Anatomical parameters of head and neck with referring to their conformation of local Arabian horses

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Abstract

The study was carried out on (180) local Arabian horses in Al-Diwaniyeh Province for three different breeds (Kehalan, Saklawi and Hamadani). They divided into six age groups which were (12-36, 36-60, 60-84, 84-120, 120-180 and 180-240 months), also their sexes divided equally and their colors (white, black, red and brown) were included in the study. Many different head and neck morphological measurements were recorded as follow: Head length (HeL), the line between the bases of ears (BR), the line between the medial canthi of the eyes (BE), the head side length (SL), the circumference of the attached part of the neck with the head (HNP), the circumference of the attached part of the neck with the body (NBP), and neck length (NL). Results indicated that in (12-36 months) group, the male and female Saklawi recorded significant decrements ($P<0.05$) with other breeds in the (HeL) measurement with 63.60 ± 1.661 and 64.20 ± 1.985 respectively, the (NL) measurement of male Saklawi was 43.80 ± 1.595 which registered a significant difference ($P<0.05$) with other breeds, as well the male of the same breed had significant decrement in both (HNP) and (SL) parameters with 70.20 ± 0.374 and 66.00 ± 1.140 respectively. The (36-60 months) group the (HeL), (BR), (NL) and (NBP) measurements of male and female Hamadani registered significant differences ($P<0.05$) with all other breeds, while the (HNP) parameters of male and female Kehalan recorded significant increment with other breeds. The (60-84 months) group the measurements of (BR) and (NBP) of male and female Hamadani were 19.80 ± 0.374, 20.40 ± 0.510 and 108.60 ± 1.913 and 108.80 ± 0.200 respectively and these results registered significant decrements with other breeds. The (84-120 months) group the male and female Hamadani recorded significant differences with all other breeds in (BR), (NL) and (NBP) parameters. The (120-180 and 180-240 months) groups the (NL) as well as (NBP) parameters of male and female Hamadani registered significant differences with all other breeds. The Arabian local horses in the present study characterized by long neck, broad forehead as well as long face.

Key words: head, neck, conformation, breeds, Arabian, horses.

المعايير التشريحية للراس والرقبة للخيول العربية المحلية مع اشارة الى تكوينها الخلقي

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الخلاصة

أجريت الدراسة على 180 حصان محلي ضمن حدود محافظة الديوانية ولثلاثة انسال مختلفة (الكحيلان و الصقلاوي والحمداني) وقسمت الى ستة مجاميع عمرية تراوحت اعمارها ما بين (12-36 و 36-60 و 60-84 و 84-120 و 120-180 و 180-240 شهراً) ، وكذلك تم تسجيل اجناسها (ذكور واناث) والوانها (اشهب وادهم وكميت واشقر). تم تسجيل العديد من قياسات الرأس والرقبة بوساطة شريط القياس المطاطي وهي كما يلي: طول الرأس و الخط الواصل بين الاذنين و والخط الواصل بين زاويتي العينين الانسيتين و طول الرأس الجانبي ومحيط اتصال الرقبة مع الرأس ومحيط اتصال الرقبة مع الجسم و طول الرقبة. أظهرت النتائج بان المجموعة العمرية (12-36 شهراً) ان الذكور والاناث التابعة لنسل الصقلاوي سجلت فرقاً معنوياً ($P<0.05$) عن بقية الانسال الاخرى بقياس (HeL) وكانت 63.60 ± 1.661 و 64.20 ± 1.985 وحسب الترتيب ، كما ان قياس (NL) لذكور نسل الصقلاوي كان 43.80 ± 1.595 وقد سجل فرقاً

معنوياً (P<0.05) عن الانسال الاخرى وكذلك فان ذكور نفس النسل السابق سجلت فرقاً معنوياً في كلا قياسي (HNP) و (SL) وكانت 70.20 ± 0.374 و 66.00 ± 1.140 وعلى الترتيب. اضهرت الفئة العمرية (36-60 شهراً) بان قياسات كلاً من (HeL) و (BR) و (NL) و (NBP) لذكور واناث نسل الحمداني سجلت فروقاً معنوية (P<0.05) مع بقية الانسال الاخرى ، بينما سجل قياس (HNP) لذكور واناث الكحيلان زيادة معنوية مع الانسال الاخرى. في الفئة العمرية (60-84شهراً) كان قياس (BR) و (NBP) لذكور واناث الحمداني 19.80 ± 0.374 ، 20.40 ± 0.510 و 108.60 ± 1.913 و 108.80 ± 0.200 وبدورها سجلت فروقاً معنوية مع بقية الانسال. في الفئة العمرية (84-120 شهراً) ان ذكور واناث نسل الحمداني سجت فروقاً معنوية (P<0.05) مع بقية الانسال في قياس (BR) و (NL) و (NBP). الفئة العمرية (120-180 و 180-240شهراً) كان فيها قياس (NL) وكذلك (NBP) لذكور واناث نسل الحمداني قد سجل فروقاً معنوية (P<0.05) مع الانسال الاخرى. تمتاز الانسال العربية ضمن موضوع الدراسة بكونها ذات رقبة طويلة وجبهة واسعة ووجه طويل.

الكلمات المفتاحية : رأس ، رقبة ، تكوين خلقي ، انسال ، عربية ، خيول.

Introduction

The Arabian horses are regarded as the most beauty breed of all the breeds in the world, the Arabian breed is also well-known for its beauty and morphological harmony which many breeders are selected for type traits (1). The Arabian horses are famous with high speed for long distances, (2) demonstrated that the performance is the result of a complex combination of conformational, physiological and behavioral traits, which are heritable. Conformation assesses the unalterable structure of an animal in relation to its function and it is the primary interest of breeders and owners, since overall body shape is defined the limits for range of movement, the function of the horse and its ability to perform (3, 4, 5). Therefore the functional conformation plays an important role in horse breeding and almost all breeding objectives for sport horses include functional conformation and movements (6). (7) Are mentioned that, the value of the Arabian horses is mainly associated with their exterior conformation, because this particular breed is used primarily for presentation. Therefore, the major criterion for their assessment is their aesthetic values, as well as, their correct body composition. Results of a last study of (8) are demonstrated that, the local Iraqi horses are Arabian horses. The head and neck determine athletic ability of the horse (9). (10) Suggests that good head-neck and neck-body insertion are more important than neck length for dressage ability. (9) Also affirms that, the head-neck connection may be favorable to achieve free movement and flexion. (11) found that the mean of the neck length of Arabian horses was 75.58 cm and the mean of the head length was 64.10 cm, but they didn't mention the age which is included in their study, while (12) mention that the mean of the neck length was 69.47 cm of Spanish Arab horses. Also (13) find as a result of their study in the Noriker draught horse that the mean of the neck length is 85.7 cm, the head length is 65.2 cm, forehead length is 28.1 cm, face length is 40.6 and the forehead width is 25.4 cm. While (14) document in their study on stallions of west American breeds that the mean of the head length is 52.6 cm and the mean of the neck length is 81.46. (15) find in their study on Pura Raza Espanol horse that the mean of the head length is 61.30 cm, the circumference of the attached part of the neck with the head is 89.81 and the circumference of the attached part of the neck with the body is 146.35 cm at the age 4-7 years. If the neck acts as a lever, head length will act as a counter weight (16). (17) Found that, the effect of sex of Arabian horses was significant just on neck length (NL) (P< 0.05), while the age was very significant on all traits (P<0.05) and the effect of body color was not significant (P>0.05). According to my knowledge, there were no any previous study of the head and neck conformation of the Arabian breeds (Al-Kehalan, Al-Saklawi and Al-Hamadani) in the province of the present study. The aim of this study is to demonstrate the head and neck anatomical parameters and conformation of the local Arabian breeds in Al-Diwaniyeh province.

Materials and methods

The study was conducted on (180) local Arabian horses in Al-Diwaniyeh Province at different breeds (Kehalan, Saklawi and Hamadani). Their ages groups were divided

into six groups which were (12-36, 36-60, 60-84, 84-120, 120-180 and 180-240 months), their ages were calculated according to (18). Also their sexes (stallions and mares) and their colors (white, black, red and brown) were included in the study. Many different head and neck measurements were recorded by tape of equine conformation as follow:

1. HeL: head length, the line from the poll of the head to the edge of the upper lip.
2. BR: the line between the bases of ears.
3. BE: the line between the medial canthi of the eyes.
4. SL: the head side length, the line from the poll of the head.
5. HNP: head-neck perimeter, the circumference of the attached part of the neck with the head.
6. NBP: neck-body perimeter, the circumference of the attached part of the neck with the body.
7. NL: neck length, the line between the head-neck perimeter and the neck-body perimeter.

The results were analyzed by one way (ANOVA) (SPSS, version 18), the significance at level ($P<0.05$).

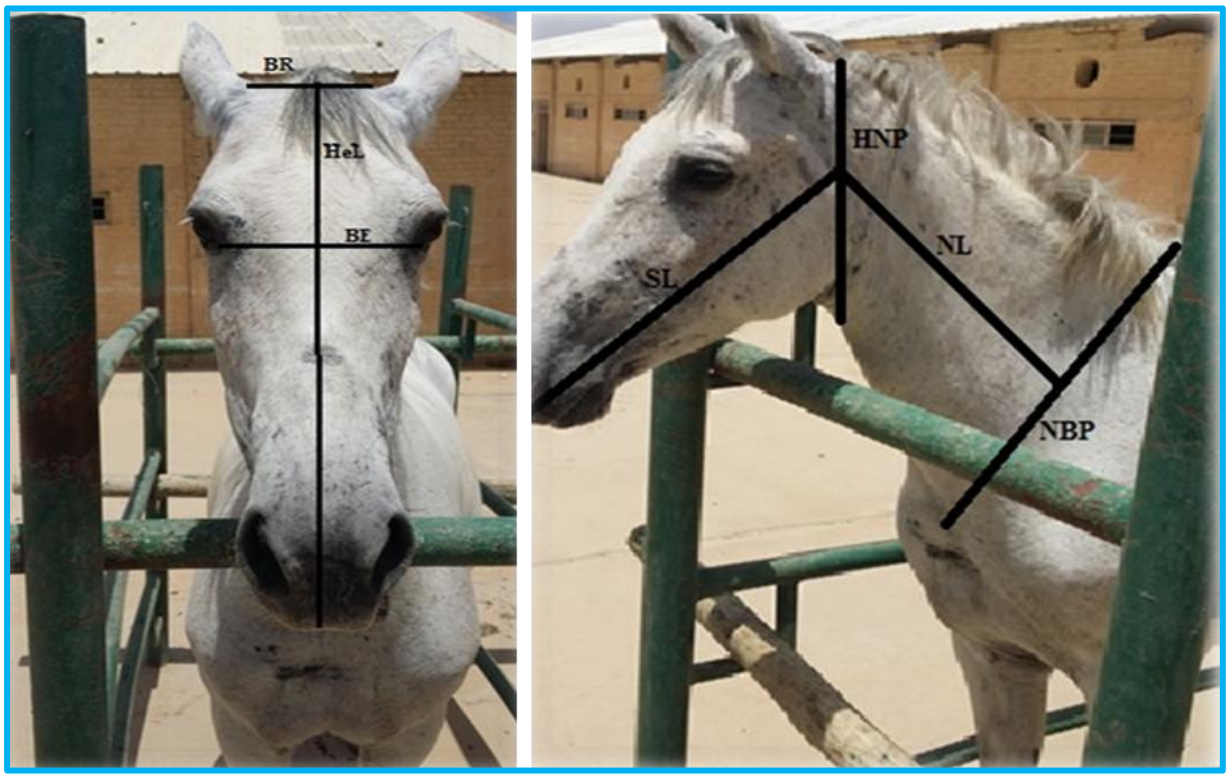

Fig. (1): Illustrate the measurements on head and neck of Saklawi mare.

Results

The female Saklawi had the superiority value with (HeL) (64.20 ±1.985), (SL) (66.20 ± 0.374) and (HNP) of the male (70.20 ± 0.374) but less with (NL) (43.80 ± 1.594); while the Hamadani got the superiority with (NBP) (98.80 ± 0.374), there was no statistical differences ($P>0.05$) among all the breeds with (HeL) and (BR). Whereas (BE) there was a significant difference ($P<0.05$) in male Kehalan. There were significant differences ($P<0.05$) in male Saklawi with male and female Hamadani and between male Hamadani and female Saklawi. The (HNP) there was a significant difference ($P<0.05$) between male and female Kehalan, as well as between male Kehalan and female Saklawi and male and female Hamadani. The (NBP) there was a noticeable significant difference ($P<0.05$) between male and female Saklawi, also between male Saklawi and female Hamdani, male and female Kehalan. The (NL) there was a significant difference ($P<0.05$) between male and female Kehalan also between female Kehalan and male and female Saklawi, as in (Table 1).

Table (1): The values of the head and neck measurements according to the breeds and sex in 12-36 months group (M ± SE).

Parameters								
Sub-Breed	Sex	HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	59.20± 1.934^{ce}	19.00± 0.316^{a}	49.80± 1.072^{a}	92.20± 1.007^{b}	68.00± 2.025^{abe}	61.00± 1.761^{b}	13.10± 0.872^{a}
	Female	57.20± 0.860^{bc}	19.00± 0.447^{a}	53.60± 1.030^{a}	98.00± 0.707^{a}	68.20± 0.800^{abe}	63.80± 0.583^{a}	14.20± 0.374^{a}
Saklawi	Male	63.60± 1.661^{a}	19.40± 0.510^{a}	43.80± 1.594^{b}	94.60± 1.806^{ab}	70.20± 0.374^{b}	66.00± 1.140^{a}	13.60± 0.748^{a}
	Female	64.20± 1.985^{a}	19.20± 0.490^{a}	52.60± 2.694^{a}	97.60± 0.510^{a}	70.00± 0.837^{be}	66.20± 0.374^{a}	14.40± 0.245^{a}
Hamadani	Male	60.80± 0.583^{abc}	18.60± 0.400^{a}	49.20± 0.970^{ab}	98.80± 0.374^{a}	66.80± 0.583^{a}	64.60± 0.510^{a}	14.00± 0.316^{a}
	Female	62.80± 1.158^{ae}	19.20± 0.583^{a}	51.40± 1.288^{a}	98.00± 0.447^{a}	67.20± 0.583^{ae}	66.20± 0.374^{a}	13.80± 0.374^{a}

Different letters denote to the significance difference (P<0.05).

Table (2): The values of the head and neck measurements according to the breeds and sex in 36-60 months group (M ± SE).

Parameters								
Sub-Breed	Sex	HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	66.20± 0.735^{a}	21.00± 0.447^{a}	55.80± 3.367^{abc}	109.00± 2.345^{a}	74.20± 2.396^{a}	68.20± 0.583^{a}	15.20± 0.800^{abc}
	Female	65.40± 0.510^{a}	21.00± 0.447^{a}	56.20± 1.068^{abc}	112.60± 0.510^{b}	76.60± 0.510^{a}	67.60± 0.600^{a}	15.40± 0.678^{abc}
Saklawi	Male	66.60± 1.364^{a}	21.20± 0.374^{a}	59.40± 1.691^{b}	111.40± 0.678^{ab}	69.80± 1.594^{b}	67.60± 1.030^{a}	14.20± 0.374^{a}
	Female	66.80± 0.583^{a}	21.40± 0.400^{a}	60.80± 2.354^{ab}	112.20± 0.374^{b}	69.40± 1.860^{b}	67.40± 0.872^{a}	16.60± 0.678^{b}
Hamadani	Male	61.40± 0.510^{b}	18.60± 0.400^{b}	53.20± 0.374^{c}	104.20± 0.374^{c}	67.60± 0.400^{b}	69.00± 0.447^{a}	16.60± 0.400^{bc}
	Female	61.40± 0.510^{b}	18.80± 0.374^{b}	53.40± 0.678^{c}	104.80± 0.583^{c}	69.20± 0.374^{b}	69.40± 0.400^{a}	16.60± 0.927^{bc}

Different letters denote to the significance difference (P<0.05).

Table 2 clarified that in (36-60) months group the sub-breed female Hamadani recorded the higher values in (BE) (16.60 ± 0.927) and (SL) (69.40 ± 0.400). Female Kehalan attained the superiority in (HNP) (76.60 ± 0.510) as well as the superiority was recorded to the same in (NBP) (112.60 ± 0.510). The (HeL) and (BR) there was a significant difference (P<0.05) between Hamadani (male and female) and the other breeds. The (BE) there was a significant difference (P<0.05) between male and female Saklawi, also there was a significant difference (P<0.05) between male Saklawi and male and female Hamadani. The (SL) there was no significant difference (P>0.05) among all the breeds. The (HNP) there was a significant difference (P<0.05) between Kehalan (male and female) with other breeds. The (NBP) there was a significant difference (P<0.05) between male and female Kehalan also male Kehalan recorded a significant difference (P<0.05) with female Saklawi and Hamadani (male and female). Whereas the female Kehalan registered a significant difference (P<0.05) with male and female Hamadani, the female Saklawi recorded a significant difference (P<0.05) with Hamadani (male and female), the (NL) there was a significant difference (P<0.05) betw-een male Saklawi and Hamadani (male and female), also female Saklawi recorded a significant difference (P<0.05) with Hamadani (male and female). The female Saklawi got the superiority in the (HeL), (BE) and (NL); (64.80 ± 2.691), (17.80 ± 0.490) and (62.80 ± 1.908) respectively, but female Kehalan had the superiority in (BR), (HNP) and (NBP) ;(22.40 ± 0.400), (78.60 ± 0.400) and (115.40 ± 0.600) respectively, while female hamdani acquired the same superior value with female Saklawi in (BE) (17.80 ± 0.735) and it had the superiority in (SL) (70.60 ± 0.510). The (HeL) of the male and female Saklawi recorded a significant difference (P<0.05) while in the (BR) of the male and female Hamadani recorded a significant difference (P<0.05) with other breeds. In case of (BE) of the male Saklawi recorded a significant difference (P<0.05) with female Saklawi as well as male and female Hamdani. In the parameter (SL) there was no significant difference (P>0.05) among all breeds. The (HNP) of female Kehalan recorded a significant difference (P<0.05) with male and female Hamadani also with male and female Saklawi, while male Kehalan recorded significant difference (P<0.05) with female Saklawi and male and female Hamadani. The measurement (NNP) of male and female Hamadani recorded a significant difference (P<0.05) with the other breeds. The (NL) of male and female Saklawi recorded a significant difference (P<0.05) with male and female Hamadani as in (Table 3). Table 4 presented that in (84-120) months group the female Kehalan had the superiority in (BR), (HNP) and (NBP); (23.40 ± 0.400), (79.40 ± 0.510) and (116.40 ± 0.600) respectively, while female Saklawi got the superiority in (HeL), (BE) and (NL); (65.80 ± 2.888), (18.80 ± 0.490) and (64.00 ± 1.924) respectively, but the female Hamadani attained the superiority in (SL) (71.60 ± 0.510) only. There were no any significant difference (P>0.05) among all breeds in the (HeL). In the (BR) of male and female Hamadani registered a significant differenace (P<0.05) with all other breeds. The measurement (BE) of the male Kehalan recorded a significant difference (P<0.05) with female Saklawi, also male and female Saklawi recorded a significant difference (P<0.05) between each of them, while male Saklawi recorded a significant difference (P<0.05) with male and female Hamadani. The (SL) measurement of the all breeds didn't record any significant difference (P>0.05). The (HNP) of the female Kehalan recorded significant difference (P<0.05) with Saklawi (male and female) and Hamadani (male and female). The (NBP) and (NL) of the male and female Hamadani recorded a significant difference (P<0.05) with the all other breeds. The female Saklawi had the superiority in the (HeL), (BE) and (NL); (66.20 ± 2.538), (19.80 ± 0.490) and (64.80 ± 1.828) respectively, but male Kehalan got the superiority in the (BR) (24.20 ± 0.860) and (SL) (72.80 ± 0.663),the latter measurement of the male Saklawi attained the same value of the male Kehalan (72.80 ± 0.347) and (72.80 ± 0.663) respectively, whereas female Kehalan recorded the superiority in (HNP)

Table (3): The values of the head and neck measurements according to the breeds and sex in 60-84 months group (M ± SE).

Sub-Breed	Sex	Parameters						
		HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	61.80± 0.800^{ab}	22.00± 0.447^{a}	58.40± 2.768^{ab}	113.00± 0.316^{a}	75.60± 2.112^{ac}	69.80± 0.374^{a}	16.20± 0.800^{ab}
	Female	63.00± 0.447^{ab}	22.40± 0.400^{a}	58.80± 0.490^{ab}	115.40± 0.600^{a}	78.60± 0.400^{a}	69.40± 0.510^{a}	16.40± 0.872^{ab}
Saklawi	Male	61.20± 0.374^{a}	22.20± 0.374^{a}	61.40± 1.913^{a}	114.40± 0.510^{a}	72.40± 1.503^{bc}	70.00± 0.447^{a}	15.20± 0.490^{b}
	Female	64.80± 2.691^{b}	22.20± 0.374^{a}	62.80± 1.908^{a}	113.80± 0.583^{a}	72.00± 1.095^{b}	69.80± 0.583^{a}	17.80± 0.490^{a}
Hamadani	Male	61.40± 0.510^{ab}	19.80± 0.374^{b}	54.40± 0.510^{b}	108.60± 1.913^{b}	69.60± 0.678^{b}	70.20± 0.374^{a}	17.40± 0.510^{a}
	Female	63.20± 0.583^{ab}	20.40± 0.510^{b}	54.80± 0.583^{b}	108.80± 0.200^{b}	71.60± 0.510^{b}	70.60± 0.510^{a}	17.80± 0.735^{a}

Different letters denote to the significance difference (P<0.05).

Table (4): The values of the head and neck measurements according to the breeds and sex in 84-120 months group (M ± SE).

Sub-Breed	Sex	Parameters						
		HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	63.40± 0.510^{a}	22.80± 0.583^{a}	61.00± 2.720^{a}	113.40± 0.510^{a}	76.40± 2.064^{ab}	71.00± 0.447^{a}	16.60± 0.678^{ac}
	Female	64.40± 0.400^{a}	23.40± 0.400^{a}	60.60± 0.400^{a}	116.40± 0.600^{a}	79.40± 0.510^{a}	70.60± 0.400^{a}	17.40± 0.872^{abc}
Saklawi	Male	63.40± 0.678^{a}	23.20± 0.374^{a}	62.60± 1.887^{a}	116.00± 0.447^{a}	73.80± 1.463^{b}	70.80± 0.374^{a}	16.20± 0.490^{a}
	Female	65.80± 2.888^{a}	22.80± 0.374^{a}	64.00± 1.924^{a}	115.20± 0.735^{a}	73.00± 1.000^{b}	70.80± 0.583^{a}	18.80± 0.490^{b}
Hamadani	Male	63.00± 0.548^{a}	20.80± 0.374^{b}	55.40± 0.678^{b}	110.40± 2.088^{c}	73.00± 1.673^{b}	71.20± 0.374^{a}	18.40± 0.510^{bc}
	Female	63.60± 0.812^{a}	21.40± 0.510^{b}	54.80± 0.583^{b}	109.60± 0.980^{bc}	73.00± 0.548^{b}	71.60± 0.510^{a}	18.40± 0.812^{bc}

Different letters denote to the significance difference (P<0.05).

(80.20 ± 0.374) and (NBP) (116.80 ± 0.800). All the breeds didn't record any significant difference (P>0.05) in the measurement of (HeL), in the (BR) the male Kehalan recorded a significant difference (P<0.05) with male and female Hamadani correspondingly male Saklawi recorded a significant difference (P<0.05) with female Hamadani. The parameter (BE) had a significant difference (P<0.05) between male and female Saklawi, in the other hand male Saklawi recorded a significant difference (P<0.05) with male and female Hamadani, while the (SL) measurement had no significant difference (P>0.05) among all breeds. In the (HNP) the female Kehalan recorded a significant difference (P<0.05) with male and female Saklawi as well as male and female Hamadani, likewise the male Kehalan documented a significance difference with female Sakalawi as well as male and female Hamadani. The male and female Hamadani recorded a significant difference (P<0.05) with the other breeds of the parameters (NBP) and (NL) (Table 5). Table 6 enlisted that in (180-240) months group, the superiority in the (HeL), (BE) and (NL) measurements (67.00 ± 1.788), (20.60 ± 0.678) and (66.00 ± 1.581) respectively were to the male Hamadani, while the male Saklawi had the superiority in the (BR), (HNP) and (NBP); (25.00 ± 0.316), (80.20 ± 0.374) and (116.80 ± 0.800) respectively, the female Saklawi was accordingly got the superiority in (SL) (73.20 ± 0.490). There were no significant differences (P>0.05) among all breeds in the measurements of (HeL). The male and female Kehalan recorded a significant difference (P<0.05) with male and female Hamadani in the (BR). The (BE) male Saklawi recorded a significant difference (P<0.05) with female Saklawi also with male and female Hamadani, the (SL) acquired no significant difference (P>0.05) among all breeds. The male and female Kehalan recorded a significant difference (P<0.05) with male and female Saklawi as well as female Hamadani in the measurement of (HNP). The (NBP) and (NL) measurement, in which the male and female Hamadani recorded significant differences (P<0.05) with the other breeds. The superiority of the (HeL), (BR), (BE), (SL) and (HNP); (63.90**±**1.224**),** (19.30±0.335), (14.00±0.394), (66.10±0.567) and (70.10±0.433) respectively were belong to sub-breed Saklawi, whereas the (NBP) (98.40±0.306) was to Hamadani and finally the sub-breed Kehalan got the highest measurement (51.70±1.654) of the (NL). There were significant differences (P<0.05) among Kehalan and other breeds in the HeL and SL, while there were no significant differences (P>0.05) among all three breeds according to the measurements of BE, NL and BR, in the other hand, the parameter HNP recorded a significant difference (P<0.05) of Saklawi with the other two breeds (Table 7) in the (12-36 months group). In 36-60 months group, the sub-breed Saklawi had the superior values in the (HeL), (BR), (NBP) and (NL); (66.70±0.700), (21.30±0.260), (111.80±0.389) and (60. ±1.386) respectively, while the sub-breed Hamadani acquired the highest value (69.20±0.291) of the (SL) although the sub-breed Kehalan had ther superiority (75.40±1.222) of the (HNP). There were significant differences (P<0.05) of Hamadani with the other two breeds in the (HeL), (NBP) and (BR), while the parameter (BE) didn't record any significant difference (P>0.05) among all breeds, the measurements (SL) and (NL) had significant differences (P<0.05) of Saklawi when compared with other both breeds, the (NBP) parameter recorded a significant difference (P<0.05) belong to Hamadani with both Saklawi and Kehalan breeds. The sub-breed Saklawi had the superior values in the (HeL), (NL) and shared the Kehalan with same highest values of (BR); (63.00±1.414), (62.10±1.295) and (22.20±0.291 and 22.20± 0.249) respectively, the highest measurements (BE) (17.60±0.427) as well as (SL) (70.40±0.306) were belong to sub-breed Hamadani, the sub-breed Kehalan had the superiority in the (HNP); (77.10±1.130) and (NBP); (114.20±0.512). There were no significant differences (P>0.05) among all breeds of the (HeL), (BE) and (SL) measurements, while the (NBP) as well as (BR); Hamadani breeds had a significant difference (P<0.05) when compared with other breeds.

Table (5): The values of the head and neck measurements according to the breeds and sex in 120-180 months group (M ± SE).

Parameters								
Sub-Breed	Sex	HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	64.20± 0.663^{a}	24.20± 0.860^{a}	62.40± 2.731^{a}	115.40± 0.510^{a}	78.00± 1.924^{ac}	72.80± 0.663^{a}	17.60± 0.678^{ac}
	Female	65.20± 0.374^{a}	24.00± 0.447^{ab}	61.80± 0.374^{a}	116.80± 0.800^{a}	80.20± 0.374^{a}	72.20± 0.374^{a}	18.40± 0.872^{abc}
Saklawi	Male	64.00± 0.949^{a}	24.00± 0.316^{ab}	62.80± 1.828^{a}	116.00± 0.707^{a}	75.00± 1.449^{bc}	72.80± 0.374^{a}	17.00± 0.632^{a}
	Female	66.20± 2.538^{a}	23.40± 0.678^{ac}	64.80± 1.828^{a}	115.60± 0.812^{a}	74.00± 0.894b^{b}	72.00± 0.894^{a}	19.80± 0.490^{bc}
Hamadani	Male	64.00± 0.548^{a}	22.40± 0.510^{bc}	55.60± 0.748^{b}	111.40± 1.806^{b}	74.00± 1.673^{b}	72.20± 0.374^{a}	19.20± 0.490^{c}
	Female	64.60± 0.812^{a}	22.00± 0.316^{c}	55.60± 0.400^{b}	111.00± 1.140^{b}	73.80± 0.583^{b}	72.20± 0.374^{a}	19.40± 0.812^{c}

Different letters denote to the significance difference (P<0.05).

Table (6): The values of the head and neck measurements according to the breeds and sex in 180-240 months group (M ± SE).

Parameters								
Sub-Breed	Sex	HeL (cm) Mean ± SE	BR (cm) Mean ± SE	NL (cm) Mean ± SE	NBP (cm) Mean ± SE	HNP (cm) Mean ± SE	SL (cm) Mean ± SE	BE (cm) Mean ± SE
Kehalan	Male	64.60± 0.812^{a}	22.00± 0.316^{a}	55.60± 0.400^{a}	111.00± 1.140^{a}	73.80± 0.583^{a}	72.20± 0.374^{a}	19.40± 0.812^{ab}
	Female	64.80± 0.583^{a}	24.60± 0.678^{a}	63.60± 2.977^{a}	116.00 ± 0.447^{a}	78.60 ± 1.913^{a}	72.80 ± 0.663^{a}	18.60 ± 0.872^{ab}
Saklawi	Male	66.00± 1.000^{a}	25.00 ± 0.316^{ac}	62.00 ± 0.447^{a}	116.80± 0.800^{a}	80.20 ± 0.374^{c}	72.80 ± 0.663^{a}	19.40 ± 0.872^{a}
	Female	64.20± 0.800^{a}	24.20 ± 0.374^{ac}	64.00 ± 2.121^{a}	116.40 ± 0.812^{a}	75.40 ± 1.208^{bc}	73.20 ± 0.490^{a}	17.60 ± 0.678^{b}
Hamadani	Male	67.00± 1.788^{a}	24.40 ± 0.678^{c}	66.00 ± 1.581^{b}	116.00 ± 1.000^{b}	74.40 ± 0.872^{bc}	72.40 ± 0.927^{a}	20.60 ± 0.678^{b}
	Female	65.00± 0.548^{a}	23.20 ± 0.583^{bc}	55.60 ± 0.748^{b}	111.80 ± 2.035^{b}	74.40 ± 1.661^{bc}	73.00 ± 0.548^{a}	20.00± 0.548^{ab}

Different letters denote to the significance difference (P<0.05).

Table (7): The values of the head and neck measurements according to the age (12-84 months) and breeds (M ± SE).

	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
(12-36 months) group.	Kehalan	58.20± 1.052^{a}	13.65± 0.483^{a}	62.40± 0.991^{a}	68.10± 1.027^{a}	95.10± 1.748^{a}	51.70± 1.654^{a}	19.00± 0.258^{a}
	Saklawi	63.90± 1.224^{b}	14.00± 0.394^{a}	66.10± 0.567^{b}	70.10± 0.433^{b}	96.10± 1.616^{a}	48.20± 1.081^{a}	19.30± 0.335^{a}
	Hamadani	61.80± 0.696^{b}	13.90± 0.233^{a}	65.40± 0.400^{b}	67.00± 0.394^{a}	98.40± 0.306^{a}	50.30± 0.844^{a}	18.90± 0.348^{a}
(36-60 months) group.	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
	Kehalan	65.80± 0.442^{a}	15.30± 0.496^{a}	67.90± 0.407^{a}	75.40± 1.222^{a}	110.80± 1.281^{a}	56.00± 1.667^{a}	21.00± 0.298^{a}
	Saklawi	66.70± 0.700^{a}	15.40± 0.542^{a}	67.50± 0.637^{b}	69.60± 1.157^{b}	111.80± 0.389^{a}	60.10± 1.386^{b}	21.30± 0.260^{a}
	Hamadani	61.40± 0.340^{b}	16.60± 0.476^{a}	69.20± 0.291^{a}	68.40± 0.371^{b}	104.50± 0.342^{b}	53.30± 0.367^{a}	18.70± 0.260^{b}
(60-84 months) group.	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
	Kehalan	62.40± 0.476^{a}	16.30± 0.556^{a}	69.60± 0.306^{a}	77.10± 1.130^{a}	114.20± 0.512^{a}	58.60± 1.327^{a}	22.20± 0.291^{a}
	Saklawi	63.00± 1.414^{a}	16.50± 0.543^{a}	69.90± 0.348^{a}	72.20± 0.879^{b}	114.10± 0.379^{a}	62.10± 1.295^{b}	22.20± 0.249^{a}
	Hamadani	62.30± 0.473^{a}	17.60± 0.427^{a}	70.40± 0.306^{a}	70.60± 0.521^{b}	108.70± 0.907^{b}	54.60± 0.371^{c}	20.10± 0.314^{b}

Different letters denote to the significance difference (P<0.05).

Table (8): The values of the head and neck measurements according to the age (84-240 months) and breeds (M ± SE).

	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
(84-120 months) group.	Kehalan	63.90± 0.348^{a}	17.00± 0.537^{a}	70.80± 0.291^{a}	77.90± 1.120^{a}	114.90± 0.623^{a}	60.80± 1.298^{a}	23.10± 0.348^{a}
	Saklawi	64.60± 1.454^{a}	17.50± 0.543^{a}	70.80± 0.327^{a}	73.40± 0.846^{b}	115.60± 0.427^{a}	63.30± 1.291^{a}	23.00± 0.258^{a}
	Hamadani	63.30± 0.473^{a}	18.40± 0.452^{a}	71.40± 0.306^{a}	73.00± 0.830^{b}	110.00± 1.095^{b}	55.10± 0.433^{b}	21.10± 0.314^{b}
(120-180 months) group.	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
	Kehalan	64.70± 0.396^{a}	18.00± 0.537^{a}	72.50± 0.373^{a}	79.10± 0.994^{a}	116.10± 0.504^{a}	62.10± 1.303^{a}	24.10± 0.458^{a}
	Saklawi	65.10± 1.329^{a}	18.40± 0.600^{a}	72.40± 0.476^{a}	74.50± 0.820^{b}	115.80± 0.512^{a}	63.80± 1.263^{a}	23.70± 0.367^{a}
	Hamadani	64.30± 0.473^{a}	19.30± 0.448^{a}	72.20± 0.249^{a}	73.90± 0.836^{b}	111.20± 1.009^{b}	55.60± 0.400^{b}	22.20± 0.291^{b}
(180-240 months) group.	Parameters / Breeds	HeL (cm)	BE (cm)	SL (cm)	HNP (cm)	NBP (cm)	NL (cm)	BR (cm)
	Kehalan	65.40± 0.400^{a}	19.00± 0.596^{a}	72.80± 0.442^{a}	79.40± 0.957^{a}	116.40± 0.452^{a}	62.80± 1.444^{a}	24.80± 0.359^{a}
	Saklawi	56.60± 1.360^{a}	19.10± 0.674^{a}	72.80± 0.512^{a}	74.90± 0.722^{b}	116.20± 0.611^{a}	65.00± 1.291^{a}	24.30± 0.367^{a}
	Hamadani	65.40± 0.542^{a}	19.80± 0.442^{a}	73.00± 0.365^{a}	74.50± 0.922^{b}	111.90± 1.016^{b}	56.00± 0.577^{b}	23.10± 0.314^{b}

Different letters denote to the significance difference (P<0.05).

The parameter (HNP) of Kehalan sub-breed recorded a significant difference (P<0.05) with the other breeds, besides there were significant differences (P<0.05) among all breeds according to (NL) measurement as in (Table 7) in the (60-84 months) group. Table 8 conscripted in the (84-120 months) group that the sub-breed Saklawi got the superior measurements in the (HeL), (NBP) and (NL); (64.60±1.454), (115.60±0.427) and (63.30±1.291) respectively, while the highest values of the (BR) (23.10±0.348) as well as (HNP) (77.90±1.120) were belong to sub-breed Kehalan, though the sub-breed Hamadani caught the top of values in the (BE) (18.40±0.452) and (SL) (71.40±0.306). There were no significant differences (P>0.05) among all breeds according to the HeL, BE and SL, whereas the NBP, NL and BR of Hamadani breeds recorded significant differences (P<0.05) with other breeds, Kehalan sub-breed noted a significant difference (P<0.05) with other two breeds in the HNP. As usual, sub-breed Saklawi attained the superiority of the (HeL) and (NL); (65.10±1.329), (63.80±1.263), with competition in the characteristics of beauty the sub-breed Kehalan got the higher values in the (BR) (24.10±0.458), (SL) (72.50±0.373), (HNP) (79.10±0.994) and (NBP) (116.10±0.504), while the sub-breed Hamadani had the superiority in the (BE) (19.30±0.448). There were also no significant differences (P>0.05) among all breeds in the HeL, BE and SL parameters, the NBP, NL and BR measurements of Hamadani verified significant differences (P<0.05) with other both breeds, though the HNP of Kehalan documented a significant difference (P<0.05) with other breeds as discovered in table-8 in the (120-180 months) group. Table-8 illuminated in the (180-240 months) group that the sub-breed Saklawi caught the top values of the (HeL) and (NL); (65.60±1.360) and (65.00±1.291) respectively, also the sub-breed Kehalan had the superiority of the (BR), ((HNP) and (NBP); (24.80±0.359), (79.40±0.957) and 116.40±0.452) respectively, in the other hand the greatest measurements as (BE) (19.80±0.442) and (SL) (73.00±0.365) were belong to sub-breed Hamdani. likewise there were no significant differences (P>0.05) among all breeds in the HeL, BE and SL parameters, Hamadani breeds registered a significant difference (P<0.05) with other two breeds in the BR in addition to NL measurements, in the NB parameter the all three breeds recorded significant differences (P<0.05) with all of them.

Discussion

According to my knowledge, this is the first study for Iraqi Arabian horses in the region. The study shows a lot different results. The conformation of head and neck has great importance in horses gait specially sport horses (19). The breeding objective must be focused on conformation traits (20). The head and neck conformation determine athletic ability (21), in this regard (22) proposes that good head and neck and neck – body insertion are more important than neck length for dressage ability. (21) as well as confirms that the head-neck connection should be favorable to achieve free movement and flexion. The results in general show clearly the superiority of Saklawi in most conformation measurements of head and neck of Arabian horses breeds. Saklawi has the superiority with (HeL), (BR), (BE), (SL) and (HNP) at the age (12-36) months this result agree with (16), this may be due to the highest speed growth rate of Saklawi than the other sub-breed. Also Saklawi has the superiority at the age (36-60) months with (HeL), (BR) and (NL). The Saklawi and Kehalan at the age (60-84), (84-120) and (120-180) months have equal superiority in measurements of head and neck, this may be due to the owner interest and wide spreading of Kehalan sub-breed in the area of the study (Al-Dewaniya province) that means the owners take care with Kehalan sub-breed because of its beauty of body conformation for that they are breeding this sub-breed with supplying and paying more for its nutrition. The Saklawi at the age (180-240) months attain the superiority in the (BR), (SL), (HNP) and (NBP) these results are axiomatically due to the Saklawi is continued with acceleration of growth rates among all

the ages stages which included in the present study with superiority. The females of all breeds have the superiority in most of registered measurements which accord with (23) and (24), this results are very important for horses management; this result may be due to the genetic variation of musculo-skeletal conformation of the females body especially with Saklawi females. The results also show that the head and neck measurements of all breeds which are included in this study are increased according to the advance of age and this fact is axiomatic phenomenon. The horses have many colors (white, black, red and brown), the results show the white color got the superiority without no significant differences (P>0.05) among all breeds or sexes and this may be due to the genetic variation which accumulates through thousands of years of horses' life. In the related study (11) find that the mean of the neck length of Arabian horses is 75.58 cm and the mean of the head length is 64.10 cm, but they didn't mention the age which is included in their study so the present study values may be approximately accord with their measurements in the advanced ages and this may be due to the variation in the ages of the animals of study, while (12) mention that the mean of the neck length is 69.47 cm of Spanish Arab horses, this result has an increment about our result and this may be due to the different breeds of horses. also (13) find as a results of their study in the Noriker draught horse that the mean of the neck length is 85.7 cm, the head length is 65.2 cm, forehead length is 28.1 cm, face length is 40.6 and the forehead width is 25.4 cm, While (14) document in their study on stallions of west American breeds that the mean of the head length is 52.6 cm and the mean of the neck length is 81.46. (15) find in their study on Pura Raza Espanol horse that the mean of the head length is 61.30 cm, the circumference of the attached part of the neck with the head is 89.81 and the circumference of the attached part of the neck with the body is 146.35 cm at the age 4-7 years. all these results vary from our results and the reason may be the different breed also. All these important results may direct us to conclude that Saklawi sub-breed has the superiority in most head and neck morphological measurements in most age groups, other morphological parameters of Saklawi with other breeds (rather than the mentioned) may need detailed researches.

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