Comparison between effect of Lactoferrin and Iron formula on blood indices

Thesis

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بسم الله الرحمن الرحيم
قالوا
سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم
صدق الله العظيم
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Eslam Saeed Abdelwahab

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List of Abbreviations

Abbr.	Full-term
ACD	Anemia of chronic disease.
APO_TF	Apotransferrin.
AZT	Azidothymidine.
BDNF	Brain derived neurotrophic factor.
BLf	bovine lactoferrin.
BMP	Bone morphogenetic protein.
C/EBPa	control enhancer_binding protein a.
CBC	Complete blood count.
CD-14	Cluster of differentiation 14.
CP	Ceruloplamin.
CRP	C-reactive protein.
DEX	Dexamethasone.
DMT-1	Divalent metal transporter 1.
EDTA	Ethylene diamine tetra acetic acid.
EPO	Erythropoietin.
Fe_s	Iron sulfer.
FPN 1	Ferroportin 1.
GDF 15	Growth differentiation factor 15.
HCP 1	heme carrier protein 1.
HCV	Hepatic c virus.
HGB	Hemoglobin.

HIFs ..... : Hypoxia-inducible factors.

HIV ..... : Hepatic I virus.

hLf ..... : human lactoferrin.

IBC ..... : Iron binding capacity.

IBD ..... : Inflammatory bowl disease.

ID ..... : Iron deficiency.

IDA ..... : iron deficiency anemia.

IDDM ..... : Insulin dependant diabetes mellitus.

IRIDA ..... : Iron refractory iron deficiency anemia.

IRPs ..... : Iron regulatory proteins.

IUGR ..... : IntraUterine Growth Restriction.

KDa ..... : kilodaltons.

Lf ..... : lactoferrin.

LFrs ..... : lactoferrin receptors.

LPS ..... : Lipopolysaccharide.

MAP ..... : Mitogen-activated protein kinase.

Mb ..... : Myoglobin.

MCH ..... : Mean corpuscular hemoglobin.

MCV ..... : Mean corpuscular volume.

Mt2 ..... : Matriptase 2.

PCV ..... : Packed cell volume.

PDB ID ..... : Identifier protein data bank.

PLT ..... : Platle.

PMNS ..... : Polymorphonucler cells.

RDW ..... : Red distribution width.

ROS ..... **:** Reactive oxygen species.

S. IL_6 ..... **:** Serum interleukin 6.

SD ..... **:** Standard deviation.

STAT 3 ..... **:** Signal transducer and activator of transcription 3.

TBI..... **:** Total body iron.

Tf ..... **:** transferrin.

TFrs ..... **:** transferrin receptors.

TGF _ B ..... **:** Transforming growth factor B.

TIBC ..... **:** Total iron-binding capacity.

TLR_4 ..... **:** Toll_like receptor 4.

TSAT ..... **:** Transferrin saturation.

TWSG 1 ..... **:** Twisted gastrulation homologue 1.

WBCs ..... **:** White blood cells.

WHO ..... **:** World health organizations.

ZnPP ..... **:** Erythrocyte zinc protoporphyrin.

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Abstract

Background: Iron deficiency (ID) is the most common micronutrient deficiency worldwide and young children are a special risk group because their rapid growth leads to high iron requirements. Risk factors associated with a higher prevalence of ID anemia (IDA) include low birth weight, high cow's-milk intake, low intake of iron-rich complementary foods, low socioeconomic status, and immigrant status. **Aim of the Work:** to compare between Iron maintenance therapy and lactoferrin on blood indices in infants and children. **Subjects and Methods:** A prospective interventional study was conducted on 40 children with an age range from 6 month to 3 year old were recruited from Nutrition unit, Children hospital - Ain Shams University. After the approval of the research ethics committee of Ain Shams University, informed consents were obtained from parents or caregivers before the enrollment of the children in the study. **Results: Conclusion:** Oral lactoferrin is effective in elevating hemoglobin and iron levels in children and can also be used to improve iron status in patients with iron deficiency.

Key words: lactoferrin, iron formula, blood indices

Introduction

Iron is a mineral that is naturally present in many foods, added to some food products, and available as a dietary supplement. Iron is an essential component of hemoglobin, an erythrocyte protein that transfers oxygen from the lungs to the tissues ***(Wessling-Resnick et al., 2014).***

Iron deficiency is the most common nutritional deficiency in children. The World Health Organization (WHO) estimates that anemia affects one-quarter of the world's population and is concentrated within preschool-aged children and women; a majority of the anemia is due to iron deficiency ***(DeBenoist et al., 2005) (Stoltzfus et al., 2003).***

Iron deficiency anemia develops when body stores of iron drop too low to support normal red blood cell (RBC) production. Inadequate dietary iron, impaired iron absorption, bleeding, or loss of body iron in the urine may be the cause ***(Hempel and Bollard, 2016).***

The functional deficits associated with anemia include gastrointestinal disturbances and impaired cognitive function, immune function, exercise or work performance, and body temperature regulation ***(Clark, 2008).***

In infants and children, Iron deficiency anemia can result in psychomotor and cognitive abnormalities that, without treatment, can lead to learning difficulties ***(Aggett, 2012).***

Lactoferrin is an iron-binding glycoprotein found in the milk of mammals such as humans, A large amount of LF is found especially in the colostrums, and its content differs among animal species. In humans, the LF content in foremilk is 5 to 7 g/l, almost 10 times higher than that in cow's milk (0.8 g/l). In addition, Lactoferrin is also found in tears, saliva, and neutrophils, and is considered to be one of defensive factors that prevent bacterial and viral infection ***(Paesano et al., 2006).***

It has also been found that the iron-binding capacity of Lactoferrin is about 300-fold greater than that of transferrin. It has been confirmed that Lactoferrin regulates iron absorption. Recently, it was reported that oral lactoferrin increases hemoglobin and total serum iron in pregnant women ***(Hagiwara et al., 1997).***

Oral Lactoferrin significantly improved the number of red blood cells, hemoglobin, total serum iron, and serum ferritin concentrations ***(Paesano et al., 2006).***

As matter of fact, in anaemic subjects also including non pregnant women, Lactoferrin oral administration firstly increases

the concentration of total serum iron indicating an efficient restoring of ferroportin function ***(Paesano et al., 2008).***

Furthermore, the increase of serum hepcidin (or prohepcidin), related to an increase of hematological parameters, should be consider as signal of a regulatory mechanism to avoid an excess of iron export from cells to blood, subsequent to the restoring of ferroportin expression by Lactoferrin. Therefore, the efficacy of Lactoferrin in curing Iron deficiency anemia can be explained through its influence on systemic iron homeostasis ***(Paesano et al., 2009, 2010).***