Arthrogryposis with attendant features of achondroplasia in Gudali calf of Nigerian cattle breed at Akinyele International Cattle Market, Ibadan, Southwest Nigeria: an epizootiologic investigation

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Abstract

This investigation describes a rarely reported occurrence of arthrogryposis in trade cattle calf of Gudali breed in Ibadan, Oyo State, South west, Nigeria. The animal was gaunt, with severely compromised gait and notable contracture of the radio carpal and tibio tarsal joints. There were varying degrees of abduction of the limbs. The animal was purchased at the age of six months in Akinyele International Cattle Market (AICM) at Akinyele Village, Akinyele Local Government area of Ibadan, Oyo-State, Nigeria for subsequent fattening operation. The condition was characterized by poor feeding performance and general unthriftiness. The defects were characterized for quality control points in good calf-selection for fattening and rearing from AICM, Ibadan. The haematology showed lower than normal blood parameters except for the Red Blood Cell (RBC) counts and the Mean Corpuscular Haemoglobin Concentration (MCHC), which may be the reason for lethargy and poor growth observed. The calf was recommended for culling due to subsequent pedal paralysis ensued. Thus, age of acquisition of calves for fattening or rearing at AICM is crucial to avoid such congenital abnormality. Acquisition of yearling calf or above age when the abnormality was obvious is recommended with enhanced veterinary support service at AICM.

Keywords: Cattle, Quality control points, Congenital malformation, Unthriftiness, Pedal paralysis

Introduction

Congenital anomalies are developmental disruptions resulting from errors in the complex normally well-orchestrated events in the development of a full-fledged animal (Spranger *et al.*, 1982; Obeg *et al.*, 2010). They have been widely reported indifferent species. Although the event or agent resulting in disrupted development remains undefined for many recognizable congenital conditions, technologic advances in the field of teratology have identified an increasing number of specific genetic, environmental and infectious agents as etiologic determinants of certain cases of defective fetal development (Pollack and Divon, 1992; Maulik, 2006). Arthrogryposis is a congenital defect often described as an extreme form of contracted tendons which makes many hock joints

abnormally flexed or extended and is seen to be secondary to a primary neuro muscular malformation. It has been reported in horses, cattle and sheep and this condition may involve two, three or all four limbs. The aetiology for this condition is believed to be multifactorial although genetical disorder has been fingered in most cases. While alluding to genetics, (Narwot *et al.*, 1980) posited that autosomal recessive gene with complete penetration in homozygous state in certain breeds of cattle causes arthrogryposis. (Jones, 1999) said chromosomal aberrations within the home box gene family was the contributing factor. Calves of different breeds of Nigeria cattle constitute 2% of weekly trade cattle population of 1400 heads transported from Northern parts of the country, Chad, Niger and Cameroon to Akinyele International

Cattle Market (AICM), Ibadan for sale. Also, 5% of these calves are born and reared in the market as a result of advanced pregnancy of some slaughter heifers and cows transported to the market (Adeyemi, 2018). Traditionally, 90-95% of Nigeria cattle is under nomadic (extensive/roaming) system throughout Nigeria by Fulani herdsmen and culturally will not normally sell-off the calves but retain them as replacement stock (heifer) and fatteners. Hence, AICM serves as a ready source of both slaughter cattle and calves for rearing in Ibadan and its environs.

Materials and methods

Akinyele cattle market owned by Oyo state government is situated in the Northern part of Ibadan city at exactly Latitude $07^{\circ}23'1''$ North and Longitude $03^{\circ}54'1''$ Geographic Positioning System (GPS handset). The market has become a common source of calves for peri-urban and urban level cattle rearing. The cattle rearers are mostly small or middle scale holders and are rapidly increasing in and around Ibadan, the largest city in West Africa due to rapid human population growth and increasing demand for beef. Major Nigerian cattle breeds in the market are Bunaji (White Fulani), Gudali, (Bokolo), Barahaji (Red Bororo), Kuri (mainly from Chad and border areas) and other minor breeds. The market population proportion of these breeds are; 42%, 20%, 25%, 10% and 8%, respectively.

Epizootiology

The epizootiologic investigation of confined four calves showed some developmental and anatomical defects in a female calf of Gudali breed. The defects were characterized for quality control points in good calf-selection for fattening and rearing from AICM, Ibadan. A Calf among four female Sokoto Gudali breed calves (25%) purchased at estimated age of

six months and reared in total confinement between January, 4th 2016 and March 9th 2017 exhibited obvious developmental congenital defects at 8 months of rearing (one year two months of age). This investigated case presents our findings on a female Gudali calf with congenital abnormality. The physiological parameters were determined for performance potential and implications of such abnormality to a farmer. The haematological parameters determined were Red Blood Cell (RBC) counts, Hemoglobin Concentration (HB), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC).

Heifer calf developmental defects

Anatomical and growth defects were observed at one year eight months of age by the owner whereas onset of the manifestation of the abnormality was not known. Clinical examination on visual assessment of abnormal calf showed the skin around the neck and the dewlap very rough, hair growth was sparse. Compared with similar heifer calf of about the same age, the calf was runted and slightly emaciated; The proximal portion of both forelimbs are abducted up to the radio carpal joint while the rest of the extremities are abducted, rotated away from the median, causing the hooves to be pointed away from the median plane as shown in Fig.1. There was a similar presentation of the hind limb which was not as pronounced as the forelimbs. The musculature around the radial joints was sparse, thus accentuating the size of the radio carpal joints in the forelimbs and the tibio tarsal joints of the hind limbs. It also presented sluggish staggering gait compared with apparently healthy calves of the same age range. Both hind limbs appear to be dragged, but this was not highly pronounced. No ill-health was observed

until March 9th, 2017 when the calf developed prolonged pedal paralysis.

Clinical parameters

The clinical thermometer reading through the anus was 37.5°C while the pulse rate using femoral vein bits was 83 per minute. The mucous membrane of the gum was pale (anaemic).

Blood examination

Blood sample of the calf with achondroplasia was collected into clean and sterile bijou bottle containing heparin through the jugular vein after disinfection of jugular furrow with methylated spirit and damping, using sterilized disposable 21/19-gauge needle attached to 20ml hypodermic syringe. Blood was taken under gentle

aspiration until 15mls had been obtained and analyzed at the Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan. The Red Blood Cell (RBC), Haemoglobin concentration (HB) and Packed Cell Volume (PCV) blood indices were determined as described by Jain (1986). Mean Cell Volume (MCV) and Mean Cell Haemoglobin Concentration (MCHC) were calculated from RBC, HB, and PCV.

Prognosis of the calf with achondroplasia defect

The calf was recommended for culling due to subsequent pedal paralysis that ensued.

Results and discussion

Fig 1: A calf with developmental defects

Arthrogryposis with attendant features of achondroplasia in Gudali calf of Nigerian cattle breed

The report of congenital malformations in ruminant livestock are relatively scarce in Nigeria. The drift in reporting appears to be heavily invested to dental skull and mandibular abnormalities (Olopade *et al.*, 2010; Yahaya *et al.*, 2011; Samuel *et al.*, 2015). Reports which involved limb deformities alongside multiple malformations was made by Ibrahim *et al.* (2006) in cows, and left sided brachial agenesis in Sahel goat (Samuel *et al.*, 2015). Arthrogryposis multiplex congenital or arthrogryposis, describes congenital joint contractures in two or more areas of the body. It derives its name from Greek word which implies 'curving of joints'. The condition is also associated with several other organ deformities in any part of the body (Mangolis and Luginbeuhl, 1975; Hall *et al.*, 1983; Bankers, 1986). Though detailed accounts of these condition has been well documented in developed

countries over a long time (Mangolis *et al.*, 1975; Pollack *et al.*, 1992), reports of cases of arthrogryposis in Nigeria and the West African region are scanty (Bankers 1986; Ibrahim *et al.*, 2006). Apart from the skeletal deformations, which are clearly evident. There is a suggestion of multiple organ involvement due to poor skin presentation, and absence of anatomical and clinical features of reproductive maturity. Arthrogryposis has been linked to myriads of aetiologies, both environmental and genetic. Arthrogryposis is one of the many cases of congenital anomalies which a veterinarian will recognize in the field. As far as the environment is concerned, there is dearth of facility which would enable determination of the factors which negatively impinge on the all development *in utero*. The aetiology or predisposing factors responsible in the region where the case is presented to remain speculative.

Table 1: Comparative haematological results of calf with achondroplasia

PARAMETERS	PCV	Hb	RBC	Reticulocytes	MCV	MCH	MCHC
(NORMAL)	(%)	(g/dL)	(x106/mm ³)		(fl)	(pg)	(g/dL)
NORMAL VALUES (Merck Manual 2012)	30- 45	10 -15	5.0 - 10.0	0.0 - 0.6	39- 55	13-17	30-36
CALF VALUES	21.0	6.9	8.26	-	25.0	8.0	33.0

Fig 2: A section of cattle breeds at AICM Ibadan

Conclusion and recommendation

Many of such congenital manifestations may not be very obvious in neonates and juvenile calves of both sexes in the cattle hence routine veterinary examinations both physical and laboratory of trade calves for rearing and fattening are essential. Such intensive and systematic investigations are not readily available in the market. Also, farmers are advised to acquire calves up to a year old and above for the purpose of rearing or fattening since this is the age of obvious physical manifestations of such congenital abnormalities especially in Gudali/Sokoto breed of Nigerian cattle as investigated in this report. Although AICM has many sections based on cattle breeds, there is current need for sections to care for pregnant cows and heifers, nursing cows and neonate calves in the market. Also, Veterinary support services need intensification for those groups of cattle in the market.

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