RESEARCH ARTICLE

THE IMPACT OF AGE ON SOME PHYSIOLOGICAL, HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF NEONATAL NATIVES CALVES IN QENA, EGYPT.

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Abstract

The study was carried out on twenty calves suspected while All animals were belonged to the villages scattered in the Qena Governorate Egypt. Blood samples were taken from the external jugular vein, and then centrifuged and stored until analyses. Blood was taken aseptically from all the animals and transported to laboratory for hematological and biochemical analysis. The hematological parameters (Hemoglobin, total erythrocyte count, total leukocyte count, packed cell volume) and biochemical parameters (Total protein, creatinine, calcium, phosphorus, iron, copper, sodium, chloride, AST, ALT) values were statistically analyzed, mean and standard deviations were calculated and set as reference values. The results showed a significant effect of days of life (P<0.05) only on total Rbc, Wbc, Hb. Total protein, Calcium, Phosphorus, Chloride, Copper and GOT during the first week of life and a significant effect of days of life. In conclusion, modifications of studied parameters could be attributed to functional development of calves in neonatal period and contribute to the knowledge of adaptation processes in calf during the first week and the first month of life resulting useful for the diagnosis and treatment of any neonatal diseases. The aim of this work was to follow the changes, during the early growth of calves, of a wide range of blood variables commonly used by veterinarians to aid the diagnosis of disease.

Introduction:

Physiological, hematological and biochemical variables are most widely used medical decision making tool. Hematological and biochemical analyses of blood are very useful to get an insight in health status of animal. The neonatal period represents a critical time during which all organ functions must adapt to the extra-uterine life; it is a transition phase from the sheltered intra-uterine to the exposed extra-uterine environment (Piccione et al., 2008).

Material and Methods:

This study was carried out in Qena governorate, Egypt, on twenty clinically healthy and full-term-born native calves (eight males: mean body weight 26.23±2.29kg; twelve females: mean body weight25.21±2.1 kg) which were monitored for 30 days. Calves were kept with their mothers and were fed only with maternal milk. For each calf, physiological parameters were measured and blood samples were collected at the same hour (10am). The studied parameters were assessed on all animals in the following experimental conditions: from the day after the birth, daily
for one week and every seven days for 30 days. Rectal temperature was recorded using a digital thermometer and respiratory rate was visually recorded using a stopwatch over a 5 min period.

From all animals, blood samples were collected from the external jugular vein into 10 mL in Vacutainer tubes with no addition of anticoagulants after collection all blood samples were centrifuged at 3000 rpm for 10 minutes; serum were separated and stored at -20°C until analyses. Serum were analyzed with commercially available kits by means of a UV spectrophotometer. Serum concentrations of the following blood parameters were measured: total protein, calcium, iron, phosphorus, chloride, and sodium for each parameter. All results were expressed as mean±standard error of the means (SEM). On all data, normally distributed (P<0.05, one way analysis of variance (ANOVA) was used to evaluate the effect of days of life during the first, second, third, and fourth week of life. If ANOVA showed an acceptable level of significance (P<0.05).

**Results:**
The obtained results represented in tables 1, 2, 3, 4.

**Table 1:** Average values (± standard errors) of physiological parameters, with the statistical significances observed in twenty calves during the first month of life.

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 7</th>
<th>Day 14</th>
<th>Day 22</th>
<th>Day 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>39.1±2.2</td>
<td>39.3±1.9</td>
<td>39.2±0.5</td>
<td>39.1±3.1</td>
<td>39.3±3.1</td>
</tr>
<tr>
<td>Breath/minute</td>
<td>56.2±2.1</td>
<td>57.1±2.3</td>
<td>57.1±2.1</td>
<td>56.3±2.2</td>
<td>57.2±2.2</td>
</tr>
<tr>
<td>Heart beat/minute</td>
<td>156.1±1.3</td>
<td>156.2±2.4</td>
<td>157.3±2.1</td>
<td>157.5±2.3</td>
<td>157.3±2.3</td>
</tr>
</tbody>
</table>

**Table 2:** Average values (± standard errors) of hematological parameters, with the statistical significances observed in twenty calves during the first month of life.

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
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<th>Day 14</th>
<th>Day 22</th>
<th>Day 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs 10^12/L)</td>
<td>7.75±1.42</td>
<td>7.7±1.8</td>
<td>8.2±1.2</td>
<td>8.1±0.5</td>
<td>8.1±0.5</td>
</tr>
<tr>
<td>WBCs 10^9/L)</td>
<td>9.1±2.7</td>
<td>9.6±2.7</td>
<td>9.3±2.7</td>
<td>10.1±2.7</td>
<td>10.1±2.7</td>
</tr>
<tr>
<td>Hb (g/L)</td>
<td>104.1±13.7</td>
<td>107.1±10.2</td>
<td>107.1±11.3</td>
<td>110.1±16.5</td>
<td>110.1±15.7</td>
</tr>
<tr>
<td>PCV (L/L)</td>
<td>0.32±0.07</td>
<td>0.33±0.05</td>
<td>0.31±0.07</td>
<td>0.34±0.02</td>
<td>0.34±0.06</td>
</tr>
</tbody>
</table>

*significant at (P<0.05)

**Table 3:** Average values (± standard errors) of blood parameters studied, expressed with the statistical significances observed in twenty calves during the first month of life.

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 7</th>
<th>Day 14</th>
<th>Day 22</th>
<th>Day 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein (g/dL)</td>
<td>5.75±0.88</td>
<td>5.94±1.1</td>
<td>5.82±1.6</td>
<td>5.65±0.95</td>
<td>6.92±0.9*</td>
</tr>
<tr>
<td>Glucose (mmol/L)</td>
<td>4.7±0.8</td>
<td>4.8±0.6</td>
<td>5.5±0.1</td>
<td>4.6±0.1</td>
<td>4.4±0.2</td>
</tr>
<tr>
<td>Urea (mg/dL)</td>
<td>54.25±5.2</td>
<td>55.25±6.7</td>
<td>55.25±5.3</td>
<td>54.25±4.6</td>
<td>55.25±6.1</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>1.5±0.5</td>
<td>1.3±0.2</td>
<td>1.8±0.2</td>
<td>1.22±0.1</td>
<td>1.6±0.2</td>
</tr>
<tr>
<td>GPT/ALT (u/l)</td>
<td>6.75±1.1</td>
<td>6.65±0.3</td>
<td>6.55±1.2</td>
<td>6.8±0.6</td>
<td>6.66±02</td>
</tr>
<tr>
<td>GOT/AST (u/l)</td>
<td>46.5±2.4</td>
<td>46.2±3.3</td>
<td>48.3±2.6</td>
<td>46.3±1.9</td>
<td>48.2±2.3*</td>
</tr>
</tbody>
</table>

*significant at (P<0.05)

GPT: glutamate pyruvate transaminases.
GOT: glutamate oxalacetate transaminases.
Table 4: Average values (± standard errors) of electrolytes, expressed in their conventional units of measurement, in twenty calves during the first month of life

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 7</th>
<th>Day 14</th>
<th>Day 22</th>
<th>Day 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium mg/dl</td>
<td>7.34 ±0.5</td>
<td>7.35 ±4.2</td>
<td>8.2 ±3.1</td>
<td>8.1 ±3.2</td>
<td>8.5 ±2.1*</td>
</tr>
<tr>
<td>Phosphorus (mmol/L)</td>
<td>2.1 ±0.2</td>
<td>2.3 ±0.2</td>
<td>3.1 ±0.1</td>
<td>2.5 ±0.2</td>
<td>2.6 ±0.3*</td>
</tr>
<tr>
<td>Chloride (mmol/L)</td>
<td>93.5±2.6</td>
<td>93.1±2.5</td>
<td>94.1±3.1</td>
<td>94.1±2.1</td>
<td>95.2±2.5*</td>
</tr>
<tr>
<td>Sodium (mmol/L)</td>
<td>132.5±2.2</td>
<td>133.1±2.1</td>
<td>134.6±3.1</td>
<td>133.1±4.1</td>
<td>133.6±3.4</td>
</tr>
<tr>
<td>Iron (µmol/L)</td>
<td>25.2±1.6</td>
<td>25.1±1.6</td>
<td>26±2.1</td>
<td>25.4±3.2</td>
<td>26.1±3.1</td>
</tr>
<tr>
<td>Copper mg/dl</td>
<td>133.1 ±3.6</td>
<td>134.2 ±2.3</td>
<td>133.5 ±3.1</td>
<td>134.6 ±3.5</td>
<td>135.3 ±6.1*</td>
</tr>
</tbody>
</table>

*significant at (P<0.05)

Physiological parameters:
Temperature, heart rate and breath/minute represented at table 1, the values were not increase with days.

Hematological parameters:
Data in table 2, indicated that the values of Rbcs, Wbcs, Hb. And Pcv were increased by the day of life of calves.

Blood biochemical parameters:
Total protein: Results in table 3 indicated that, the concentrations of plasma total protein were increase from one day (5.75±0.88) to (6.92±0.9g/dl) at 30 days.

Plasma glucose: Data in table 3 indicated that, the concentrations of plasma glucose were decreased with time from one day (4.78±5.2) to (4.4±.2mg/dl) at 30 days.

Urea: Values in table 3 showed that, the concentration of urea values increased by the day of life of calves.

Creatinine: Data in table 3 indicated that, the concentrations of plasma creatinine were increased in dam from zero time (1.5±0.5) to (1.6±0.2 mg/dl) at 30 days.

GPT: glutamate pyruvate transaminases: showing that in table 3 there are no variations of the values from one day to 30 day.

GOT: glutamate oxalacetate transaminases: data indicated that there are an increase of the values from one day (46.5±2.4 to 48.2±2.3(u/l)) at 30 days in table 3.

2-blood electrolytes
Calcium level: Results in table 4 indicated that there was an increase in calcium level in calves at one day (7.34±0.5) than at 30 day (8.5±2.1mg/dl).

Phosphorus level: results in table 4 indicated that, the concentrations of plasma phosphorus were variations in the value of calves from one day 2.1 ±0.2 to 2.6 ±0.3 mmol/L at 30 day.

Sodium level: Data in table 4 indicated that, the concentrations of plasma sodium were increased in calves from one day (132.5±2.2) to (133.6±3.4)(mmol/L).

Chloride level: Results in table 4 indicated that, data indicated that there are an increase of the values from one day (93.5±2.6) to (94.1±2.1)(mmol/L) at 30 days.

Iron values table 4 Results indicated that, the concentrations of plasma iron were slow increased in calves from one day (25.2±1.6) to (26.1±3.1) (mmol/L) at 30 day.

Copper values table 4 Results indicated that, the concentrations of plasma copper were increases in the value of calves from one day (133.1 ±3.6) to (135.3 ±6.1 mg/dl) at 30 day.

Discussion:
The obtained data did not show a significant effect of days of life on the studied physiological parameters (rectal temperature, heart rate, and respiratory rate) during the first month of life. Rectal temperature was between 39.1°C and 39.3°C for the first days of life, with no significant differences recorded (Piccione et al., 2007b). Also in the present study for respiratory rate during the first month of life there are no significant effect of days of life on the respiratory rate. Also there is no significant effect of days of life on the heart rate. Regarding to the age influence, the results indicate the influence of the age of cattle on the red blood cells, white blood cells, hemoglobin, and packed cell volumes which are significantly more in young cattle than in adult, (Moosavianet al., 2010), (Mohriet al., 2010), (Nezar et al.2013), (Mohriet al. 2006), (Brun–Hansen et al. 2006) and (Hege C. et al. 2006).
Immediately after parturition the values of (PCV), haemoglobin (Hb) and number of red blood cells are higher in newly calves (Harvey 1997), while (Mohri et al. 2007) observed a decrease of PCV and Hb from birth to the age. The obtained results showed a significant effect of days of life on total proteins, these agree with (Muri et al., 2005), (Egli and Blum 1998), (Peterson et al., 1981). Total protein data increased with the increasing the age of calves and significant at(P<0.05) (Egli and Blum 1998), (Knowles et al.2000), (Neama .A. Ashmawy2015), (CsillaTóthová et al.2016).

Plasma glucose increase with the increasing day of life, these agree with (Knowles et al.2000) and ECLI and BLUM 1998).

The concentration of urea in blood depends from nutrition, diagnostically is important also at diseases of kidneys (Kraft &Dürr, 1999b; Jazbec, 1990). Increased concentration of urea incalves’ serum indicates increased catabolism of proteins and appears at long lasting diarrheas (Jazbec, 1990). Hanschke and Schulz (1982), (Maria et al, 2011, Campanile et al. 1997 and, Grasso et al, 2007), the obtained results are not increase with the age of calves, this are not agree with the results obtained by Hanschke and Schulz (1982), (Hugi et al. 1997), (Knowles et al. 2000).

GOT is present in different tissues and is a sensitive indicator of soft tissue damage. In heart and skeleton musculature as in liver there is high activity of GOT,(Kurz& Willet, 1991), Hammon and Blum (1998) glutamate oxalacetate transaminases have an increase change with day of life, this agree with (Egli & Blum, 1998). Mohri et al. (2007). while the (GPT) glutamate pyruvate transaminases; have no change with day of life.

Age-related changes have been detected for Calcium, and Phosphorus. Egli and Blum (1998). The obtained data showing an increase in the values of calcium (Bostedt and Schramel, 1982), While Egly and Blum 1998) Sayed that it is decreased with the age.,

The values Sodium and chloride in the present study are increase with age, this agree with (Dubreuil and Lapierre1997). (Reece, 1984),(Maach et al., 1991). (Jozcia and Martin 2006) they reported the increase of sodium and chloride levels with age. Other researchers said that the values of Cl, Na and K were within the published reference values for adult cattle. (Dubreuil and Lapierre1997). and copper with the days of life of the calves significant at(P<0.05) while the values, this agree with (Birgit Puschner et al. 2004). For diagnostic purposes, liver copper concentrations of newborn calves are often used to determine the copper status of dams (Gooneratne and Christensen1989).

The values of phosphorus are increase with the age of calves, this agree with (Underwood &Suttle, 2001), (Kraft 1999b) (Rosol and Capen, 1997), (Steinhardt and Thielscher, 2000), (Mohri et al. 2007),

The iron is very important for synthesis of haemoglobin. The level of iron have slow increase with the increasing day of life of calves, this agree with the result achieved by (Egli and Blum 1998), (Knowles et al.2000).

Creatinine is excreted with urine. It is important for the assessment of functioning of the glomerular system in the kidneys, but it concentration increase only at serious damage (Kraft & Dürr, 1999b). the values of creatinine obtained are not increase with the age of calves, and this are not agree with the results reported by (Maach et al. (1991), (Klee, 1985), they observed increase of creatinine concentration to the age of calves.

Conclusion:-

The age of calves influence the hematological and biochemical variables what should be considered by interpretation of laboratory results.

The results of various studies on age dependent dynamics of hematological and biochemical variables in calves are different. The differences are influenced by the fact that blood samples were taken in different age periods, breeds, rearing systems, geographic regions, and were analyzed with different methods.

For proper interpretation of laboratory results it is the best to use the reference values from the laboratory which performed the analyses of blood.

The results of the present study showed that for some physiological, hematological and biochemical parameters. The results from this study provide data on 20 calves followed over time and may serve as preliminary reference
intervals. However, because of differences between herds in relation to geographical regions, management and feeding strategies of dairy cows and calves cautions must be in mind to use appropriate reference range.

References:


