Lactoferrin Versus Ferrous Sulfate in Management of Iron Deficiency Anemia among Female Medical Ain Shams Students

Thesis

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List of Abbreviations

Abbr.	Full term
ACLS	Advanced cardiovascular Life support
30 d	30 days
AI	Anemia of Inflammation
bLf	bovin lactoferrin
BMI	Body Mass Index
BP	Blood Pressure
DCYTB	Duodenal Cytochrome B
DMT1	Divalent Metal Transporter
DNA	Deoxyribonuclic Acid
ESAs	Erythropoiesis Stimulating Agents
Fe3+	Ferric form
Fe2++	Ferrous form
GAGs	Glycoseaminoglycans
HCT	Haematocrit
HIF	Hypoxia Inducible Factors
hLf	human Lactoferrin
HB	Hemoglobin
HB A2	Hemoglobin Adult
HSR	Hypersensitivity Reaction
IDA	Iron Deficiency Anemia
IL6	Interleukin 6
IRIDA	Iron Refractory Iron Deficiency Anemia
kDa	kilodaltons
LID	Latent Iron Deficiency
Lps	Lipopolysaccaride
M	Molecule
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin Concentration
MCV	Mean Corpuscular Volume

NSAID	Non Steroidal Anti-Inflammatory Drugs
PB	Peripheral Blood
PGF2a	Prostaglandin F2a
PNH	Paroxysmal Nocturnal Hemoglobinuria
PTD	Preterm Delivery
RBCs	Red Blood Cells
RDW	Red Blood Cells distribution width
RES	Reticuloendothelial System
rhlF	Recombinant human lactoferrin
RLS	Restless Legs Syndrome
ROS	Reactive Oxygen Species
SF	Serum Ferritin
TF	Transferrin
TIBC	Total Iron Binding Capacity
TMPRSS6 gene	Transmembrane Protease Serine Member 6
TS	Transferrin Saturation
WED	Willis –Ekbom Disease

Abstract

Introduction:
Iron, an essential element for cell growth and proliferation, is a component of fundamental processes such as DNA replication and energy production.Human lactoferrin (hLf), an 80-kDa multifunctional
iron-binding cationic glycoprotein. Prevalence of iron deficiency anemia is roughly 38% of pregnant women,
29% of non-pregnant women and 29% of all women of reproductive age have anemia globally.

Methods: *This study as part of The Nutritional Assessment of Medical Students of Ain Shams University (NAMS/ASU).They will be randomly allocated to three arms of clinical trial. All the project 1225 students were investigated by CBC; Serum Iron, Transferrin Sat. 105 students were proved to have iron deficiency anemia.* ***Results:****The result of supplementation of iron,lactoferrin combined showed an increase in Hb,HCT level in groupI (iron supplemented), group II (lactoferrin supplemented) as well as group III(combined supplemented) in spite of the fact that rate of change in group I and II was higher than group III.*

Conclusion:*This significantly high increase of hematological parameters, serum iron profile in all lactoferrin treated female lead us to suppose that it might be useful to take not only iron salt but also lactoferrin for prevention and treatment of iron deficiency anemia. In females with iron deficiency anemia, daily lactoferrin intake is good as iron salt in improving hematological parameters with fewer gastrointestinal side effects.*

Keywords: *Lactoferrin, Ferrous Sulfate, Iron Deficiency Anemia*

INTRODUCTION

Iron, an essential element for cell growth and proliferation, is a component of fundamental processes such as DNA replication and energy production. However, it can also be toxic when present in excess for its capacity to donate electrons to oxygen, thus causing the generation of reactive oxygen species (ROS), such as superoxide anions and hydroxyl radicals ***(Rosa et al., 2017).***

Human lactoferrin (hLf), an 80-kDa multifunctional iron-binding cationic glycoprotein, is constitutively secreted by exocrine glands and by neutrophils during inflammation. It is responsible for Physiological transport of iron from tissue to circulation, thus could be used for curing iron deficiency and iron deficiency anemia ***(Paesano et al., 2009).*** hLf is recognized as a key element in the host immune defense system ***(Cutone et al., 2017).*** Bovine Lf (bLf), which shares high sequence homology with the human protein, is also a multifunctional glycoprotein with identical antibacterial, antifungal, antiviral, antiparasitic, anti-inflammatory, and immunomodulatory activities of hLf ***(Cutone et al., 2017).***

Prevalence of iron deficiency anemia is roughly 38% of pregnant women, 29% of non-pregnant women and 29% of all women of reproductive age have anemia globally ***(WHO 2015).***

A study done on pregnant women showed an increase of total serum iron in all bovine lactoferrin treated women ***(Suzuki et al., 2005).*** Lactoferrin was also proven useful for prevention of iron deficiency anemia specially among female long distance runners ***(Koikawa et al., 2008)*** Lactoferrin was more effective than ferrous sulphate over a two months period in pregnant women with iron deficiency anemia ***(Rezk et al., 2016).***

AIM OF THE WORK

This study aimed to compare the efficacy of lactoferrin as approved to iron supplementation or the two combined supplementation in iron deficiency anemic medical Ain Shams female students. The efficacy is determined by complete blood picture and iron profile

LACTOFERRIN

Lactoferrin (Lf) is an approximately 80-kDa iron-binding glycoprotein, belonging to the transferrin family. LF is produced and stored in specific neutrophil granules and released during neutrophil activation and degranulation ***(Rodríguez-Franco al., 2005)***. It has been detected in secretory fluids.

Table (1): Lactoferrin concentration in different human fluids and secretions. ***(Luigi Rosa et al., 2017)***

Biological Fluids	Concentration (mg/mL)
Colostrum	8
Milk	1.5-4
Tears	2
Saliva	0.008
Vaginal secretion	0.008
Seminal fluid	0.112
Cerebrospinal fluid	Undetectable
Plasma	0.0004
Joint fluid	0.001

Lf, identified in 1939 in bovine milk and isolated in 1960 from both human and bovine milk, is the most important of transferrin family, owing to its multifunctional activities ***(Luigi Rosa et al., 2017)***.