

# Assessment of Serum Ghrelin in Iraqi Children with Iron Deficiency Anemia

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## Abstract

A total number of 40 children with iron deficiency anemia and 40 healthy control children between the ages of 5 – 11 years were included in this prospective study which was done in Kerbala Pediatric teaching hospital in Iraq from the period of April to November 2019 to assess serum ghrelin levels. Iron deficiency anemia was diagnosed based on clinical and laboratory findings ((complete blood count by automated coulter), serum iron, Total iron binding capacity, and serum ferritin by Abbott machine)), and serum ghrelin levels by ELISA. All patients and controls were included by these investigations. In children with iron deficiency anemia the mean values of Hb, PCV, MCV, serum iron and serum ferritin levels were significantly lower than that of the control. (Patients' Hb (g/dl):  $9.8 \pm 1.8$ , control:  $12.5 \pm 0.8$ ), (PCV (%) for patients:  $29.9 \pm 2.9$ , control:  $36.3 \pm 4.5$ ), (MCV(fl) For patients:  $67.9 \pm 7.9$ , control:  $76.2 \pm 4.7$ ), (serum iron ( $\mu\text{mol/l}$ ) for patients:  $5.7 \pm 1.7$ , control  $16.7 \pm 4.4$ ), (Serum ferritin (ng/ml) for patients' group:  $11.5 \pm 3.9$ , control:  $82.3 \pm 35.1$ ) Serum ghrelin levels were low in children with iron deficiency anemia (mean:  $3.5 \pm 3.3$  ng/ml) with statistically significant differences from that of the control (mean:  $5.4 \pm 2.2$  ng/ml). Serum ghrelin levels are reduced in children with iron deficiency anemia. Low ghrelin levels might cause delay in growth and development of children with iron deficiency anemia.

**Key words:** Ghrelin hormone and iron deficiency anemia.

## Introduction

Anemia is known as a reduction in the total of hemoglobin or the masses of red blood cells. Iron deficiency anemia (IDA) is a type of anemia that occurs as a result of insufficient materials (iron) to create mature RBCs. Iron deficiency anemia is ideally a result from insufficient iron intake, prolonged bleeding or both of them. The most common cause of anemia throughout the world is IDA<sup>1</sup>. The most prevalent hemopoietic

disease in infants, children and adolescents, except the neonate<sup>2</sup> Ghrelin is a kind of growth hormone (GH) secretagogue which induces GH secretion. The hypothalamic hormone which connects the gastrointestinal-pituitary axis<sup>3</sup>. Ghrelin is a peptide consisting of 28-amino acids, and it functionally acts on the growth hormone secretagogue receptor (GHS-R). Ghrelin is a chief controller of sensing nutrient, initiation of meal, and appetite<sup>4,5</sup>. Signal of ghrelin has been involved in the control of insulin resistance, obesity and DM. A lot of those unrelated effects of ghrelin on food intake<sup>6</sup>. This statement depends on current evidence of ghrelin's effect in glucose & energy homeostasis<sup>7-9</sup>, heart disease, bone metabolism, muscular atrophy and cancer involvement/evolution<sup>10</sup>. For the diagnosis of iron deficiency anemia, serum ferritin level is very important which is usually low; however, the reduction in serum ferritin levels is

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statistically not significant with the clear cut off value of 30 µg/L<sup>11</sup>. Persistent low ghrelin levels interfere with growth and development of children.

### Materials & Methods

This prospective study included 40 children, with age range of 5-11 years with iron deficiency anemia who are diagnosed on basis of clinical findings (Pallor, generalized weakness, palpitation, decreased appetite and shortness of breath) that are confirmed by laboratory findings (decrease Hb, MCV, and serum iron, increase serum total iron binding capacity, and decrease serum ferritin) in pediatric hospital in Kerbala/Iraq through the period from April to November 2019. Another 40 children with no anemia (healthy control) who were age and sex matching with the patients' group were also included in the study.

A venous blood sample of 5 ml was obtained from each patient and control child after taking a written consent from their parents. Each blood sample was divided into two parts; 3 ml for gel tube (for measurement of serum iron, serum TIBC, serum ferritin by Abbott biochemical analyzer and serum ghrelin by ELISA) and 2 ml for EDTA tube (for CBC by automated counter). Statistical analysis was done by using SPSS version 22.0

### Results & Discussion

As shown in table 1, Results showed that Hb, PCV, MCV, serum iron and serum ferritin are low for 40 children (100% of cases) with statistically significant differences from that of the control. Serum TIBC levels were higher in 40 children (100% of cases) with statistically significant differences from that of the control.

Serum ghrelin level was low with a mean value of  $3.5 \pm 3.3$  ng/ml (range: 0.01-8 ng/ml) for children with

iron deficiency anemia with statistically significant difference from the mean level of the control ( $5.4 \pm 2.2$  ng/ml, range: 1.1-9.8 ng/ml).

The most prevalent hematopoietic system disease seen through infants and children and considerably influence life quality and performance. The top cause of IDA in childhood is reduce dietary iron, with increase requirement for iron, as a result of rapid growth, malnutrition and blood loss<sup>12</sup>. In this study, laboratory findings of decrease Hb, MCV, and decrease serum iron, increase serum TIBC, and decrease serum ferritin in patients' group were very important for establishing the diagnosis of IDA.

Through a study noticed that serum ghrelin levels in anemic children after treatment were greater than that of normal children<sup>12</sup>. In current study, children with IDA were diagnosed and assessed for serum ghrelin levels with no further assessment of serum ghrelin after treatment.

Low serum ghrelin can lead to loss of appetite and growth retardation<sup>14</sup>. A considerable positive association was found between body iron status and ghrelin levels. Low ghrelin levels in IDA can lead to anorexia<sup>15</sup>. Another study showed a positive association depleted store of iron with ghrelin levels, which indicate that ghrelin intermediate reduce appetite in IDA<sup>16</sup>. Ghrelin may influence in absorption of iron from GIT and recruitment from the stores in the liver. As a result of that concentration of ghrelin may give reflection about body iron stores and probably marker of anorexia, but more research with large prospective study need to be done to illustrate the mechanisms leads to reduce serum ghrelin in IDA<sup>17</sup>.

**Table 1: Different parameters of patients and controls.**

Parameter (unit)	Patients n= (40) Mean $\pm$ SD	Control n= (40) Mean $\pm$ SD	P value
Hb (g/dl)	9.8 $\pm$ 1.8	12.5 $\pm$ 0.8	<0.01**
PCV (%)	29.9 $\pm$ 2.9	36.3 $\pm$ 4.5	0.03**
MCV (fl)	67.9 $\pm$ 7.9	76.2 $\pm$ 4.7	<0.01**
Serum iron ( $\mu$ mol/l)	5.7 $\pm$ 1.7	16.7 $\pm$ 4.4	<0.01**
Serum TIBC ( $\mu$ g/dl)	304.8 $\pm$ 46.6	202.2 $\pm$ 30.6	<0.01**
Serum ferritin (ng/ml)	11.5 $\pm$ 3.9	82.3 $\pm$ 35.1	<0.01**
Serum ghrelin (ng/ml)	3.5 $\pm$ 3.3	5.4 $\pm$ 2.2	<0.01**

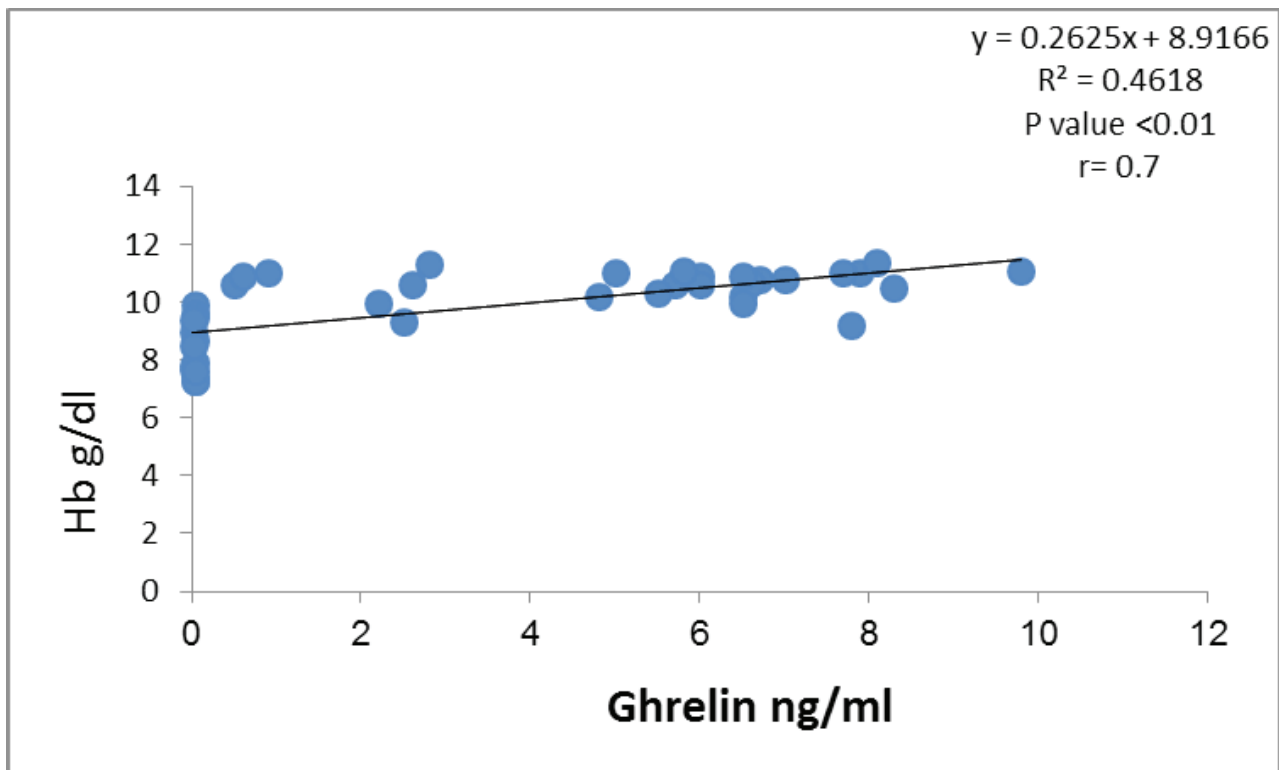
There were a association the serum ghrelin levels with Hb, PCV, MCV, S. Iron, S. TIBC and S. ferritin. As shown in the table 2. The relationship serum ghrelin with Hb is shown in Figure 1.

**Table 2. The correlation between Serum Ghrelin and other Parameters.**

Parameters (unit)	Ghrelin (ng/ml)	
	P-value	r
Hb (g/dl)	<0.01	0.7**
PCV (%)	<0.01	0.7**
MCV (fl)	0.006	0.4**
Serum iron ( $\mu$ mol/l)	0.4	0.3**
Serum TIBC ( $\mu$ g/dl)	0.2	-0.2
Serum ferritin (ng/ml)	<0.01	0.5**

\*Correlation is significant at the 0.05 level (2-tailed).

\*\*Correlation is significant at the 0.01 level (2-tailed).



**Figure 1: The association of serum levels of Ghrelin (ng/ml) with Hb (g/dl) in the patients group.**

**Financial Disclosure:** There is no financial disclosure.

**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the College of Applied Medical Sciences and all experiments were carried out in accordance with approved guidelines.

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