How to Cite:
Khames, A. S., & Al-Khazarajii, S. A. N. (2022). The effects of uncontrolled breeding's on Iraqi horses conformation. *International Journal of Health Sciences*, *6*(S2), 5063–5073. https://doi.org/10.53730/ijhs.v6nS2.6061

The effects of uncontrolled breeding's on Iraqi horses conformation

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***Abstract*---**Due to the great importance of digital measurements of the conformation of the motor system in horses and the lack of a specialty center for higher cases, the purpose of this research was to form a specialized center for the conformation of the motor system in horses and depended on 60 horses of both sexes between the ages of 3 to 4 and a half years were employee for the body measurement in Iraqi equestrians club in Abu Ghraib and Iraqi equestrians Federation in Al Jadriya. The parameter which were used in this project angles measurement both fore and hind limb as well as the joint inclination. Therefore there were significant changes in the thoroughbred and Iraqi horses. To be concluded that angle inclination measurement can be used for horse evaluation.

***Keywords*---**horse conformation, Iraqi horses, thoroughbred, crossbreed angles, inclination.

Introduction

Conformation is the physical appearance of an animal due to the arrangement of muscle, bone and other body tissue. It is the sum of these body parts and how they blend together which determines the acceptability or unacceptability of the horse's conformation and good conformation is the overall blending of body parts to form a beautiful athlete (Kylee, 2016).Iraqi horses characterized by their agility and their speed in running made them desirable all over the world, as all horse breeding centres in the world, whether in Europe, America, Asia, are keen to own Arabian horses or horses born from mating a non-Arab horse with an Arabian mare or vice versa (Alkhazraji, 1999). Iraqi horses originated from breeding of the Arabian horses and non-Arabic horses.

In horse breeding, different conformation traits are routinely assessed by visual scoring procedures, which allow for the prediction of future performance at an early age. Such “secondary” or “indicator” traits can be split into three groups: functional traits, type traits and locomotion traits. Functional traits are based mostly on empirically defined anatomic and orthopedic criteria (Druml *et al.*, 2016). Horses with good conformation move fluidly, experience less wear and tear on joints, and are more apt to stay fit. Explaining how conformation relates to structure and function, (Heather Smith Thomas, 2005) shows you how to identify a horse’s desirable attributes and potential faults.

Evaluation of and selection for functional conformation is therefore used as a tool for indirect performance selection. Furthermore, positive effects on longevity of riding horses have been determined for favorable total conformation and leg conformation (Wallinn *et al.*, 2001), Conformation measurements were recorded on healthy Iraqi horses aging 3-4 years (Merhish *et al.*, 1998).

Aims of this study

Therefore, due to abnormal or bad conformation and due to lack of the data related to this conformation and to establish a centre depending on the measurement of poor and un recorded with disease condition. This study was designs depending to the recommendation of Al-kazrajii(1999) and Mirahish (1998),this study aims to know the changes that occurred in the conformation of Iraqi horses (represented by angles inclinations) as a result of uncontrolled breeding with the purebred horses and their effect on the performance of horses, and to determine the extent of the effect through conducting statistical analyzes of changes in the conformation of Iraqi horses compared to the horses resulting from this breeding.

Materials and Method

Instruments that used in this research

1. plastic measurement tape
2. goniometer

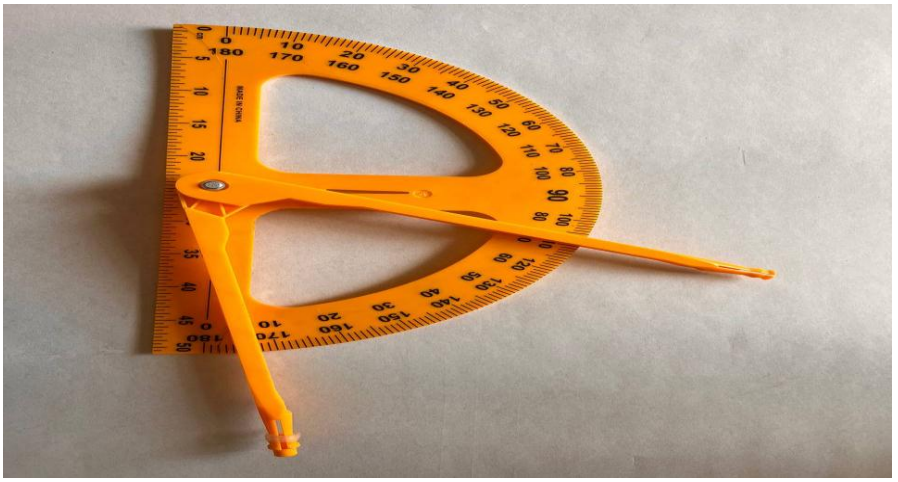

Figure (1): Show the study design and sampled horses and their regions

This study was conducted on 60 horese T, I and c .their ages were above 3 years and from both sex .Those horses were divided into three groups from different regions Iraqi Equestrian Federation in AL Jadriya and Iraqi Equestrian Club in Abu Ghraib.

- Horse measurements are taken according to the attached tables below , after classify the horses in the study into three groups:
  1. First group: pure Iraqi horses.
  2. Second group: Thoroughbred horses.
  3. Third group: Crossbreed horses.
  4. Name of the owner and name, sex, and age of the horse are fixed for each
  5. Age of the horses in this study will be between 3.5 – 4 years.

Site	Horse breed	No. of horses
Iraqi Equestrian Club in Abu Ghraib	Pure Iraqi horses	10
	Thoroughbred	10
	Crossbred	10
Iraqi Equestrian Federation in AL Jadriya	Pure Iraqi horses	10
	Thoroughbred	10
	Crossbred	10

Table(1):show the study design and sampled horses and their regions

The horses were identified at the beginning of the research (in rest and after exercise) , the age, gender, knowledge of the anatomical formations, consideration to visual examination of the cauterization, watching the horse from the front, and paying attention to the symmetry in the size of the joints and hooves, as the horse was seen from behind while standing, normal walking, trotting and when running. On a circumference of 8-15 meters with changing directions in each

cycle, the horses were clinically examined by palpation of the front limbs from the shoulder joint to the sole of the hoof and the hind limbs from the pelvic joint to the sole of the hoof in order to ensure the integrity of the, identifying and locating the injuries and the accompanying pain, heat, lameness, and others. All information about each horse was recorded in a special register, the position of the horse, the age, gender and sex of the animal, and also the composition measures included in this study.

Statistical analysis for the measurement of conformation data

The Statistical Analysis System- SAS (2012) program was used to detect the effect of difference in parameters in the groups in the current study. Least significant difference –LSD test (Analysis of Variation-ANOVA) was used to significant compare between means Chi-square test was used to significant compare between percentage (0.05 and 0.01 probability in this study.

Table (2): show the angles measurement to the hind limb (external measurement)

Angles measurements	In degrees
Inclination of scapula	
Angle of shoulder joint	
Angle of elbow joint	
Angle of fetlock joint	
Angle of fore hoof	
Inclination of pelvis	
Angle of hip joint	
Angle of stifle joint	
Angle of hind fetlock joint	
Angle of hind hoof	

Figure (2) the angle measurement of fore limb and hind limb

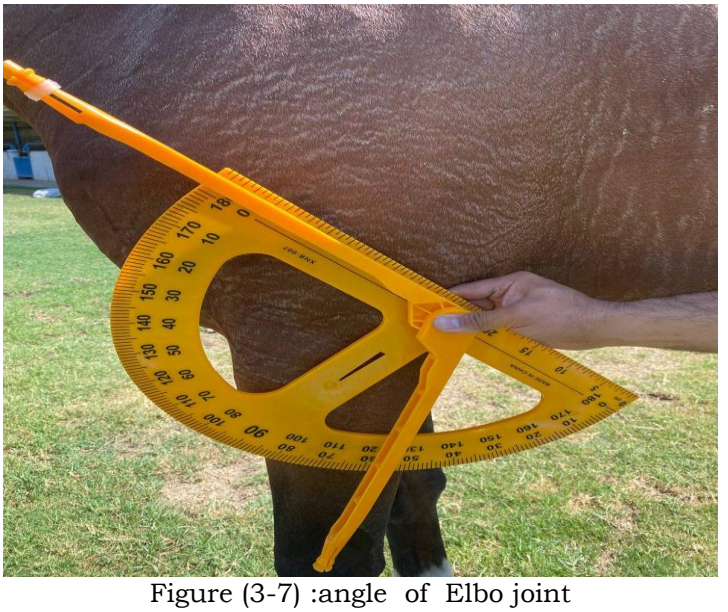

Figure (3-7) :angle of Elbo joint

Results

Angle measurement

Inclination of scapula

The results of the inclination of scapula measurement revealed a significant increase in Cross group(47.35 ±0.28 a) among group while Thoroughbred horse

showed the lowest (45.95 ±0.29 b) average , while the Iraqi horse showed (46.50 ±0.58 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.163 in Inclination of scapula. These close differences in the inclination of the scapula in the three groups, could be related to the different in the gender and usage of the animal therefore, the long-time of exercise in the thoroughbred group lead to that differences. Beside that scapular inclination contributes significantly to inferior stability of the scapular joint. Increased scapular inclination prevents inferior displacement of the humeral head, probably because of a bony cam effect that causes tightening of the superior capsule (Itoi *et al.*, 1992) the inclination of scapula

Angles of shoulder joint

The results of the angles of shoulder joint measurement revealed a significant increase in Iraqi group (90.40±0.22 a) among group while Thoroughbred showed the lowest (80.15 ±0.21c) average , while the cross breeds showed (81.90 ±0.37 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 0.791 * As for the average measurement of the angle of the sholder joint, which is confined between the line passing through the posterior part of the large tuberosity of the humerus, passing through the broad part of the tuberosity of the scapula, ending with the upper end of the plate spine, and the line passing through the part of the tuberosity of the great humerus, ending with the elbow joint

in Angles of shoulder joint . However, according to Weller *et al.* (2006), Thoroughbreds differ from other breeds, not only with regard to segment lengths but also, and maybe especially, with regard to joint angles. With this approach, the scapula is located at a smaller angle against the ground and it allows more effective forward ejection of the front limb. Presumably, its length is not crucial for the speed the horse can develop. According to Mawdsley *et al.* (1996), long strides and speed, in particular, depend on the length of the croup. From the anatomical point of view, hind limbs are used to start a stride and fore limbs are used mainly to support the body mass during movement.

Inflammation of the intertubercular (bicipital) bursa as a primary cause of lameness is uncommon, even though the condition can occur in horses of any age, breed, or sex. It can present as septic or nonseptic Several case studies have identified a very low incidence of the problem. shoulder lameness suggested causes include stretching or tearing of the bursa or biceps tendon during the cranial phase of the stride with the limb in full extension or by a fall or slip that results in flexion of the shoulder with extension of the elbow (Baxter,2020)

Angles of Elbow joint

The results of the angles of Elbow joint measurement revealed a significant increase in cross group (128.20 ±0.78 a) among group while Thoroughbred horse showed the lowest (114.10 ±0.25 c) average , while the Iraqi horses breeds showed (121.50 ±0.46 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.537 * the elbow joint angle in the studied models is between the line and confined The connection

between the elbow joint and the posterior part of the great tuberosity of the humerus and the line connecting the elbow joint and the styloid process of the radius bone. The elbow should be 'free' and allow a fist to be placed between it and the ribs. A 'tied-in' elbow limits stride length. The point of the elbow should be in the same plane as the point of the shoulder, so that it does not turn in or out. The measurement from the withers to the point of the elbow should be about the same as from the point of the elbow to the ground, ensuring adequate depth of chest.

The tarsal angles in racing horses could be considered small if <155° and large if >165°. In a previous study, the majority of angular measurements were highly reproducible and consistent within different animals, except for the angles of the shoulder and elbow (Gmel *et al.*, 2018). The effect of the posture on the joint angles was selected and the correcting the joint angles for relevant posture variables in different statistical models (Gmel *et al.*, 2018).

Angles of Fetlock joint

The results of the angles of Fetlock joint measurement revealed a significant increase in Thoroughbred group (142.80 ±0.25 a) among group while cross horse showed the lowest (139.50 ±0.68 b) average , while the Iraqi horse showed (141.75 ±0.32 a) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.647 in Angles of Fetlock joint . The fetlock joints should be well defined and bony rather than puffy. Seen from the side, a line dropped from the midpoint of the scapula should run down in front of the forelimb and pass down through the middle of the hoof. If this is difficult to visualise, it may be easier to locate the small projection or tuber on the scapula that lies a little above the mid-point. A line dropped from here should pass down through the elbow joint, the knee and the fetlock and hit the ground just behind the heels. In addition, a line dropped from the elbow should run vertically down the back of the leg.In the standing position, the fetlock and digit are prevented from non-physiologic hyperextension by the suspensory apparatus of the fetlock (interosseus muscle, intersesamoidean ligament, and distal sesamoidean ligaments), digital flexor tendons, and collateral ligaments of the joints. During flexion of the fetlock and digit, most of the movement is in the fetlock, the least amount of movement is in the pastern joint, and movement in the coffin joint is intermediate. Although the pastern joint is a hinge joint, providing only limited flexion and extension, manipulation can cause transverse flexion and some axial rotation when the joint is flexed (Adams and Stashak, 2002).

Joint Angle Measurements Associated with Lameness Decreased weight-bearing due to lameness in the forelimbs or hind limbs will decrease maximum fetlock extension and maximum coffin joint flexion during the stance phase of the lame limb compared to the stance phase of the contralateral sound limb (Figure 4-2) Maximum fetlock extension and coffin joint flexion during stance are sensitive indicators of both forelimb and hind limb lameness in the horse. Fetlock extension during lame limb stance was 8° less than sound limb stance in a sole pressure-induced lameness model of a grade 2 (out of 5) lameness. Carpal extension during stance is reduced but only with moderate to severe lameness

Proximal limb joints become more flexed during weight bearing of the lame limb, resulting in an overall limb shortening during stance (Buchner *et al.*, 1996).

Angle of fore hoof

The results of the angles of fore hoof measurement revealed a significant increase in Thoroughbred group (51.60 ±0.45 a) among group while cross breed showed the lowest (49.20 ±0.017 c) average , while the Iraqi horse showed (50.20 ±0.27 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.978 in Angle of fore hoof.

Previous reports of angles less than 50° are currently considered to be too low and normal angles are thought to be approximately 54° (Cohen *et al.*, 2000; Cervantes *et al.*, 1992). However, these angles may vary considerably but the angle of the dorsal hoof wall should be similar to the angle of the pastern. Exceptionally long, sloping pasterns or a broken back hoof-pastern axis are thought to increase strain to flexor support structures of the fetlock and phalanges . Short, upright pasterns or a broken forward hoof-pastern axis are thought to cause greater concussive stresses to the fetlock, (Matoon *et al.*, 2004) phalangeal joints, and foot. They may also be associated with suspensory and tendon injuries in racehorses.

Inclination of pelvis

The results of the inclination of pelvis measurement revealed a significant increase in Thoroughbred group (52.75 ±0.86 a) among group while cross breed showed the lowest (38.60 ±0.40 c) average , while the Iraqi horse showed (46.25 ±0.34 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.657 * in Inclination of pelvis . The pelvic girdle consists of the sacrum comprising fused sacral vertebrae, two pelvic bones, and the first three coccygeal vertebrae. Each pelvic bone (os coxae) is made up of three flat bones, the ilium, pubis and ischium, which are fused into one. All three bones meet at the acetabulum which articulates with the head of the femur to form the hip joint.

Angle of Hib joint

The results of the angle of hib joint measurement revealed a significant increase in Thoroughbred group (91.65 ±0.50 a) among group while cross breed showed the lowest (73.60 ±0.50 c) average , while the Iraqi horse showed (77.05 ±0.67 b) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.600 * in Angle of Hib joint. The hip joint is deep in the hindquarter of the horse and is most easily seen when the hind leg is flexed. It is the joint between the pelvis and the femur and is capable of a wide range of movement. It protects the internal organs and acts as a site for muscle attachment to allow the efficient transfer of force to the spine (Elkhair, 2014).

While the hip joint is a ball-and-socket joint, capable only of very limited rotation, its principal movements are flexion and extension. Abduction of the thigh is restricted by the ligament of the head of the femur and the accessory femoral

ligament. Adduction is checked by the attachments of the gluteal muscles on the femur. In the normal standing position, the caudolateral part of the head of the femur lies outside the acetabulum. The hip joint is slightly flexed in this position, the cranial angle being about 115°. The range of motion between extreme flexion and extension is only 60°.

Angle of stifle joint

The results of the angle of stifle joint measurement revealed a significant increase in Thoroughbred group (122.25 ±0.33 a) among group while cross breed showed the lowest (120.50 ±0.54 b) average , while the Iraqi horse showed (121.05 ±0.38 b) average, Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.214 * in Angle of stifle joint .

The stifle joint is the largest in the horse's body. One of its main functions is to cause the limb to become rigid when the foot is placed on the ground. This is achieved by contraction of the muscles inserted into the patella. In upward fixation of the patella where no flexion of the stifle and hock can occur, the lower limb joints such as the coffin, pastern and fetlock can still be flexed. The semiflexed position of the stifle joint helps it to act as a shock absorber and reduce the effects of concussion The quadriceps femoris muscle is relatively relaxed in this position. Extension of the stifle joint through action of the quadriceps femoris, tensor fasciae lata, and cranial division of the biceps femoris muscles plus passive traction exerted by the fibularis tertius is limited by tension from the collateral and cruciate ligaments. Flexion of the joint by the semitendinosus, middle division of the biceps femoris, popliteus, and gastrocnemius muscles, plus passive traction exerted by the superficial digital flexor, is limited only by the caudal muscle masses. During flexion the crus is rotated slightly medial, and the femoral condyles and menisci move slightly caudal on the tibial condyles with somewhat more movement on the lateral surfaces (Thomas, 2005).

Angle of hind fetlock joint

The results of the angle of hind fetlock joint measurement revealed a significant increase in Thoroughbred group (142.25 ±0.37 a) among group while Iraqi horse showed the lowest (140.80±0.22 b) average , while the cross breeds showed (142.45 ±0.54 a) average , Means having with the different letters in same row differed significantly (P≤0.05) and LSD value 1.143 * in Angle of hind fetlock joint . There was no significant difference between thoroughbred and cross breed . The hock joint, although composed of numerous bones, has a smaller amount of movement than the knee joint. The partial flexion of the hock joint at all times helps it to absorb shock and reduce the effects of concussion.

Angle of hind hoof

The results of the angle of hind hoof measurement revealed a significant increase in Thoroughbred group (53.35 ±0.42 a) among group while cross horse showed the lowest (49.05 ±0.05 b) average , while the Iraqi horse showed (51.25 ±0.38 b) average , Means having with the different letters in same row differed

significantly (P≤0.05) and LSD value 1.253 * in Angle of hind hoof. The hind foot is usually narrower, has a larger hoof angle, and has a more pointed6,7 appearance at the toe than does the forefoot. Break-over should be evident straight over the toe, and the frog should divide the sole into equal halves. The mean hoof angle in the 7,11,36 hindfoot is usually 55° or greater, and there should be no defects in the wall. The walls should show normal wear on the medial and lateral sides, and the sole should be slightly concave medial to lateral and front to back. The sole of the hind foot is normally more concave than that of the forefoot.

Table (4): Comparison between difference groups in Angles measurement

Angles measurement (cm)	Mean ± SE			LSD value
	Thoroughbred	Iraqi	Cross	
Inclination of scapula	45.95 ±0.29 b	46.50 ±0.58 ab	47.35 ±0.28 a	1.163 *
Angle of shoulder joint	80.15 ±0.21 c	90.40 ±0.22 a	81.90 ±0.37 b	0.791 *
Angle of elbow joint	114.10 ±0.25 c	121.50 ±0.46 b	128.20 ±0.78 a	1.537 *
Angle of fetlock joint	142.80 ±0.25 a	141.75 ±0.32 a	139.50 ±0.68 b	1.647 *
Angle of fore hoof	51.60 ±0.45 a	50.20 ±0.27 b	49.20 ±017 c	ZA
Inclination of pelvis	52.75 ±0.86 a	46.25 ±0.34 b	38.60 ±0.40 c	1.657 *
Angle of hib joint	91.65 ±0.50 a	77.05 ±0.67 b	73.60 ±0.50 c	1.600 *
Angle of stifle joint	122.25 ±0.33 a	121.05 ±0.38 ab	120.50 ±0.54 b	1.214 *
Angle of hind fetlock joint	142.25 ±0.37 a	140.80 ±0.22 b	142.45 ±0.54 a	1.143 *
Angle of hind hoof	53.35 ±0.42 a	51.25 ±0.38 b	49.05 ±0.50 a	1.253 *
Means having with the different letters in same row differed significantly. * (P≤0.05).				

Conclusion and Recommendations

Uncontrolled breeding lead to out of range horses in conformation in comparison to the Iraqi horses. Thoroughbred horses gave the highest measurement in most indices that used in this study. Environment, sex, age, nutrition, exercise, and rest are contributed and affecting horse conformation and lameness problems. Selecting the indices that include in this study associated with good value of conformation. Future studies should be including other horses and different ages for comparisons of conformation.Using genetic represented by PCR and followed by sequencing may be an alternative way of conformation especially there are some features could be explored. Using a digitalized camera for easy way of studying the conformation with especial program

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