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# BLOOD PRESSURE, PULSE AND HEART RATE IN HEALTHY EGYPTIAN THOROUGHBREDS ARABIC AND MIXEDBREDS HORSES USING ELECTRONIC MODIFIED OSCILLOMETRIC TECHNIQUE

(With 5 Tables & One Fig.)

By

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(Received at 21/9/1993)

## ضغط الدم والنض ومعدل ضربات القلب في الخيول السليمة ذات الأصل المصري العربي الأصل والمصري الخليط باستخدام تكتيك الاوسيلومتري الكهربى المتطور

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قيس ضغط الدم في ٤٤ من الخيول (٣٠ خيل ذات أصل مصري عربي أصل، ٢٤ خيل ذات أصل مصري خليط) وذلك باستخدام تكتيك الاوسيلومتري الكهربى.

ظهر وجود تأثير معنوى للعمر والحمل على ضغط الدم بنوعية الانقباضى والانبساطى على الخيول محل الدراسة.

ظهرت اختلافات معنويه فى ضغط الدم الانبساطى تحت تأثير السلالة والجنس ولم تكن هناك علاقه بين معدلات النض وضربات القلب وبين ضغط الدم. تتضح أهمية قياس ضغط الدم بصورة جلية عندما تقترن بالاعراض الاكلينيكية المصاحبه.

## SUMMARY

Blood pressure (BP) was measured in 54 horses (30 Egyptian Arabic thoroughbreds and 24 Egyptian mixedbreds horses using electronic oscillometric technique. Age and pregnancy showed significant ( $P < 0.05$ ) differences in systolic and diastolic pressure. Variations in classes and sex showed significant ( $P < 0.05$ ) difference in diastolic pressure. There was no correlation between pulse, heart rates and blood pressure. The value of measuring BP is practical, when it is combined with the clinical signs.

## INTRODUCTION

Changes in blood pressure (BP) provides valuable indices for the efficiency of circulation. NELSON (1979) reported that if normal systolic pressure in horse is about 100 mmHg, a pressure below 80 mmHg indicates a critical situation. In addition, the fall in BP reflects a valuable monitor for the severity and progression of circulatory insufficiency (WELD, 1984). The clinical diagnostic value of indirect BP determination has yet to be determined. Hypertension has been found in association with epistaxis, laminitis in horses and with painful fracture of the distal bones of the limb (Blood and RODESTITIS, 1989). The authors added that it is also of value in the assessment of the degree of shock and possibly may be of value in the differential diagnosis of conditions such as colitis -X and acute salmonellosis and in assessing the prognosis of colics in horse.

Measuring BP in horses can be done directly through cordiac catheterization or puncture of bronchial or carotid artery, but it is impractical in clinical case. Indirectly measuring of BP using auscultatory or palpatory methods (Gedds, 1970) can determine only systolic pressure. Recently other techniques as Doppler ultrasonic probos (JONSON, et al, 1976) can detect blood flow and arterial wall motion, and an electronically modified oscillometric all have been verified by comparison with directly measured arterial pressure. Such techniques have been proved to be reasonably accurate methods for BP measurements in the horse (Parry et al. 1983) The new electronic oscillometric technique measures systolic and diastolic pressure by electronic observation of pressure fluctuation in the occlusive bladder.



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The present study was designed to give an account on the blood pressure, pulse and heart rate. in horses and the possibility of using the electronic oscillometric technique for this purpose.

### MATERIAL and METHODS

#### Animals:

Fifty four horses of different ages, sexes and classes were examined for soundness to be ensure that they are clinically healthy. Out of the total number, thirty Egyptian thoroughbreds Arabic horses were from El-Zahraa Station of Arabic horses. The other twenty four mixedbreds horses were obtained from Brock's Hospital in Cairo, stable of Police office in Assiut and veterinary clinic, faculty of veterinary medicine, Assiut university.

#### Technique:

The horses blood pressure (BP) was measured in the horses from the base of the tail in the standing posture, where both the head and the tail of the animal were in their normal position. Blood pressure was determined in relaxed restrained animal by electronically modified oscillometric technique using digital blood pressure monitor (MOD. DS-15-Japan). Pulse and heart rates of the examined horses were also recorded.

To measure BP, a pneumatic rubber bladder is centered squarely over the middle coccygeal artery, at the base of the tail and secured snugly in place by its outer inelastic self-adhesive clothed sleeve. The bladder is connected to an inflation / deflation device and electronic blood pressure and pulse fluctuation detector. Two successive readings were taken to ensure that the values recorded are representative of the horse's cardiovascular status at that time. Repeating of measuring the blood pressure was done after a pause of about 30 minute if there marked variations (more than 6 mmHg) in both SP and DP between two successive readings. Measuring of BP was done with less noises and minimal environmental disturbances.

### RESULTS

The effect of class, sex age and pregnancy on the blood pressure, the pulse and heart rates are shown in Tables 1,2,3 & 4. The results are summarised in Table 5 and Fig. 1. A significant ( $P<0.05$ ) variation in systolic and diastolic pressure was observed between young and adult horses and between pregnant and non pregnant mares. Difference in class and sex showed significant ( $P<0.05$ ) variation in diastolic pressure. A slightly lowered pulse and heart rates were



observed in thoroughbreds males, adult hores and non-pregnant mares than mixedbreds, females, young and pregnant mares respectively. The pulse and the heart rates showed no effect on blood pressure.

### DISCUSSION

A resting BP values (all values are reported as systolic and diastolic pressure  $\pm$  SD) for healthy Egyptian thoroughbreds arabic horses and Egyptian mixedbreds ones were  $97.6 \pm 17.8 / 85.4 \pm 13.2$  mmHg and  $107.8 \pm 30.1 / 72.0 \pm 25.1$  mmHg CUCV respectively. Diastolic pressure showed significant ( $P < 0.01$ ) difference between the two classes, but no significant ( $P > 0.05$ ) difference was noted in systolic pressure. Normal resting BP of 456 thoroughbreds in united states were reported as  $111.8 \pm 13.3 / 69.7 \pm 13.8$  mmHg CUCV, while study of 97 thoroughbreds in A-ustralia quated resting BP of  $117.8 \pm 17.1 / 84.4 \pm 13.4$  mmHg CUCV (PARRY *et al.*, 1983). The Austral-ian thoroughbreds study demonstrated a significant effect of class on BP.

Blood pressure of clinically healthy horses in the present investigation showed the presence of significant ( $P < 0.01$ ) effect of sex on the diastolic pressure, and significant ( $P < 0.01$ ) increase in the BP values were found in young horses and pregnant mares. Parry *et al.* (1983) recorded that in the Australian thoroughbreds study no significant ( $P > 0.05$ ) effects of age or sex were exerted on the BP. The higher values of BP in young and pregnant horses may be due to increased physiological demands and increased sensitivity to environmental stimuli in young, pregnant mares than adult non-pregnant ones. This view could be supported by PARRY *et al.* (1983), who suggested that physiologic changes in the BP of about 15 mmHg are possible between observations due to environmental stimuli and physiological demands.

Although pulse and heart rates were higher in mixedbreds, female young and pregnant mares than thoroughbreds, male, adult and non pregnant ones, they elicited no effect on blood pressure. This can be explained by increased physiological demands required by higher activity in young age and in females during late pregnancy. This can be supported by SCHLANT and SONNENBLICK (1986), who observed that the increase in reflex in autonomic sympathetic exeitation to the heart and to the most of arteries and veins is one of the compensatory mechanism that anable the animal to restore its normal blood pressure for the increased demand. No signficant ( $P > 0.05$ ) effect of heart rate on BP was observed by PARRY *et al.* (1983) in Australian thoroughbreds horses.



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It can be concluded that the use of electronic modified oscillometric technique is of value in measuring blood pressure. Further studies on BP in different animal species in healthy and diseased conditions are needed to evaluate the practical importance of BP measuring.

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Table (1): Effect of class on blood pressure value\*, pulse and heart rate in healthy horses using electronic oscillometric technique

Animal No.	Thoroughbreds				Mixedbreds			
	SP mmHg	DP mmHg	P/ min	HR/ min	SP mmHg	DP mmHg	P/ min	HR/ min
1	129	95	44	38	121	102	49	40
2	75	65	40	36	143	115	39	38
3	99	83	44	36	152	111	42	40
4	85	70	42	36	165	140	37	36
5	79	62	47	44	145	114	45	43
6	81	68	44	40	145	100	50	48
7	147	67	41	40	153	130	40	38
8	105	65	40	36	165	139	40	36
9	83	53	46	38	103	69	45	42
10	106	88	43	40	82	71	35	32
11	82	71	38	36	80	71	46	44
12	85	52	38	36	91	75	42	40
13	83	48	38	38	86	75	38	40
14	88	71	44	40	88	73	46	38
15	118	94	43	40	76	66	35	32
16	100	75	46	44	83	56	50	46
17	91	64	45	40	90	77	38	36
18	106	66	52	48	84	54	42	36
19	88	73	42	40	85	64	32	36
20	116	93	40	38	83	63	31	32
21	98	84	33	32	90	81	58	48
22	108	88	34	36	91	69	38	38
23	80	70	39	36	88	58	40	36
24	110	63	36	36	88	73	42	40
25					98	71	42	40
26					110	96	45	42
27					140	110	45	44
28					145	105	42	40
29					80	63	47	46
30					83	71	44	38
X	97.58	85.4	41.6	38.5	107.77	72.0	42.17	39.5
SD	17.8	13.2	4.3	3.4	30.1	25.1	5.7	4.4

\* Value = Coccygeal uncorrected value (CUCV)

SP = Systolic pressure

DP = Diastolic pressure

P = Pulse

HR = Heart rate



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Table (2): Effect of sex on blood pressure value\*, pulse and heart rates in healthy horses using electronic oscillometric technique

Animal No.	Males				Females			
	SP mmHg	DP mmHg	P/ min	HR/ min	SP mmHg	DP mmHg	P/ min	HR/ min
1	147	67	41	36	129	95	44	38
2	105	65	40	36	75	65	40	36
3	106	88	43	36	99	83	44	36
4	82	71	38	38	85	70	42	36
5	85	52	38	36	79	62	47	44
6	91	64	45	40	81	68	44	40
7	121	102	49	40	83	53	46	38
8	153	130	40	38	83	48	38	38
9	165	139	40	36	88	71	44	40
10	82	71	35	52	118	94	43	40
11	80	71	46	36	100	75	46	44
12	90	81	58	48	103	69	45	42
13	91	75	42	36	143	115	39	38
14	86	75	38	40	152	111	42	40
15	83	56	50	46	165	140	37	36
16	84	54	42	36	145	114	45	43
17	85	64	32	36	145	100	50	48
18	83	63	31	32	88	73	42	40
19	88	58	40	36	98	71	42	40
20	88	73	46	38	110	96	45	42
21	76	66	35	32	140	110	45	44
22	91	69	38	38	145	105	42	40
23	88	58	40	36	80	63	47	46
24	106	66	52	42	83	71	44	42
25	88	73	42	40	116	93	40	38
26	-	-	-	-	98	84	33	32
27	-	-	-	-	108	88	34	36
28	-	-	-	-	80	70	39	36
29	-	-	-	-	110	63	36	36
X	97.7	74.4	41.6	38.4	107.9	83.4	42.2	39.6
SD	23.9	20.9	6.2	4.6	26.7	21.6	4.0	3.6

\* Value = Coccygeal uncorrected value (CUCV)

Table (3): Effect of age on blood pressure value\*, pulse and heart rate in healthy horses using electronic oscillometric technique

Animal No.	1 - 8 Years				9 - 18 Years			
	SP mmHg	DP mmHg	P/min	HR/min	SP mmHg	DP mmHg	P/min	HR/min
1	75	65	40	36	129	95	44	38
2	99	83	44	36	121	102	49	40
3	85	70	42	36	143	115	39	38
4	79	62	47	44	165	140	37	36
5	81	68	44	40	145	114	45	43
6	147	67	41	40	145	100	50	48
7	105	65	40	36	153	130	40	38
8	83	53	46	38	165	139	40	40
9	106	88	43	40	82	71	35	32
10	82	71	38	36	86	75	38	40
11	85	52	38	36	76	66	35	32
12	83	48	38	38	90	77	38	36
13	88	71	44	40	85	64	32	36
14	118	94	43	40	83	63	31	32
15	100	75	46	44	91	69	38	38
16	91	64	45	44	98	71	42	40
17	106	66	52	48	110	96	45	42
18	88	73	42	40	140	110	45	44
19	103	69	45	42	145	105	42	40
20	80	71	46	44	116	93	40	38
21	90	81	58	42				
22	91	75	42	40				
23	88	73	46	38				
24	83	56	50	46				
25	84	54	42	36				
26	88	58	40	36				
27	152	111	42	40				
28	88	73	42	40				
29	80	63	47	46				
30	83	71	44	38				
31	98	84	33	32				
32	108	88	34	36				
33	80	70	39	36				
34	110	63	36	36				
X	94.3	70.4	42.9	39.4	118.4	94.8	40.3	38.6
SD	17.6	12.8	4.9	3.7	30.3	24.8	5.1	4.1

\* Value = Coccylgeal uncorrected value (CUCV)



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Table (4): Effect of pregnancy on blood pressure value\*, pulse and heart rate in healthy horses using electronic oscillometric technique

Animal No.	Pregnant				non-pregnant			
	SP mmHg	DP mmHg	P/ min	HR/ min	SP mmHg	DP mmHg	P/ min	HR/ min
1	152	111	42	40	143	115	39	38
2	145	114	45	43	165	140	37	36
3	145	100	50	48	88	73	42	40
4	140	110	45	44	98	71	42	40
5	145	115	42	40	80	63	47	46
6	110	96	45	42	83	71	44	42
7					103	69	45	42
8					129	95	44	38
9					75	65	40	36
10					99	83	44	36
11					85	70	42	36
12					79	62	47	44
13					81	68	44	40
14					83	53	46	38
15					83	48	38	38
16					88	71	44	40
17					118	94	43	40
18					100	75	46	44
19					116	93	50	48
20					98	84	33	32
21					108	88	34	36
22					80	70	39	36
23					110	63	36	36
X	139.5	107.7	44.8	42.8	98.8	77.1	41.6	38.8
SD	14.9	7.8	2.9	3.0	25.5	22.9	4.0	3.3

\* Value = Coccygeal uncorrected value (CUCV)

Table 5: Mean value of blood pressure, pulse and heart rates in healthy horses.

	Class		Sex		Age		Pregnancy	
	Mixed-breds	Thorough-breds	Male	Female	Young	Adult	+ve	-ve
SP	107.8 ± 30.1	97.58 ± 17.8	97.76 ± 23.9	107.9 ± 26.7	94.32 ± 17.6	118.4** ± 0.3	139.5** ± 14.9	98.92 ± 25.5
DP	72.0 ± 5.1	85.4** ± 13.2	74.40 ± 20.9	83.45** ± 21.6	70.44 ± 12.8	94.75** ± 24.8	107.67** ± 7.8	77.12 ± 22.9
P	42.2 ± 5.7	41.6 ± 4.3	41.6 ± 6.2	42.2 ± 4.0	42.9* ± 4.9	40.3 ± 5.1	44.8* ± 2.9	41.6 ± 4.0
HR	39.5 ± 4.4	38.50 ± 3.4	38.4 ± 4.6	39.6 ± 3.6	39.4 ± 3.7	38.5 ± 4.1	42.8* ± 3.0	38.8 ± 3.3

\* Significant at  $p < 0.05$ \*\* Significant at  $p < 0.01$



Mean values of blood pressure in healthy horses using electronic oscillometric technique.

