treat
IV	Intravenous
MCH	Mean corpuscular haemoglobin
MCHC	Mean corpuscular hemoglobin concentration
MCV	Mean corpuscular volume
NNT	Number needed to treat
OR	Odds ratio
PCV	Packed cell volume
RR	Relative risk

List of Abbreviations Cont...

Abb.	Full term
RR	Relative risk
SD	Standard deviation
SNOS	Sequential, Numbered, Opaque Sealed
sTfR	Soluble TfR
TIBC	Total iron-binding capacity
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization

INTRODUCTION

Anemia is characterized by reductions in hemoglobin concentration, red-cell count, or packed-cell. The mean minimum acceptable hemoglobin level during pregnancy by World Health Organization criteria is taken to be 11 g/dL ***(Jufar and Zewde, 2014).***

Anemia is a common problem in obstetrics and perinatal care. The main cause of anemia in obstetrics is iron deficiency, which has a worldwide prevalence between estimated 20%–80% and consists of a primarily female population ***(Breymann, 2015).***

Maternal risks include increased risk of infection, depleted blood reserves during delivery and thus an increased risk of allogeneic blood transfusion in the case of significant blood loss, cardiovascular stress, anaemia symptoms (fatigue, reduced physical and mental capacities, headaches, orthostatic dizziness, exhaustion, etc.), prolonged hospitalisations, decreased milk production in the puerperium, increased risk of post-natal depression, depleted maternal iron stores postpartum ***(Breymann, 2015).***

For these reasons, the efficient treatment of anaemia following its diagnosis has a positive impact on maternal as well as foetal outcomes ***(Breymann et al., 2017).***

The choice of treatment depends on the cause of the anaemia, i.e. generally iron deficiency. Oral iron products or intravenous iron products can be used for iron therapy. Various studies have shown that, once indicated, intravenous iron therapy is superior to oral iron therapy in terms of speed and absolute extent of haemoglobin increase ***(Breymann et al., 2011).***

The primary treatment for mild cases of iron-defciency anaemia and iron deficiency without anaemia in pregnancy is peroral iron therapy (iron II salts or iron III polymaltose) at doses of 160–200 mg/day (ideally on an empty stomach, fractionated). The same applies to iron deficiency and depleted iron stores (ferritin < 30 µg/L) without anaemia at the beginning of pregnancy, because of the additional requirement for iron in the course of the pregnancy,iron substitution with an iron dose below 100 mg/day, as is contained in certain multivitamin products are given, after 2–4 weeks, checks should be performed to see if treatment has been successful. In the following clinical situations intravenous iron therapy is indicated in pregnancy from the second trimester onwards: Lack of response to oral iron (Hb levels rising by less than 10 g/L within 14 days), intolerance of oral iron products (gastrointestinal side effects) or lack of compliance, severe or advanced anaemia (Hb < 9 g/dL), need for rapid and efficient anaemia treatment (advanced gestational age, placenta praevia, etc,….) ***(Breymann et al., 2010).***

It is a well established fact that there is a physiological drop in hemoglobin (Hb) in the mid trimester. This physiological drop is attributed to increase of plasma volume and hence decrease of blood viscosity lead to better circulation in placenta ***(Tan et al., 2013).***

Its suggest that the lowest critical hemoglobin value in iron-treated pregnant women should be 110 g/l (6.8 mmol/L) in the 1st trimester, and 105 g/L (6.5 mmol/L) in the 2nd and 3rd trimester ***(Tabrizi and Barjasteh, 2015).***

Oral iron preparations for the correction of iron deficiency include iron salts, iron chelates and ferric hydroxide complexes. Ferrous salts are characterized by a variable absorption rat ***(Abdel Moety et al., 2017).***

Furthermore, gastrointestinal (GIT) disturbances occur in about 50% of patients taking this form of oral iron preparations ***(Galy et al., 2010).***

Amino acid chelated iron therapy was reported to have more rapid effect with less GIT side effects ***(Abdel Moety et al., 2017)*** and this is what we want to study in this study.

Amino acid chelated preparations act by Biotron process as follow:

The journey of multiamino acids chelated minerals during the absorption pass through 3 stations: Amino acid cage

catches the mineral through high quality organic legends, not affected by HCL no cost … no waste. Then Amino acid cage carries the mineral through 18 essential aminoacid to protect it from antinutritional factors. After that the Amino acid cage passes the minerals to the blood stream " up to 95% absorption" with minimal side effects.

In this study, aimed to compare between an iron amino acid chelated preparation and a conventional iron salt (ferrous fumarate) as regards the efficacy in correcting iron deficiency anemia with pregnancy and their tolerability in the treatment of iron deficiency anemia with pregnancy.

Aim of the Work

Amino acid chelated iron may has no difference in effect, safety, adverse effect and out comes from Iron salts (ferrous fumarate) in treatment of iron deficiency anemia during pregnancy.

Iron Deficiency Anemia During Pregnancy

Anemia is the most frequent derailment of physiology in the world throughout the life of a woman. It is a serious condition in industrialized and semi-industrialized countries and it becomes a very serious condition in poor resources countries. Anemia is a major public health problem, causing an unfavorable status in respect to upcoming pregnancy. Among fertile, nonpregnant women, approximately 40% have low iron reserves ***(Milman, 2008).***

Anemia is one of the world's leading cause of disability and thus one of the most serious global public health issues. In fact, it involves issues of morbidity and mortality, but it can be mostly the basis of the inability of the woman to react to a postpartum blood loss thus leading to serious consequences ***(UNICEF/UNO/WHO 2001).***

Prevalence of anemia: Iron deficiency is the most widespread nutritional deficiency in the world and it accounts for 75% of all types of anemia in pregnancy ***(Di Renzo et al., 2015)***

There is also a possible association between Helicobacter species infection and anemia as reported in a study of Kibru in 2014 ***(Kibru et al., 2014).***

2. Iron deficiency in women:

Nutritional iron deficiency is the most common deficiency disorder in the world, affecting more than two billion people worldwide, with pregnant women at particular risk ***(de Benoist et al., 2008).***

World Health Organization (WHO) data show that iron deficiency anaemia (IDA) in pregnancy is a significant problem throughout the world with a prevalence ranging from an average of 14% of pregnant women in industrialized countries to an average of 56% (range 35–75%) in developing countries**.** ***(World Health Organization [WHO] 1992) & (ACC/SCN (United Nations Administrative Committee on Coordination/Standing Committee on Nutrition., 2004)***

Furthermore, IDA not only affects a large number of women in the developing world, but is also considered the only nutrient deficiency that is significantly prevalent in the developed world also ***(de Benoist et al., 2008).***

The high prevalence of IDA in women has substantial health consequences with subsequent socioeconomic hazards, including poor pregnancy outcome, impaired educational performance, and decreased work capacity and productivity ***(Zimmermann and Hurrell, 2007).***