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DISTAL LIMB LAMENESS IN DRAUGHT DROMEDARY CAMELS

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ABSTRACT

This study was conducted to study the prevalence and incidence of lameness in draught camels in private camel farms. The incidence and prevalence of the distal limb lameness was 28.22% out of 450 draught camels. Lameness was more frequently observed in the distal forelimbs (53.5%) than hind limbs (46.6%). The foot disorders were the most common disorders causing lameness (59.05%) and the fetlock and metacarpus (MC)/metatarsal (MT) disorders were 40.94%. The distal forelimb affections had a higher incidence of foot disorders (31.5%) and fetlock and metacarpus (MC)/metatarsal (MT) disorders (22.0%) compared with the hind limbs. The prevalent distal limb disorders were the interdigital fibroma (17.3%), foot wounds (14.66%), foot abscess (14.66%), swollen digit (13.3%), the sole ulcer (9.3%), incomplete separation of the nail (6.67%) and septic distal interphalangeal joint arthritis (6.65%). Degenerative joint diseases of fetlock were (21.15%), pastern (6.65%) and coffin joint (9.33%). The MC/MT osteoperiosteal reactions (25.00%), angular fetlock deformity either valgus or varus deformities with toe-out or toe-in (21.24% and 11.53%, respectively) and septic tenosynovitis (21.15%) showed the highest causes of lameness in draught camels. The abnormal camel limb conformations, excessive workloads, trauma, and the camels used for long hours in harsh and unsuitable sandy and rocky ground conditions were considered the causes of lameness. This study will provide an assessment of the incidence of distal limb disorders in working camels.

Key words: Distal limb, draught camel, lameness, foot disorders, fetlock disorders

Draught camels are often overburdened and used for long hours in harsh conditions and suffer from a variety of musculoskeletal disorders and lameness. Camel can carry a load up to 300 kilograms over long distances and more than 450 kilograms over a short distance (Gahlot, 2007). Lameness in camel has widely different etiology which includes direct trauma, nutrition fractures, punctured foot (Gahlot, 2007 and Al-Juboori, 2013) and abnormal conformation of the limbs (Mostafa and Khalil, 2018). The commonly reported surgical musculoskeletal affections were phalangeal and foot affections, punctured foot, foot abscess, avulsion of the toe nail, severed flexors and congenital flexion of the fetlock, medial deviation of the fetlock, laceration at metacarpus (Qauzi, 2010 and Gharu, 2014); fracture, sprain, subluxation and punctured foot (Ramadan, 1994).

Camel lameness was represented through Partial or non-weight bearing by one or more limbs, swelling over joint, pain on palpation, toe-out postures, shivering while sitting, semi flexed hock in sitting postures and asymmetry of the pelvis (Gahlot, 2007). The objective of this study was to identify the range and prevalence of distal limb pathological conditions contributing to lameness in draught camels.

Materials and Methods

This study was carried out on 450 camels belonging to private camel farms from March 2016 to November 2019. The camels were of both sex (112 males and 15 females) with a mean age of 6.65 ± 3.88 years. These animals were examined for various surgical affections of fore and hind limbs

Lameness recorded in the present studies were based on history and clinical examination. The occurrence of lameness and surgical affections of the distal fore and hind limbs were examined clinically and radiographically. Clinical examination included a gross examination of the distal fore and hind limbs of a camel in standing position and palpation.

Animals were observed in standing from front, sides, and rear positions and during a motion for diagnosis of lameness and surgical conditions. The supportive, swinging, or complementary type of lameness were determined. Camel progression in a straight line, in a circle (clock and anticlockwise),

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and by observing gait on sandy, hard tracks (Gahlot, 2007). The solar and dorsal surface of foot was examined after removing the dirt by washing and cleaning for swelling, embedded foreign body, growths, exuberant granulation, sinus tracts, and others. The site of pain was located by physical examination, thumb palpation, or hoof tester. Exploratory puncture of the swelling was done to aspirate the contents in order to differentiate abscess from other swellings.

Clinical examination was performed under xylazine (Xylaject, Adwia Co., Cairo, Egypt.) at a dose rate of 0.25 mg/kg after securing camel by rope halters and taken into lateral recumbency. A distal limb radiographic study was taken in routine dorso/palmar/planter and lateromedial projections. For foot radiography dorso/palmar/planter projections were made. The radiographic factors used were 55-65 Kvp and 10mAs and 80 cm FFD (Mostafa *et al,* 1993).

Incidence/ occurrence of clinical distal limb surgical conditions causing lameness was recorded on either the fore and hind limbs. The incidence and percentage were represented as the mean ± standard error (±SD).

Results and Discussion

The number of camels with the distal limb lameness was 127 (28.22%) out of 450 examined camels. Gahlot (2013) found that the incidence of lameness in camels was 24.61% followed by arthritis (16.92%) and wound (16.92%). The incidence of lameness in racing camel was found to be 9.39% in acute and 2.50% in chronic lameness (Al Juboori, 2013). However, the incidence of lameness in draught camels in the present study was higher compared with racing camels. Furthermore, the incidence of musculoskeletal disorders causing lameness in camels was 24.63% in forelimbs and 26.15% in hind limbs (Quazi, 2010). In addition, Singh and Gahlot (1997) reported the incidence of musculoskeletal lameness in the clinical (10.10%) and in the field (55.62%).

Reix *et al* (2014) and Broster *et al* (2009) reported that the incidence of lameness in working donkeys and horses was 96%. The differences in incidence of lameness between camels and equine could be attributed in the present study to the distinguishing features of the camel's limbs as being relatively long and slender strong to raise the body away from hot sand and have a broad flat leathery pad to adapt to the desert environment (Soliman, 2015).

The current study revealed the incidence of the forelimbs was 53.5% and 46.6% in the hind limbs. Similar results coincided with Al-Juboori (2013) who diagnosed the incidence of camel forelimb lameness (62.45%) and hind limbs (37.55%). In this respect, Stashak and Hill (2002) reported that 95 % of lameness was found in the distal forelimb of the horse due to the forelimbs receive the shock of landing and subjected to a great concussion. Contrary to our findings, draught donkeys and horses had a greater significant hind limb lameness than forelimbs due to the propulsion required for draught traction work (Maranhão *et al,* 2006).

Accordingly, in the present study, the distal forelimb affections had higher incidence of foot disorders (31.5%) and fetlock and metacarpus (MC)/metatarsal (MT) disorders (22.0%) compared with the hind limb (Fig 1). Table (1) revealed that foot disorders were the most common distal fore and hind limb disorders causing lameness (59.05%) and the fetlock and metacarpus/metatarsal disorders were 40.94%. The similar findings were also diagnosed in foot disorders in camels (59.37%) (Gahlot, 2011).

The interdigital fibroma (17.3%) appeared as a firm mass in the middle of interdigital space covering the dorsal aspect of both digits and the skin covering of the fibroma was ulcerated (Fig 2). In bovine, Amstel and Shearer (2008) pointed out chronic skin irritation from grazing stubble or rocky pastures or poor limb conformations were the common cause of interdigital hyperplasia. Consequently, draught camel fibroma in the present study might be attributed to hard chronic irritation of unsuitable working surfaces such as sharp rocky stones and thrones

Foot wounds (14.6%) were mainly punctured wounds. The wound had swollen, hot, painful resulted from sharp pointed foreign bodies at the heel or lateral aspect of the footpad or at the abaxial aspect of the 4th digit (Fig 3). In previous study Gahlot and Chouhan (1992), Purohit and Chouhan (1992), Ramadan (1994), and Gahlot (2011) reported that punctured foot had the highest incidence in camels. The penetration of the sole by glass pieces, thrones, nail, and sharp foreign bodies was considered the main cause of punctured foot in camels (Jhirwal *et al,* 2007). Therefore, draught camels in the present study have a high incidence of the punctured foot. This suggests that the road surfaces predisposes foot for the injuries like punctured foot. Furthermore, secondary complications were recorded in draught camels such as septic distal interphalangeal joints and phalangeal phlegmon.

Swollen digit (13.3%) clinically appeared as painless, diffuse firm swelling involving one

Table 1. The distribution of the most common distal limb disorders in the fore and hind limbs in draught camels.

Surgical affections	Limb		Total	Percentage
	Fore	Hind		
1. Foot disorders				
Interdigital fibroma	8	5	13	17.34%
Localised foot abscess	7	4	11	14.66%
Foot wounds	5	6	11	14.66%
Swollen digits	6	4	10	13.33
Sole ulcer	3	4	7	9.34%
DJD coffin joint	2	5	7	9.33%
Nail affections	2	3	5	6.67%
DJD pastern joint	3	2	5	6.65%
Septic coffin joint arthritis	3	2	5	6.65%
Ankylosing arthritis	1	0	1	1,30%
Total foot disorders	40	35	75	59.05%
2. Fetlock disorders				
Osteoperiosteal reactions(MC/MT)	9	4	13	25.00%
Angular medial deviation	6	5	11	21.24
Septic tenosynovitis	4	7	11	21.15%
DJD fetlock	5	6	11	21.15%
Angular lateral deviation	4	2	6	11.53%
Total fetlock disorders	28	24	52	40.94%
Total fore and hind limbs	68	59	127	28.2%

DJD: Degenerative joint disease. MC/MT: metacarpal/metatarsal.

digit extending to the phalangeal areas (Fig 4). Radiographically, increased thickness of the soft tissue of the affected digits was found to be associated with osteoperiosteal reactions on the PII and PIII. This could be attributed to the continuous repeated traumatic injuries of these digits during walking on rocky, stony and uneven surfaces. In addition, Ramadan (1994) diagnosed cases of diffuse swelling of the digits and termed an elephant foot due to the sand flies biting.

The sole ulcer (9.3%) appeared an irregular small circumscribed loss of the keratinised layer of the footpad (Fig 5) with a severe loss in the surrounding keratinised pad at the solar aspect. Weaver (1975) attributed ulceration of the sole in cattle to bad housing and husbandry conditions such as short, rough standings, gross neglect of hoof trimming, and the excess feeding of concentrates. On the other hand, Greenough (2015) reported sole ulcer results from activation of metalloproteinase in subclinical laminitis and crushed and ischemia of the corium associated with the unhygienic condition. The camel sole ulcer might be due to overworking in unsuitable roads.

In the present study, draught camels have a high incidence of foot disorders, i.e. foot abscess (14.66%), incomplete separation of the nail (6.67%), and septic distal interphalangeal joint arthritis (6.65%). Foot abscess either interdigital or localised (Fig 6) were considered as a common sequel to traumatic pain penetration and punctured wound caused by rocky stone and throne planet (Dioli and Stimmelmayr, 1992). The observed causes in the present study were excessive workload and long draught hours on unsuitable road surfaces.

Degenerative joint disease (DJD) of the proximal (Fig 7a, b) and distal interphalanageal (Fig 8a, b) joints were seen and radiographic pictures showed uneven joint spaces and periarticular bone growths. Ramadan (1994) and Gahlot (2007) reported that camel arthritis and punctured foot were the main causes of lameness in camels. In addition, ankylosing arthritis of the PIP joint associated with osteoperosteal reaction covering the distal half of the PI and proximal 2/3 of the PII was seen in aged camel more than 10 years old. This might be attributed to traumatic injuries or long harsh hours working in a rocky stony and rough or uneven grounds. The same has been reported in camels by

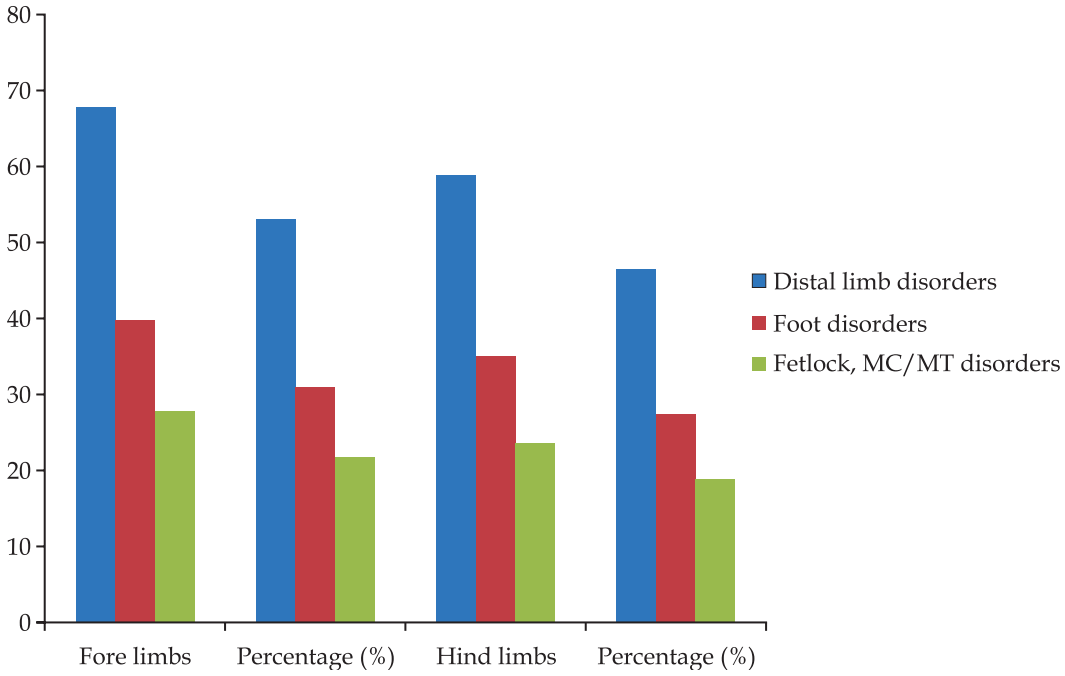

Fig 1. Histogram for distribution of distal limb lameness in fore and hind limb of draught camels.

Fig 2. Interdigital fibroma at the proximal part of the interdigital space with phlegmon of the foot (arrow).

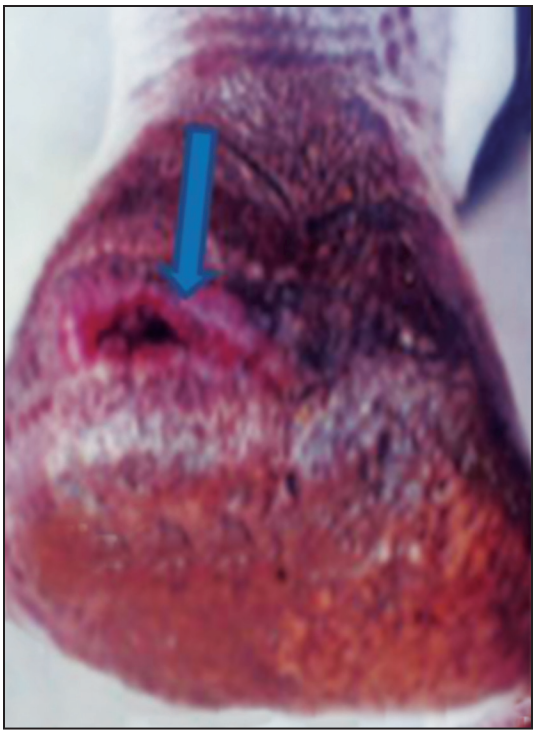

Fig 3. Punctured foot wound at the heel (arrow).

Ramadan (1994). Similar findings have been reported in draught horses predisposed to OA of the PIP and DIP joints with short, upright pastern and other factors such as angular limb deformities toe-in or toe- out conformation could play a substantial role (Goble, 2011).

Mostafa and Khalil (2018) reported that the most common camel limb conformations predisposed to fore and hind limb lameness were base-wide (26.9%), base narrow (10.1%), toe out (15.4%), upright pastern (13.9%) and sloppy pastern (18.2). Stashak and Hill (2002) reported that upright pastern in

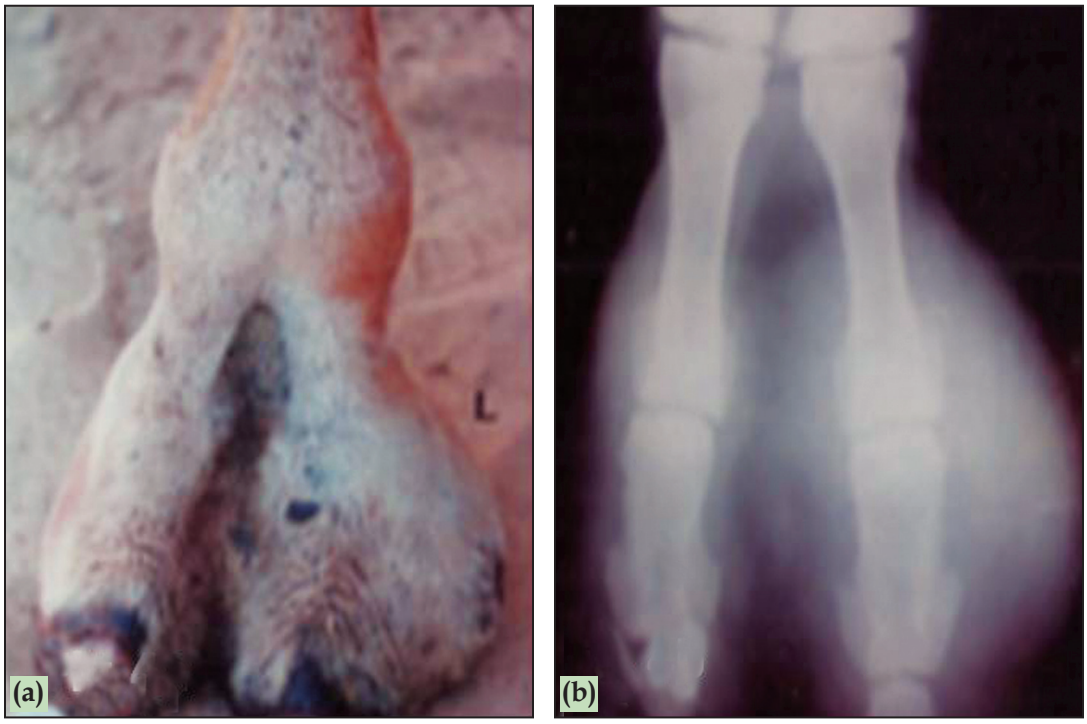

Fig 4. **(a)** Some degree of digital swelling at the 4th left hind digit, **(b)** Radiography showed severe soft tissue thickening at abaxial digit.

Fig 5. Superficial circumscribed sole ulcer with excessive wearing of the surrounding keratinised foot pad (arrow).

Fig 6. Open interdigital abscess discharging pus (arrow).

Fig 7. **(a)** Degenerative Joint Disease (DJD) in form of osteoarthritis of the proximal interphalangeal joint (PIP) with marked swelling at the abaxial digit. **(b)** Radiography revealed osteosclerotic bone reaction, osteoperiosteal reaction at the distal articular surface of PI and proximal articular surface of PII. Marked lipping on the axial border of PII.

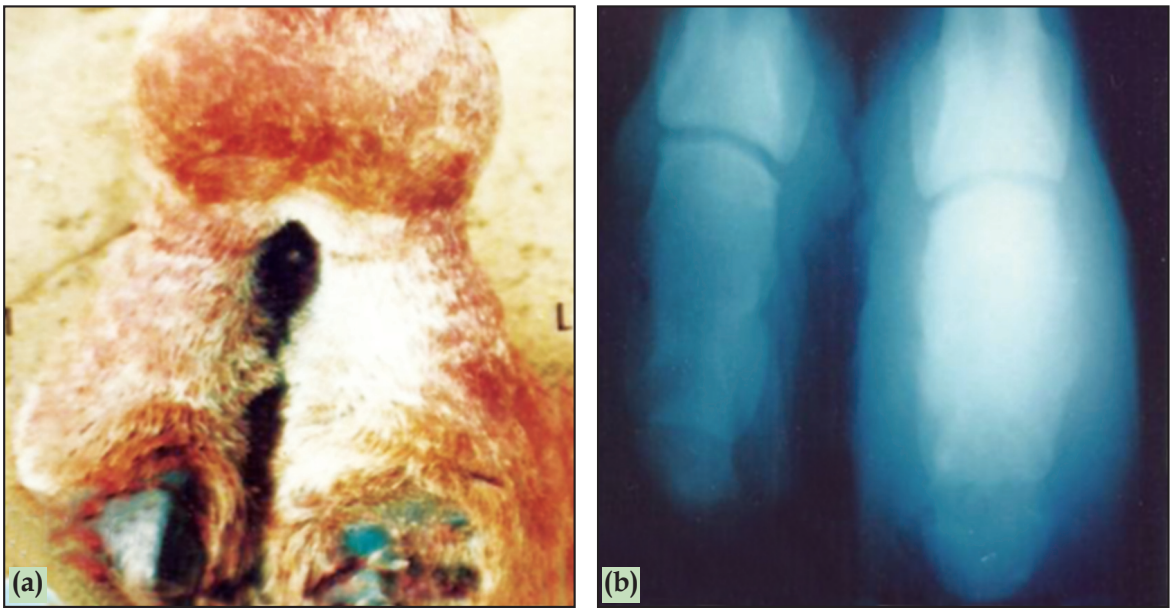

Fig 8. (a, b): DJD in form of osteoarthritis of the distal interphalangeal joints (DIP) or coffin joint . Notice osteoperiosteal reaction covering the PII and PIII and involving the DIP.

horses predisposes to concussion and injuries to the fetlock, phalangeal, and soft tissue structures. Moreover, Anderson *et al* (2004) reported that toe out creates excessive strain in the inner side of the hoof, pastern, and fetlock predisposing to DJD, ring bone and SDFT tendonitis, and suspensory desmitis in horses. Therefore, the observed DJD of the fetlock, pastern and coffin joints in the present study could be attributed to abnormal camel limb conformations associated with excessive workloads and the camels used for long hours in harsh unsuitable ground conditions. Similar findings have been observed in working horses (Broster *et al,* 2009) and donkeys (Reix *et al,* 2014).

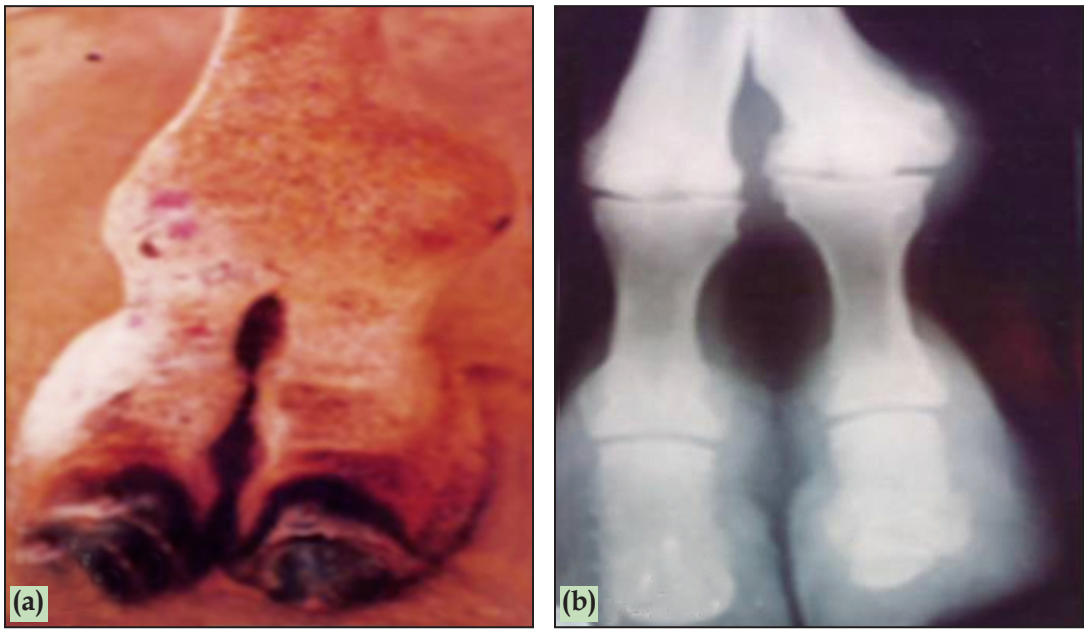

Fig 9. **(a)** Angular limb deformities with valgus and toe out conformation and **(b)** Varus with toe in conformation.

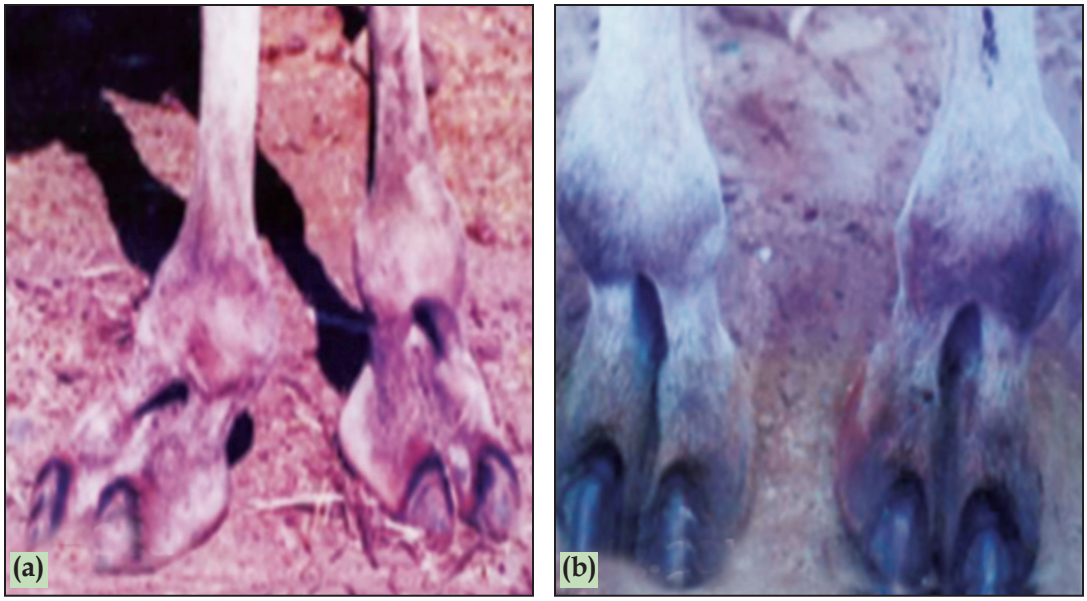

Fig 10. **(a)** Angular fetlock deformity with marked swelling, medial fetlock deviation, **(b)** Dorso-palmar radiograph showed broadening and irregularity of the articular surface of the distal end of the metacarpal.

The current study revealed that the metacarpal (MC)/metatarsal region and fetlock joint region had 40.94% of the distal limb disorders. Stashak and Hill (2002) reported that the superficial situation of the horse distal limb structures were accounted for high pathological disorders

Angular fetlock deformity either valgus or varus deformities with toe-out or toe-in were 21.24% and 11.53%, respectively (Fig 9a, b). Fahmy *et al* (2006) diagnosed angular fetlock deformity of the hind limbs in 6929 camels suffering from different degrees of valgus or varus deformities. Moreover, toe out conformation induced excess strain on the inner side of the pastern, and fetlock predisposes DJD of the fetlock and pastern, ring bone and foot soreness in the horses (Thomas, 2005). Similar results have been observed in camels fetlock DJD (Fig 10 a, b) and foot disorders in the present study.

In the present study, the osteoperiosteal (25%) reactions of both MC/MT regions were observed most commonly in the palmar/planter or dorsal aspects as single or multiple osteophyte reactions or exostosis. In addition, open traumatic septic tenosynovitis for flexor tendons (21.15%) was also noted. Aljaboori (2013) diagnosed sore shin with osteophyte formation (10.64%) in racing camels due to the traumatic opening of soft tissue structures. Goble (2011) attributed exostosis of MT/MC in the horse to direct trauma or instability due to abnormal limb conformation. In conclusion, this study reveals a high prevalence incidence of distal limb lameness in draught camels.

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