

Platelet Indices in Male and Female German Shepherd Dogs in the Sudan

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Abstract: The objectives of this study are to find reference values for German shepherd dog reared in Sudan, evaluate the effects of sex on platelet parameters, correlations between platelets indices. Thirty three healthy dogs aged between 2 to 4 years of the breed German shepherd in the Sudan were categorized into two sex groups (14males, 19 females) were used in this study. Five ml Blood samples were taken from cephalic vein and analysis was performed using the Sysmex KX2 hematology analyzer. The following parameters were evaluated: platelet count (PLT), mean platelet volume (MPV), platelet crit (PCT), and platelet distribution width (PDW), along with parallel red blood cell parameters. The overall mean values of platelet parameter were: PLT 183.52 ± 59.97 ($\times 10^9/L$), MPV 9.19 ± 0.96 fl, PCT $0.13 \pm 0.09\%$ and PDW $15.61 \pm 0.90\%$. Significant sex differences were observed for platelet count and red cell distribution width ($P \leq 0.05$) between male and female. Significant ($P \leq 0.01$) correlation was found between PLT and PCT in female and the over all, No significant correlations between PLT and MPV, PDW in the two sexes, moreover, significant correlations ($P \leq 0.01$) were observed between PDW and RBC, MCV, and RDW in the over all. However, no significant correlations were detected between RBC and PLT, PCT, and PCV in all dogs. Effect of sex should be considered in clinical interpretation of dog platelet variables. Determined reference values may be useful information for an increasing clinical use

Keywords: Platelet variables –Sex- Platelet count- German Shepherd dogs

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I. Introduction

Platelets are a part of the blood that helps the blood clot Guyton and Hall(2006).Platelets volume (MPV) and platelets crit (PCT) are indices used in evaluating immune mediated thrombocytopenia (IMT) in dogs and humans with congenital macrothrombocytopenia (David *et al*,2008). The higher MPV is a larger platelets size and the platelets distribution width (PDW) reflects the variability in the platelets size , (Amin, *et al* (2004). PLT and PCT values may be used as valuable parameters for diagnosis and probably for monitorization and prognosis in infected dogs with Ehrlichiosis and/or Anaplasmosis.(Funda and Kerem,2014). Previous data proved that platelet count may be a reliable screening test for dog granulocytic ehrlichiosis (Bexfield,*et al*2005, Mazepa,*et al* 2010), and dog monocytic ehrlichiosis (Bulla,*et al* ,2004). The effect of breed and age should be considered in clinical interpretation of dog platelet variables (Lysann and Reinhard , 2016).

The aims of this study are to assess the effects of sex on platelet and red blood cells indices, correlations between platelets indices as well as to find reference values for German shepherd dog in Sudan.

II. Materials and methods

Study design and Animals: The present study was enrolled among 33 dogs (14male/19 female; aged from 2 to 4 years) belonging to the Police Directorate for Dogs at Khartoum State during the year 2014. The dogs belong to German Shepherd breeds. They were apparently healthy on clinical examination. All the females were non pregnant and non lactating. The dogs were housed in kennels individually and were fed chicken soup with noodles,(imported dog food not available at that time, the Besterly Senior-the Netherland).

Informed written consent was obtained from the director of the police directorate for dogs prior to enrolment of the dogs participated in study.

Haematological examinations. five ml blood samples were withdrawn from cephalic vein into anti coagulated (EDTA- k3) tubes. Complete blood counts were performed on referral within - each tube was gently inverted 3-

4 times to insure mixing of sample and immediately transported to the laboratory using an automated hematology analyzer Sysmex KX2 IN. The samples were analyzed for PLT, PCT, MPV and PDW, as well as RBC, packed cell volume (PCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), hemoglobin concentration (Hb) and red cell distribution width (RDW). Hematology analyzer with special reference to thrombocyte indices, mean platelet volume (MPV), and plateletcrit (PCT).

Statistic analysis:

The data were presented as means ± standard deviation. The differences for mean values among groups were detected by student's t test as described by Gomez and Gomez, (1984). Overall means and range were calculated. The nonparametric test was used to determine the normality and Spearman correlations were used to determine correlations among platelets indices and between the platelets and parallel red cell parameters.

III. Results

Hematological analysis. Table (1) shows hematological variables obtained (means, standard deviation and the total ranges for platelets and RBC parameters). Female showed significant ($p \leq 0.02$) differences in mean of platelets count and RDW than male, whereas, male showed higher values of red cell indices but not significant.

Table 1. Platelets indices and Red Cells parameters in male and female German Shepherd Dogs in Sudan

| Parameter | Male | Female | Overall |
|--------------------------|---------------------------|-----------------------------|---------------|
| Platelets indices | | | |
| PLT($\times 10^9/L$) | 170.50±43.78 ^b | 193.11± 56.81 ^{a*} | 183.52± 59.97 |
| PCT (%) | 0.11±0.031 | 0.14± 0.03 | 0.13± 0.038 |
| MPV(<i>fL</i>) | 9.51± 0.71 | 8.96± 1.06 | 9.19± 0.96 |
| PDW (%) | 15.49± 0.91 | 15.69± 0.91 | 15.61± 0.90 |
| Red cells indices | | | |
| RBC($\times 10^{12}$) | 6.60± 0.81 | 6.35± 0.74 | 6.46± 0.77 |
| PCV (%) | 46.57± 4.93 | 44.73± 5.16 | 45.5± 5.07 |
| MCV(<i>fL</i>) | 70.79± 2.49 | 70.56± 4.47 | 70.66± 3.71 |
| MCH(<i>pg</i>) | 27.65± 1.58 | 27.53± 2.15 | 27.58 ±1.89 |
| MCHC(%) | 39.15± 1.96 | 39.19± 2.19 | 39.17± 2.07 |
| Hb(<i>gm/dl</i>) | 18.25± 2.26 | 17.09± 3.71 | 17.58± 3.19 |
| RDW (%) | 14.14± 0.53 ^b | 14.68± 1.95 ^{a*} | 14.45± 1.51 |

* $P \leq 0.05$

Correlation analysis for relevant hematological variables: In the present study correlation among those three thrombocyte indices (PLT($\times 10^9/L$), PCT(%), MPV(*fL*) and PDW(%) were investigated for all groups. Significant correlation ($P \leq 0.01$) was found between PLT and PCT in females and the overall dogs, while male represented low significant ($P \leq 0.05$) correlation. No significant correlation between PLT and MPV, PDW in all dogs. The correlation between platelet parameters and parallel red blood cell (RBC) parameters packed cell volume (PCV), mean corpuscular volume (MCV) and red cell distribution width (RDW), showed. No significant correlation was found between RBC and PLT, PCT, and PCV in all dogs, (Table 3). However a highly significant correlation ($P \leq 0.01$) was found between PDW and RBC, MCV, and RDW in all dogs. Low significant correlations ($p \leq 0.05$) was found between MPV and RDW in the overall dogs and female. PDW was highly correlated ($P \leq 0.01$) with MCV and RDW in female. Low significant correlation ($P \leq 0.05$) between PDW and MCV was found in male, further more female was showed a highly significant correlation ($P \leq 0.01$) between PDW, MCV, and RDW. Low significant correlation ($P \leq 0.05$) between PLT and MCV in male. The female performed low significant correlation between PWD and RBC.

Table 2: Correlation among Platelets Indices in German Shepherd Dogs in Sudan

| Parameter | PLT($\times 10^9/L$) | PCT (%) | MPV(<i>fL</i>) | PDW (%) |
|------------------------|------------------------|---------------------|------------------|---------|
| Over all | | | | |
| PLT($\times 10^9/L$) | 1 | 0.880 ^{**} | 0.046 | -0.336 |
| PCT (%) | 0.880 ^{**} | 1 | 0.098 | -0.087 |
| MPV(<i>fL</i>) | 0.046 | 0.098 | 1 | 0.190 |
| PDW (%) | -0.336 | -0.087 | 0.19 | 1 |
| Males | | | | |
| PLT($\times 10^9/L$) | 1 | 0.634 [*] | 0.454 | -0.465 |
| PCT (%) | 0.634 [*] | 1 | 0.217 | 0.283 |
| MPV(<i>fL</i>) | 0.454 | 0.217 | 1 | -0.024 |
| PDW (%) | -0.465 | 0.283 | -0.024 | 1 |
| Females | | | | |
| PLT($\times 10^9/L$) | 1 | 0.960 ^{**} | 0.001 | -0.332 |

| | | | | |
|---------|---------|--------|-------|--------|
| PCT (%) | 0.960** | 1 | 0.152 | -0.320 |
| MPV(fL) | 0.001 | 0.152 | 1 | 0.364 |
| PDW (%) | -0.332 | -0.320 | 0.364 | 1 |

*P≤0.05 ** P≤0.01 - reverse correlate

Table (3) Correlation between Platelet indices and Parallel Red Blood Cell Parameters in German Shepherd Dogs in Sudan

| Parameter | PLT(×10 ⁹ /L) | PCT (%) | MPV(fL) | PDW% |
|---------------------------|--------------------------|---------|---------|----------|
| Over all | | | | |
| RBC(×10 ¹² /L) | 0.170 | 0.071 | 0.053 | -0.473** |
| PCV (%) | 0.042 | -0.035 | 0.163 | -0.217 |
| MCV(fL) | -0.307 | -0.245 | 0.254 | 0.627** |
| RDW (%) | 0.012 | -0.61 | -0.434* | -0.544** |
| Male | | | | |
| RBC(×10 ¹² /L) | 0.263 | 0.023 | 0.048 | -0.403 |
| PCV (%) | 0.114 | -0.062 | 0.070 | -0.271 |
| MCV(fL) | -0.553* | -0.262 | 0.038 | 0.564* |
| RDW (%) | -0.124 | -0.425 | 0.060 | -0.476 |
| Female | | | | |
| RBC(×10 ¹² /L) | 0.191 | 0.160 | -0.013 | -0.512* |
| PCV (%) | 0.070 | 0.035 | 0.141 | -0.153 |
| MCV(fL) | -0.241 | -0.241 | 0.315 | 0.694** |
| RDW (%) | -0.023 | -0.070 | -0.490* | -0.694** |

*P≤0.05

** P≤0.01

- reverse correlate

IV. Discussion

There is a scarcity in publication regarding the correlation between platelet indices and their parallel red cell indices in Shepherd dogs in Sudan. In the current study a higher platelet counts and slight rise in PCT were found in the German Shepherd female’s dog in Sudan than the male, this significant difference between male and female for the previous parameters is on line with what reported in Humans by Giacomoini *et al*,(2001), Lawrir *et al*,(2009). The difference between the sex may be attributed to hormonal profile (Bain 1985).

The present study revealed a high significant correlation between PLT count and PCT in the overall dogs and female and low significant correlation between the previous parameters in male. Hussein *et al* (2010) found similar result in camels except of that male showed highly significant correlation between the two parameters. On the other hand there was no significant correlation between PLT and MPV this was agreed with Hussein *et al*(2010) in camels.No significant difference between male and female in PDW and MPV, this was on line with Awad Elkareem *et al*(2015),Botma *et al*(2012),Punnet *etal*(2014) in Humans, and contrasted with the findings of Hussein *et al* (2010) in camels.In the current study there was no significant correlation between PCT and MCV or between MPV and MCV ,this be through with the findings of Wiwanitkit(2004) in Humans as well as Hussein *et al* (2010) in camels confirming the view that the sizes of RBC and blood platelets are independent of each other (Wiwanitikit 2004).However, in concur with these authors, a highly significant inverse correlation was found between PDW and RDW in all dogs. More over a highly reverse correlation was found between PDW and RBC in the over all, while a highly proportional correlation was found between PDW and MCV ,this contrast with the findings of Hussein *et al* (2010) in camels.

The red blood cell parameters within the normal range for dogs and various species of farm animals(Feldman *et al*2000), as well as no significant differences were found between male and female for red blood cells count PCV,MCV,MCH,MCHC and hemoglobin concentration, this findings were agreed with the findings of Gracnier *et al* (2007) , Rovira (2007),Shiela *et al*(2007) and Lund *et al*(2000) in dogs. On the contrary Aroch *et al*(2005) obtained higher RBC count,Hb,PCV,MCHC values in free ranging males golden jackals than the females. That likely as the result of climate variation, species, animal habitat, method of sampling and the device used in the examination of the samples.

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