Pharmacist-led intervention in iron overloaded children with beta thalassemia major

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التدخل الصيدلى لأطفال انيميا البحر المتوسط (ثلاسيميا الكبرى) الذين يعانون من تراكم الحديد

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Dedication

To the kindest heart I've ever met in my life. To the one who granted us her whole life without waiting anything in return. To my great Mom ,,

"You were always the motive for me to success just to please your heart. I'm totally indebted to you for everything I achieved in my life. May Allah accept all your good deeds with us."

To the soul of my Dad ,,

"I hope that you were here today, but it's all about what Allah wants. May Allah send his mercy upon you and accept you in his paradise."

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List of Abbreviation

ACCP	American College of Clinical Pharmacy
ADE	Adverse drug event
ADR	Adverse drug reaction
ALT	Alanine aminotransferase
APhA	American Pharmacist Association
BTM	Beta Thalassemia Major
CBC	Complete blood count
DFO	Deferoxamine
DFP	Deferiprone
DFX	Deferasirox
DNA	deoxyribonucleic acid
DRP	Drug-related problem
EMH	Extramedullary hematopoiesis
Hb	Hemoglobin
Hct	Hematocrit
HRQoL	Health-related quality of life
ICT	Iron chelation therapy
IE	Ineffective erythropoiesis
IV	Intravenous
LIC	Liver iron concentration
MCV	Mean corpuscular volume
MRI	Magnetic resonance imaging
NTBI	Non-transferrin bound-iron
QoI	Quality of life
RBC	Red Blood Cell
SC	Subcutaneous
SCr	Serum creatinine
SF	Serum ferritin
SQUID	Superconducting quantum interference device
TIF	Thalassemia International Federation
UKCPA	United Kingdom Clinical Pharmacy Association
WBC	White blood cell

Abstract

Clinical pharmacist-provided services in iron overloaded beta-thalassemia major children; a new insight to patient care

Abstract of the XXXVI World Congress of the International Society of Hematology Hosted by the British Society for Haematology, 18–21 April 2016, Glasgow, UK. Published in the British Journal of Haematology (bjh), Volume 173, Issue Supplement S1, Pages 1-191, April 2016

Iron overloaded β-thalassemia major (BTM) children have high risk for delayed sexual and physical maturation, liver, heart diseases, and reduced life expectancy. The lifelong need to use iron chelators along with its unpleasant administration, side effects and lack of awareness regarding iron overload risks, all hamper BTM patient compliance to iron chelators. This study evaluates the impact of clinical pharmacist provided services on the outcome of iron overloaded BTM children.

A prospective randomized controlled study was conducted at Pediatric Hematology Clinic, Children's Hospital, Ain Shams University from November 2014 to July 2015. Forty-eight BTM children (8-18 years) with serum ferritin >1000 µg/l were randomly assigned to two groups (n=24/group); **Control group**, received standard medical care -**Intervention group**, received standard medical care plus clinical pharmacist provided services which included; detection of drug-related problems (DRPs) and their management, patient education regarding disease nature and iron chelators using especially designed educational series, providing patient-tailored medication chart detailed with drug dose, frequency and administration precautions.

The 2 groups were comparable at baseline in patient healthcare satisfaction, quality of life (QoL), *both assessed by PedsQL™ related modules*, and serum ferritin (SF) levels. After 6 months of study implementation, there was a highly significant difference between the 2 groups (control vs intervention) in; SF levels (Mean: 3871 µg/l vs 2362 µg/l, P=0.0042), patient healthcare satisfaction (Median: 24.47 vs 90.29, P<0.0001) and QoL (Median: 49.84 vs 63.51, P=0.0049). In the intervention group, comparing baseline to end of study, DRPs decreased from 64 to 4, number of noncompliant patients decreased from 24 to 3, SF levels significantly decreased (mean: 3949 µg/l vs 2362 µg/l, p<0.0001).

After 6 months of clinical pharmacist intervention, there was an improvement in patient compliance to iron chelators, healthcare satisfaction, QoL and SF levels. Clinical pharmacist can positively impact the outcome of BTM children.

Keywords:

Beta thalassemia major, Iron overload, Clinical pharmacy, Drug-related problems, Iron chelation therapy

Literature Review

Part I: Thalassemia

Definitions and History

The thalassemia syndromes are a heterogeneous group of inherited anemias characterized by defects in the synthesis of one or more of the globin chain subunits of the hemoglobin tetramer. The clinical syndromes associated with thalassemia arise from the combined consequences of inadequate hemoglobin (Hb) production that causes diminished Hb tetramers, hypochromia and microcytosis, and the imbalanced accumulation of globin subunits, causing precipitation of unpaired globin chains, ineffective erythropoiesis (IE) and hemolysis. ***(Edward J. Benz, 2013; Giardina and Rivella, 2013)***

Thalassemia results from a reduction in the rate of synthesis of one or more of the globin chains. Usually, the synthesis of either the α or the β chains of Hb A ($\alpha_2\beta_2$) is impaired. Thalassemias are named according to the chain with reduced or absent synthesis to either α-thalassemia or β-thalassemia ***(Giardina and Rivella, 2013; Loukopoulos, 2014).*** The thalassemias are quantitative disorders as the primary lesion lies in the amount of globin produced. However, some rare forms of thalassemia are characterized by the production of structurally abnormal globin chains in reduced amounts. These thalassemic hemoglobinopathies share features of thalassemia as well as those of structural hemoglobinopathies (e.g., sickle cell anemia) ***(Giardina and Rivella, 2013).***

β-Thalassemia was first described in 1925 by Cooley and Lee. They described four children with anemia, splenomegaly, mild hepatomegaly, and mongoloid facies. Later on, these characteristics became the typical findings in young children with untreated β-thalassemia major (BTM), often referred to as Cooley's anemia ***(Cooley and Lee, 1925).*** In 1932, Whipple and Bradford published a paper outlining the detailed autopsy studies of children who died of this disorder ***(Whipple and Bradford, 1932).*** Because of the high incidence of patients of Mediterranean descent with this disorder, Whipple called the disease Thalassic (Greek for "great sea") anemia, which was subsequently changed to thalassemia ***(Whipple and Bradford, 1936).*** In the 1940s, more studies illustrated the genetic basis for this anemia where severe homozygous condition became known