The Difference Between Hemolytic Anemia and the Deficiency of G6PD Among Children Using a Discriminant Analysis

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Abstract: There are numerous and different reasons for the causes, symptoms, consequences and treatments of anemia diseases. The correct diagnosis of each type of anemia is therefore, important. Those who are most vulnerable are the newborns and under-five children. Therefore, the main objective of this study is to identify the variables that affect the diagnosis of the two anemia diseases among children: hemolytic anemia and G6PD deficiency. This aim is intended to be achieved by using the discriminant analysis to differentiate between the G6PD deficiency and hemolytic anemia among the selected 150 children infected with the diseases. The result of the study showed that three factors such as jaundice, fever and age contribute to the significant differences between the group of children infected with hemolytic anemia and the group of children infected with G6PD deficiency. There is high capability of differentiating between these two groups with the discriminant function obtained from these factors. Therefore, this study recommends the use of discriminant function to help in diagnosing the cases of these diseases as carried out by the medical authorities concerned with anemia in children.

Key words: Discriminant analysis, anemia diseases, hemolytic anemia, G6PD deficiency, medical authorities, symptoms

INTRODUCTION

Generally, anemia is known to be a common disease among children. There are many cases of Anemia such as the G6PD deficiency and hemolytic anemia. In anemia, diagnosis is carried out based on the age of the patient, the gender of the patient and the symptoms of the disease through clinical tests. Then in order to determine the appropriate treatment methods for each type of anemia, laboratory tests are conducted. Thus, to identify the factors affecting the diagnosis of these two types of anemia (follicular anemia and hemolytic anemia) among children is the aim of the study. The study explored differential analysis through simple random technique to select 150 children. A central education in the housing area of Baghdad was chosen the population with hemolytic anemia or follicular anemia in 2017. Due to the strong nature of the analysis of discriminatory statistical methods it can be used to analyze differences between two or more variables with similar qualities. This will allow the factors to be classified into the right groups with the least possible error using one or more discriminatory functions in accordance with the available information on the population of the study.

Literature review: From the concept of analysis, differential analysis is known as a statistical method for analyzing multivariate data which deals with two categories of techniques. First and foremost is the classification of the observations into their groups where they belong which is simply referred to as the Predictive Discriminant Analysis (PDA). It entails the prediction of observation return to their studied group. The second one is called the Descriptive Discriminant Analysis (DDA) (Erimafa et al., 2009). The following summarized the objectives of the analysis:

Maximizing the degree of excellence (Lambda) and minimizing the degree of overlapping between the studied groups to the lowest possible degree which represents the ratio of the sum of the squares of deviations between the groups to the sum of squares of deviations within the groups. Designing the linear combinations and discriminant function of the independent variables in the best way to differentiate between the classifications of the dependent variables.

Using the strength of the distinction between the groups selected in this study to determine the relative importance of the independent variables in the discriminatory function. Using the values of independent
variables to make division of cases between the categories of the dependent variable. Percentage evaluation of the division accuracy. The following are the conditions and assumptions to be considered before applying discriminatory analysis:

- Although, there may be a degree of overlapping, the two or more studied groups should be statistically distinct and identifiable
- There should be two views at least in each group (Savic et al., 2008)
- The total number of observations should be greater than number of independent variables (Discriminating Variables) in the discriminant function (Savic et al., 2008)
- Absence of correlation problem between the variables used in the discriminant function which leads to multiple linear duplications
- Unless special formulas are used, the variance matrices for groups are almost equal (Savic et al., 2008)
- In each of the studied group, a multiple natural distribution is followed by the differential variab les (Savic et al., 2008)
- From the group size, there should not be significant difference which leads to erroneous classification process where the larger group tends to have the views (Savic et al., 2008)

Practically it has been observed that the method of discriminatory analysis is reliable enough even if the conditions and above are not satisfied (Savic et al., 2008). Looking at the case of two groups is the distinguishing function of the analysis. The discriminant function is in accordance with the factors of the sample randomly chosen and placed in two different groups. The return to a group can be determined and the uniqueness tested in this function (Saleh, 2008).

Given that the sample area is W, it can then be divided into two parts: R returns to the first group while WR belongs to the second group. Any group of these two groups can receive the boundary between the two groups, i.e., $X_1, X_2, ..., X_p$, the aim of the equation is find the linear function. According to Saleh (2008), the mathematical formula will be as follows:

$$ y = b_1x_1 + b_2x_2 + ... + b_px_p $$

(1)

where, $y$ stands for linear discriminant function which is the linear combination of independent variables (explanatory). It can be interpreted in the following form of matrices:

$$ y = b^tX $$

(2)

The best distinction between the two groups is achieved by the process of estimating the parameters $(b_1, b_2, ..., b_p)$ that makes the function through the square ratio of the difference between the two groups to the common variation of the two groups as high as possible (Saleh, 2008) the greatest possible:

$$ Q = \frac{[(\bar{y}_1 - \bar{y}_2)^2]}{\sum_{i=1}^{n_1} \sum_{j=1}^{n_2} (y_{ij} - \bar{y}_i)^2} = \frac{b^t(\bar{x}_1 - \bar{x}_2)b}{b^tb} $$

(3)

Where:

$$ \bar{y}_i = b_1\bar{x}_{i1} + b_2\bar{x}_{i2} + ... + b_p\bar{x}_{ip} $$

(3)

And:

$$ \bar{x}_i = (\bar{x}_{i1}, \bar{x}_{i2}, ..., \bar{x}_{ip}), \quad i = 1, 2, ... $$

(4)

Which represents the sample size $E$

$$ s = \frac{1}{n_1 + n_2}\left((\bar{x}_1 - \bar{x}_2)^t(\bar{x}_1 - \bar{x}_2)\right) $$

(5)

The maximization of the ratio ($Q$) is achieved by partial derivation and maximization by zero. Thus, the following is obtained:

$$ b = s^{-1}(\bar{x}_1 - \bar{x}_2) $$

(6)

After the extraction of the values $(b_1, b_2, ..., b_p)$ and obtaining the special function, classification of the new vocabulary can be done into one of the two groups with this function by assigning a cut-off point or critical score that makes the probability of misclassification less of what it can be (AL-Hamadani, 2014).

The size of the groups under this study determines the process of assigning the point of separation. If the size of the second group is similar to the size of the first group then the following equation holds (Ramayah et al., 2010):

$$ z_c = \frac{n_1\bar{y}_1 + n_2\bar{y}_2}{n_1 + n_2} $$

(7)

Where:

- $z_c$ = Cut-off point
- $\bar{y}_1$ = Centroid for group 1
- $\bar{y}_2$ = Centroid for group 2
- $n_1$ = First group size (number of views of the first group)
- $n_2$ = Second group size (number of views of the second group)
When the size of the second group is not similar to
the size of the first group, then the following equation
holds (Ramayah et al., 2010):

\[ z_{c} = \frac{\bar{y}_{1} + \bar{y}_{2}}{2} \]  \hspace{1cm} (8)

\( \bar{y}_{1} = \) The view is classified into the first group
\( \bar{y}_{2} = \) The view is classified into the second group
\( \bar{y} = \) Then the observation is randomly assigned to
the first or second group

Whereas:

\[ \bar{y} = (\bar{x}_{1}, \bar{x}_{2})x \]  \hspace{1cm} (9)

The rejection of the null hypothesis that assumes the
mean of the group determines the significance of the
discriminant function. Hence:

\[ H_{0}: \mu_{1} = \mu_{2} \hspace{1cm} VS \hspace{1cm} H_{1}: \mu_{1} \neq \mu_{2} \]  \hspace{1cm} (10)

The F test and its mathematical formula are one
of the several measures to test this hypothesis as follows
(Saleh, 2008):

\[ F_{ca} = \frac{n_{1}+n_{2}-2-p}{(n_{1}+n_{2}-2)p} \times T^{2} \]  \hspace{1cm} (11)

The Hypothesis \( H_{0} \) is accepted while \( H_{1} \) is rejected
with a significant level of \( \alpha \) if:

\[ F_{ca} > F_{a(p, n_{1}, n_{2}-p-1)} \]  \hspace{1cm} (12)

This shows that there is no equality in the mean of
the two groups. The scale of the Wilk’s Lambda and
its mathematical formula can be used as follows
(Akkar, 2008):

\[ \Lambda = \frac{|W|}{|W+B|} = \frac{|W|}{|T|} \]  \hspace{1cm} (13)

Where:

\( W = \) The matrix and common variance in the total
values
\( B = \) The matrix of variance and contrast between the
aggregates
\( T = \) The total range of the variance and contrast of the
aggregates

If the value of Wilk’s Lambda is close to or equal to one
it ranges between zero and one. This shows that there is
no discrimination as the value of the groups is equal; The
strength of discrimination is indicated if the value is close
to zero (Akkar, 2008).

**Probability of classification error:** To measure the
performance of a discriminatory function, the probability
of a rating error is an ideal criterion. Thus, the less the
efficiency of the discriminant function, the lower the
probability of the misclassification. Re-substitution
method is one of the several methods for estimating the
probability of error of classification where the probability
of error is estimated by applying the following
mathematical formula (Al-Hamdani, 2014):

\[ \hat{p}_{i} = \frac{n_{i}}{n_{k}} \]  \hspace{1cm} (14)

Where:

\( \hat{p}_{i} \) = The probability of classifying the individual into
group \( i \) which originally belongs to group \( k \)
\( n_{i} \) = The number of views in group \( k \) that is
categorized as belonging to group \( i \)
\( n_{k} \) = The number of group views \( k \)
\( K \) = The number of groups studied \( (k = 1, 2) \)

**MATERIALS AND METHODS**

**Hemolytic anaemia:** Is a disorder in the blood system as
a result of red blood cell with higher breakdown than the
rate of production in the spleen. Although, this is just one
of the causes of anaemia. Hemolytic anaemia is caused
due to the following factors varying from one pattern to
another:

- Internal hemolytic anemia such as sickle cell anemia
  and thalassemia
- Exogenous hemolytic anemia such as infection and
  pharmacological interactions of certain
  pharmacological drugs

The signs of hemolytic anemia are shown based on
the causes and severity of the symptoms which differs
from one condition to another. In a simple case, no
symptom may appear on the patient. Generally, all types
of anaemia contain the hemolytic anemia. The symptoms
of the diseases are the breakage of red blood cells and the
releases of hemoglobin in the blood are: yellowing of the
eye and skin, difficulty in breathing, stress, paleness,
chest pain, dizziness, heart failure, dark yellow or brown
urine, arrhythmias, cold limbs, headache and lack of
concentration.

The cause and severity of the condition of the
diseases, the development of the condition, the history of
the disease and the age of the patient determine the
treatment of the hemolytic anemia. In some cases where
the cause can be controlled, the acquired hemolytic
anaemia can be fully recovered. The disease persists with
the patient throughout his life in the case of hereditary anemia. This, therefore, necessitates continuous medical care. Generally, the aim of the treatment is to:

- Stop or reduce the breakdown of the red blood cells
- Raise the appropriate number of the red blood cells to some extent
- If possible, to treat the cause of the condition

The treatments for the disease include:

- Blood transfusion
- The use of drugs such as cortisone and folic acid
- Splenectomy

**G6PD deficiency**: Also known as voile, folic acid and bean anemia is a hereditary anemia as a result of decomposition of red blood cells due to genetic disorder that causes a deficiency of the enzyme G6PD. Therefore, the disease is medically referred to as the G6PD deficiency or Favism. To strengthen the defence of this biochemical means on the surface of the cell within a series of interactions against oxidizing substances whose attack may break down cell walls and then decompose them is the function of this enzyme.

The disease is genetically and sexually transmitted. It affects the male child more through their mother. The disease may appear in some cases among the female children. The male child affected with this disease can transmit it to their daughters but not to other children.

When the patient is infected with the disease, the symptoms of folic anemia begins to show. After the infection of the virus, the lentils or any type of legumes especially hepatitis appears. Then, the symptoms may disappear if some drugs are taken by the person with the disease or without taking any kind of oxidized substances like legumes. Similarly, some of the symptoms of jaundice are discoloration of skin, mucous membranes (conjunctivitis), nausea, palpitations, vomiting, dark urine, back pain, abdominal pain and light fever. These symptoms are as a result of severe destruction of erythrocytes through increased production of bilirubin. However, the newborns may be vulnerable to this substance as they can be very harmful as they cause serious problems by getting deposited inside the brain. The folic acid fracture has no cure and its prevention from passing on from one generation to another generation is impossible. To treat the disease, the patient has no avoid blood fracture by refraining from oxidized substance to minimize the viral and bacterial diseases.

**Variables in the composition of the linear discriminant function**: This study relies on set of variables collected from each of the items of the research sample in order to form a linear discriminative function; these variables are:

**The dependent variable (y)**: This is the diagnosis hemolytic anemia disease of a child and is identified by the number of the child’s diagnosis of follicular anemia.

**The independent variables (X₁, X₂, ..., Xₙ)**: In order to find the linear discrimination function, the symptoms of hemolytic anemia, follicular anemia and other common characteristics were used. The classifications are made into two groups: A group of children with hemolytic and another group with follicle anemia. These variables are:

These variables and their representations are: X₁: Sex, X₂: Age, X₃: Nausea, X₄: Fever, X₅: Jaundice, X₆: Paleness of the Face, X₇: Darkness. The analysis technique employed for the data and to obtain results is SPSS Version 21.

**RESULTS AND DISCUSSION**

**The results of the discriminatory analysis**: The result from the Table 1 and 2 shows that there is no correlation between the independent variables. The method of stepwise was employed to evaluate the independent variables with the moral effect in the differential analysis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Mean</th>
<th>SD</th>
<th>Unweighted</th>
<th>Weighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemolytic anemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.431818</td>
<td>0.4981680</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Age</td>
<td>3.557786</td>
<td>2.3149049</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Nausea</td>
<td>1.034091</td>
<td>0.1825026</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Fever</td>
<td>0.522727</td>
<td>0.5033456</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.636364</td>
<td>0.4830824</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Paleness of the face</td>
<td>0.522727</td>
<td>0.5033456</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Dark urine color</td>
<td>0.545455</td>
<td>0.5967831</td>
<td>88</td>
<td>88.0000</td>
</tr>
<tr>
<td>Gender</td>
<td>1.451613</td>
<td>0.5017157</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Age</td>
<td>8.825806</td>
<td>3.5671054</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Nausea</td>
<td>1.096774</td>
<td>0.2986036</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Fever</td>
<td>0.467742</td>
<td>0.5030315</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.193548</td>
<td>0.3983042</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Paleness of the face</td>
<td>0.467742</td>
<td>0.5030315</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Dark urine color</td>
<td>0.532258</td>
<td>0.5030315</td>
<td>62</td>
<td>62.0000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.440000</td>
<td>0.4980499</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Age</td>
<td>5.735222</td>
<td>3.8875759</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Nausea</td>
<td>1.060000</td>
<td>0.2382624</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Fever</td>
<td>0.500000</td>
<td>0.5016750</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.453333</td>
<td>0.4904852</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Paleness of the face</td>
<td>0.500000</td>
<td>0.5016750</td>
<td>150</td>
<td>150.0000</td>
</tr>
<tr>
<td>Dark urine color</td>
<td>0.540000</td>
<td>0.5000671</td>
<td>150</td>
<td>150.0000</td>
</tr>
</tbody>
</table>
Table 2: The correlation matrix within the independent variables

Pooled within-groups matrices

<table>
<thead>
<tr>
<th>Variables</th>
<th>Gender</th>
<th>Age</th>
<th>Nausea</th>
<th>Fever</th>
<th>Jaundice</th>
<th>Paleness of the face</th>
<th>Dark urine color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>1.000</td>
<td>-0.031</td>
<td>-0.057</td>
<td>-0.107</td>
<td>0.001</td>
<td>0.001</td>
<td>0.064</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.031</td>
<td>1.000</td>
<td>0.001</td>
<td>0.049</td>
<td>-0.009</td>
<td>-0.009</td>
<td>-0.023</td>
</tr>
<tr>
<td>Age</td>
<td>-0.057</td>
<td>0.001</td>
<td>1.000</td>
<td>-0.078</td>
<td>-0.021</td>
<td>-0.021</td>
<td>-0.104</td>
</tr>
<tr>
<td>Nausea</td>
<td>-0.107</td>
<td>0.049</td>
<td>-0.078</td>
<td>1.000</td>
<td>0.010</td>
<td>0.010</td>
<td>0.039</td>
</tr>
<tr>
<td>Fever</td>
<td>0.072</td>
<td>0.385</td>
<td>-0.004</td>
<td>-0.205</td>
<td>-0.056</td>
<td>-0.056</td>
<td>-0.028</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.001</td>
<td>-0.099</td>
<td>-0.021</td>
<td>0.010</td>
<td>1.000</td>
<td>-0.389</td>
<td>-0.389</td>
</tr>
<tr>
<td>Paleness of the face</td>
<td>0.064</td>
<td>-0.023</td>
<td>-0.104</td>
<td>0.039</td>
<td>-0.389</td>
<td>1.000</td>
<td>-0.389</td>
</tr>
</tbody>
</table>

Table 3: Significant independent variables

Variables entered/removed\*d

<table>
<thead>
<tr>
<th>Steps</th>
<th>Variable</th>
<th>Entered</th>
<th>Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
<th>Between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td></td>
<td>120.246</td>
<td>1</td>
<td>148.000</td>
<td>7.494E-21</td>
<td>Hemolytic anemia and the deficiency of G6PD</td>
</tr>
<tr>
<td>2</td>
<td>Jaundice</td>
<td></td>
<td>119.786</td>
<td>2</td>
<td>147.000</td>
<td>1.566E-31</td>
<td>Hemolytic anemia and the deficiency of G6PD</td>
</tr>
<tr>
<td>3</td>
<td>Fever</td>
<td></td>
<td>84.569</td>
<td>3</td>
<td>146.000</td>
<td>9.113E-32</td>
<td>Hemolytic anemia and the deficiency of G6PD</td>
</tr>
</tbody>
</table>

At each step, the variable that maximizes the smallest F ratio between pairs of groups is entered. *Maximum number of steps is 14; *Minimum partial F to enter is 3.84; *Maximum partial F to remove is 2.71 and F level, tolerance or VIN insufficient for further computation.

Table 4: The detailed of Wilk’s Lambda

Wilk’s Lambda

<table>
<thead>
<tr>
<th>Steps</th>
<th>Number of variables</th>
<th>Lambda</th>
<th>df1</th>
<th>df2</th>
<th>df3</th>
<th>Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.552</td>
<td>1</td>
<td>1</td>
<td>148</td>
<td>120.246</td>
<td>1</td>
<td>148.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.380</td>
<td>2</td>
<td>1</td>
<td>148</td>
<td>119.786</td>
<td>2</td>
<td>147.000</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.365</td>
<td>3</td>
<td>1</td>
<td>148</td>
<td>84.569</td>
<td>3</td>
<td>146.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 5: The underlying roots

Eigenvalues

<table>
<thead>
<tr>
<th>Function</th>
<th>Eigenvalue</th>
<th>Variance (%)</th>
<th>Cumulative (%)</th>
<th>Canonical correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.738</td>
<td>100.0</td>
<td>100.0</td>
<td>0.797</td>
</tr>
</tbody>
</table>

*First 1 canonical discriminant functions were used in the analysis

Table 6: The Wilk’s Lambda

Wilk’s Lambda

<table>
<thead>
<tr>
<th>Test of function(s)</th>
<th>Wilk’s lambda</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.365</td>
<td>147.544</td>
<td>3</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 7: Non-standard discriminatory transactions

Canonical discriminant function coefficients

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.348</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.512</td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.880</td>
</tr>
<tr>
<td>Unstandardized coefficients</td>
<td>0.925</td>
</tr>
</tbody>
</table>

while the method of inserting or removing the variables in the gradual differential analysis is controlled by the smallest F ratio. In this analysis, the minimum value of F for each variable must be at least 3.84. The required upper limit of the partial F value is 2.71 to bring out any variable of the analysis. Table 3 reveals that X2, age, is the first variable included in the analysis due to its largest value of F (120.246). The second variable with the largest value of F in this analysis is the X3, Jaundice with 119.786. The third variable, X4 fever has F value of 84.569.

The result obtained as presented according to Table 4 indicates that Lambda’s value (0.552) is required first before the introduction of the first variable X2, age in the analysis. The value of Lambda is 0.380 when the second variable X3, Jaundice was introduced in the analysis. Then, the value of Lambda reduced to 0.365 later in the analysis. This shows that the value of Lambda decreases as effective variable is added to the analysis. The greater the difference between the two groups, the lower the value of the Lambda. The tabular value of F is lesser than the value of F at each step. This indicates that the level of the statistical significance at each step is zero. Table 5 shows the inherent root value of the discriminant function to be 1.738. This is an indication of high ability of the discriminant function to differentiate between the two groups. The canonical correlation is valued as 0.797 showing the linear discrimination quality.

The value of the square test X2 is 147.544 as shown in Table 6 and 7 which is larger than the tabulated value.
Table 8: Result classification

<table>
<thead>
<tr>
<th>Variables</th>
<th>Diagnosis</th>
<th>Hemolytic anemia</th>
<th>Foley anemia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>Count</td>
<td>83</td>
<td>5</td>
<td>88</td>
</tr>
<tr>
<td>Hemolytic anemia</td>
<td>94.3</td>
<td>5.7</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Foley anemia</td>
<td>3.2</td>
<td>96.8</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

69.3% of original grouped cases correctly classified

Due to the three variables, age, jaundice and fever it is possible to conclude that there are statistically significant differences between the two groups. The value indicates that the moral level of significance is equal to zero. Therefore, the linear discriminatory function is mathematically depicted as follows:

\[ Y = 0.925-0.348X_1+0.512X_2+1.800X_3 \]

Table 8 above presents the accurate final results of the classification. There are 83 cases of children with hemolytic anemia in the first group with 94.3% correct classification while wrong classification was done to 5 cases with 5.7% for the first group. There are 60 cases of children with follicular anemia in the second group with 96.8% correct classification while wrong classification was done to 2 cases with 3.2% for the first group. It shows that 95.3% have been correctly categorized.

CONCLUSION

From the seven variables, only three have the greatest effect on the diagnosis of hemolytic anemia and folic anemia in children. They are: jaundice, fever and age in order of importance. Due to the three variables (jaundice, fever and age), there are significant differences between the group of children with follicular anemia and the group of children with hemolytic anemia. The discriminatory function from these variable relationships is suitable to make distinction between the groups.

For the group of children with follicular anemia, the correct classification is 96.8% while the rate of correct classification for the group of children with acute hemolytic anemia is 94.3%. The total rate of correct classification for the entire selected sample is 95.3%.

RECOMMENDATIONS

The discriminant function is recommended to be used to assist the medical authorities dealing with children diagnosed with hemolytic anemia and folic anemia. The method of discriminatory analysis and its reliability in making distinction between all types of anemia in children is generally recommended.

REFERENCES

Al-Hamani, B.R., 2014. Distinguishing the medical staff according to their knowledge of the International Classification (ICD-10) using the distinctive function. MBA Thesis, University of Baghdad, Baghdad, Iraq.