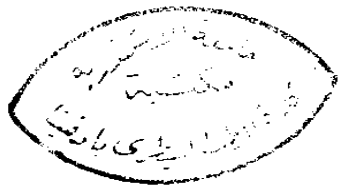

SOME STUDIES ON DOWNER COW SYNDROME IN DAIRY CATTLE

by

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To

Faculty of Veterinary Medicine

Alexandria University

For

Master Degree

(Veterinary Medicine)

1995

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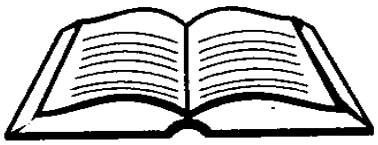

بسم الله الرحمن الرحيم

سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم

صدق الله العظيم

جامعة الأسكندريه
كلية الطب البيطرى

بسم الله الرحمن الرحيم

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قـررت لجنة الحكم والمناقشه ترشيح الطالب ط.ب/ أحمد محمد خليل للحصول على درجة الماجستير فى العلوم الطبيه البيطريه تخصص < الطب العام والعلاجى >.

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(والمشرف على الرساله) .

تحريرا فى ١٩٩٥/١٠/١م

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

First thank to " Allah " who help me to finish this study .

I wish to express my thankfull gratitude to prof. Dr. Mahmoud Ismail prof. of general medicine -faculty of Vet. Med. Alex. Univ. who allowed me the chance to complete this study under his keen supervision and actual encouragement .

My sincer thank to prof. Dr. M. El-Fadaly director of Vet .Service Department -Ministry of Defence for his valuable guidance , he has given so much of his experience and scientific knowledge .

I wish to express sincer gratitude to Dr Ali Metwalli ,lecturer of general medicine -faculty of Vet.Med. Alex. Univ.for his good help.

My sincer appreciastion to prof. Dr Nabila S. Degheidy prof .in parasitology and infectious disease division -National Research Center ,for her continuous helpful advice and actual cooperation during this work .Also my deep thank to prof. Dr .Wahid M. Ahmed prof. of reproductive and artificial insemination division , National Research Center , for his cooperation in biochemical analysis of this study and his good advices.

It is my great pleasure to express deepest and sincere thanks to my colleagues and soldiers in EL-Nobaria military farm especially Dr. S.A.EL-atrash for their help throughout the current work.

Also I express deep thank to my colleagues in veterinary service department in ministry of defence for their help and encouragement.

DEDICATED TO :

MY FATHER

MY MOTHER

MY WIFE

A N D

MY KIDS

CONTENTS

INTRODUCTION

Introduction

The general term "downer" has been in use for a long time, it appeared in print as early as 1905 when Upton Sinclair used it to describe debilitated cattle of Chicago slaughter houses in his Classic book "The Jungle".

The application of the term by various authors has not been constant, Hallgren (1955), Hemsley (1957) and Rosenberger (1958) regard downers as cows that are normal in every aspect, but unable to regain their feet, Kronfeld (1964) used the term creeper cow to describe alert downers, Blood and Handerson (1974) considered the condition separate from parturient paresis, Cox (1982) stated that many primary factors, including parturient paresis may cause the initial stage of recumbency followed by secondary muscle and nerve damage caused by tissue compression, this damage leads to permanent recumbency even if primary factors have been ameliorated by therapeutic measures and the cow considered downer if recumbent for more than 24 hours in sternal position. A common observation of downer cows was that they were over-conditioned , Allen and Davies (1981) considered under nutrition is the most important cause of prolonged recumbency. Diagnosis is based on history, clinical finding and biochemical analysis.

Although the syndrome has seen at all stages of production cycle, most cows are affected after parturition and usually are in peak lactation years and high producers. Incidence vary according to definitions of downers, Allen and Davies (1981) stated that as many as 20% of cows attended by veterinarians for recumbency in a parturient period have been affected, and the downer cows cause not only significant economic loss but also emotional stress to the man of dairy production .

There is no universal cause of the downer cow syndrome (D.C.S), but there are numerous causes and no list could be completed.

This study was planned to secure the following :-

1- some epidemiological studies.
2- clinical picture of diseased animals
3- effect of disease on some biochemical constituents of the blood of affected animals.
4- effect of stages of production cycle on the biochemical constituents of the blood of daily cattle .

Literature

I . Epidemiology

Rosenberger (1958) stated that most downers occurred as sequelae to milk fever, but that they could occur at any time of the year and in dairy cattle of any age.

Lavor et al. (1961) reported that about 15% of parturient cows do not respond to calcium therapy.

Jonsson (1963) stated that downer cow syndrome usually occurs after parturition, and pluriperous cows are mainly affected.

Bjorsell et al. (1969) suggested that downer cow syndrome is a complication of milk fever, and that muscle damage is a common explanation of why the cow remain downer.

Johonson and Pehrson (1969) defined the downer cow as one with parturient paresis, which , did not respond to 2 parental therapy with calcium salts and the primary cause of the condition were myocamdiosis, hypocalcaemia, impaired liver function and hypophosphataemia.

Curtis, et al. (1970) recorded 70 out 82 cases occurred from November to April and suggested that the downer cow syndrome is a complication of parturient paresis because 91% of downer was affected following parturient paresis.

Flagsted (1970) demonstrated a degenerative myopathy in the form of ischaemic muscle necrosis occurs commonly in cattle which are recumbent for more than 48 hours.

Blood and Handerson (1974) reported that the downer cows may be normal except for recumbency and there is severe circulatory crisis occurred near parturition in affected cows.

Arthur (1975) stated that hypocalcaemia was a chief cause of recumbency in parturient and puerperal cows and other conditions may cause the same condition like severe puerperal toxemia, muscular weakness and lesions of locomotor systems.

Julien and Conard (1977) recorded that the incidence of this disease has corresponded to significant changes in dairy management in the past two decades.

Radwan (1979) found that the most susceptible age for downers was 6 - 9 years and from 22 downers were 14 recently calved, 6 at different stages of pregnancy, and 2 non-lactating non-pregnant.

Allen and Davies (1981) stated that the downer cow syndrome may occur independently or as sequel to milk fever or hypomagnesamia.

Cox et al. (1981) stated that the term downer cow typically refers to a cow which in sternal recumbency and unable to rise . He also gave experimental confirmation to the importance of pressure damage to the pathogenesis of the downer cow syndrome.

Wildman et al. (1982) stated that the increased incidence of metabolic disease in high producing dairy cows indicates a need for concern with each stages of the lactation cycle.

Cox (1982) by using the criterion of 24 hours of paradoxial sternal recumbency, found that, an incidence of 21.4 cases per 1000 cows a year ; 33% recovered, 23% slaughtered and 44% died or euthaenatized. He found that 58% of the cases occurred within the day of calving and 97 % periparturient or occurred the first 100 days of lactation and the highest incidence of downer condition was in winter although the highest calving rate was in fall.

Andrews (1983) described the downer cow from clinical standpoint as, related to calving period , down more than 24 hours, had two calcium injections and no obvious reason for being down.

Curtis et al. (1984) believed that the increased potential exercise per day predisposed cows to parturient paresis.

Erb et al. (1984) thought that the stress of milk production predisposes to some disorders and may interfere with fertility.

Curtis et al. (1985) suggested that feeding higher intakes of protein and energy in the last 3 weeks of dry period may reduce the incidence of metabolic and reproductive disorders .He also stated that these disorders occur as complex ,a cow that develops one disorders is at increased risk for other disorders.

Updike (1985) stated that in human and domestic animals, these compartments are best developed in the antebrachial and crural regions.

Andrews (1986) stated that the downer cases can occur at any time, but most are associated with parturition and the etiology is still not fully understood. He observed that the cases of recumbency around parturition can involve, metabolic disorders, toxaemia, injuries during or following calving and management and the secondary damage is responsible for downer cow syndrome.

Cox et al. (1986) concluded that there are no magic bullet for downer cows and no completely reliable diagnostic /prognostic tests, prevention is preferable to therapy and the pressure damage must be reduced concurrent with treatment of metabolic or toxic problem.

Fenwick et al. (1986) reported that 1.9% of 584 milk fever cases in Victoria were downer cows.

Onapito (1986) revealed that the nature and extent of muscle and nerve damage in downer cows appears to be directly related to the degree of pressure elevation and the duration that, intramuscular pressure stays above critical capillary perfusion pressure. He also concluded that recumbency -induced damage in the downer cow syndrome, has mainly similarities with compartemental/crush syndrome of human but also has many differences in presentation and pathogenesis, which appear to have anatomic basis.

Clarck et al. (1987) stated that 39% of downer cows recovered ,30% died and 32% were killed and precalving cows had 11% more death and 7% less survivors than post calving cows

Rao et al. (1987) reported that downer cow syndrome characterize by inability of a post parturient cow to stand voluntary but remain clinical normal.

Cox (1988) thought that the laboratory examination are not useful in most downer cows and in general, clinical observation is considerably more productive and the prognosis for the downer cows is dependent, not only on the cow herself but also on the willingness and ability of the caregiver to provide good nursing care.

Grohn and Erb (1989) stated that all of the metabolic disorders except udder edema were directly interrelated. They found also that the milk fever plays a central role linking to all of the other disorders and there may be few survivors of downer syndrome .Both downer cow syndrome and udder edema appear to be dead ends in their scheme of interrelationships even though they occur early in the periparturient period.

Milian et al. (1989) reported that downer cows more likely to end in immediate culling, which was particularly costly to the farmers.

Jonic et al. (1990) concluded that downer cow syndrome most frequently present a complication of puerperal paresis.

Zepperitz (1990) thought that hypocalcaemia resulted from excessive withdrawal of milk.

Barnouin and Chassagen (1991) stated that the risk for both retained placenta and milk fever appear to be greatest in old cows fed calcium fresh or ensiled fodder diets poor in cereal.

Tucker et al. (1991) suggested that feeding 1% Ca Cl_2 to dry cow for three weeks prepartum could be suitable method to prevent parturient paresis.

Chihaya et al. (1992) considered the downer cow syndrome one of acidosis-inducing factor which may have predispose to alimentary mycosis.

El-Fadaly and Radwan (1992) reported that the progressive increase in foetal weight, especially during the last third of pregnancy, imposes large demands on the matter, furthermore and after parturition. The formation of colostrum and beginning of lactation, constitute a heavy load on the animal body that may affect some cows especially aged ones beyond the limits of physiologically normality.

Jensen et al. (1992) concluded that the analytical results should not be assessed by critical differences alone, but should also be compared with the corresponding reference intervals.

Kumar et al. (1992) reported that various etiological agents such, milk fever not responding to calcium therapy, hypophosphataemia, hypokalaemia, fat cow syndrome, vitamin E and Selenium deficiencies, excessive protein intake and trauma at time of parturition have been proposed to be the cause of downer cow syndrome and the line of treatment depends upon the etiological agent involved.

Correa et al. (1993) observed that the clinical hypocalcaemia and still birth increased the risk of downer cow syndrome fivefold.

Jordan and Fourdrain (1993) recorded that the incidence of metabolic disorders: parturient paresis 7.2%, displaced abomasum 3.2%, ketosis 3.7%, and non specific downer cow syndrome 1.1%, in the top milk producing herd.

Madel et al. (1993) found that the lack of exercise, low protein feeds fed during pregnancy, stress induced by changing cow sheds, and sudden introducing of concentrates were the main causes of metabolic disorders.

Walt et al. (1993) concluded that food deprivation for 72 hours in cattle can not be regarded as major stressor.

Steffen et al. (1994) stated that necessity of a thorough examination after obstetrical manipulation is stress with special reference to problems occurring in recumbent cows.

II - Clinical picture

Hallgren (1955) described the downer cows as alert and clinically normal except for inability to rise.

Bjorsell et al. (1969) defined downers as cows with psyches. maintaining normal appetite but simply unable to rise.

Fenwick (1969) collected data on 400 consecutive cases of recumbent cows believed to have had milk fever and all cows were included had mastitis or metritis. Toxemia, edema of the vulva , or leg injuries without some degree of narcosis . Exceptions did occurred , two cows were in lateral recumbency, blooted , regurgitating rumenal contents and gasping in extremes of staggering . He suggested also other disorders occurred as a result of prolonged biochemical upsets as ; limb dysfunction and hypothermia.

Curtis et al. (1970) stated that a cow with parturient paresis, showing the typical attitude with the neck flexed laterally and the head resting on the shoulder.

Allen and Davies (1981) stated that the downer cow is usually bright and often continues to urinate unless she is suffering from additional disorders. Her attempt to rise are often half-hearted and when she is strongly stimulated, She will often extend her neck to the ground, open her mouth and protrude her tongue and groan but still make no attempt to rise. Many cows display the creeper syndrome when they crawl around the box but unable to stand. The cow may lie on her side with all four legs outstretched, or lie on her brisket with her hind legs stretched out behind or flexed under her body. When trying to rise she has difficulty in extending the joints of her hind limbs and the fetlock joint often knuckles over. Sometimes she will straighten her fore limbs and sit up like a dog but will not make attempt to raise her hind quarters.

If the cow is recumbent owing to injuries during calving the vulva will often be swollen and there will sometimes be a copious discharge from the vulva.

Cox (1982) believed that the criterion of remaining in sternal recumbency for 24 hours after initial recumbency is the choice for a definition of the downer cow.

Rebhun et al. (1984) reported that most downers will stand on the fore limbs after some prodding, especially when electrically prod.

Andrews (1986) stated that the typical downer cow is bright and alert. It will eat and drink normally, with normal urination and defection and the rectal temperature is usually normal as is the respiratory rate but often the pulse rate is raised.

Cox and Onapito (1986) observed that many downer cows can stand on the forelimbs, but the hind limbs are always non functional or paretic. They considered the body weight is a reason for being cattle are susceptible to the downer problem.

Roussel (1986) found that clinical findings in the experimental downers included swollen, extended rear limbs and knuckling of rear fetlock.

Cox (1988) stated that laboratory examination are not useful in most downer cows, and in general clinical observation is considerably more productive.

Correa et al. (1993) suspected that common causal association may underlie clinical hypocalcaemia, stillbirth, dystocia, retained placenta, and downer cow syndrome.

III . Biochemical constituents of the blood :-

1- Serum Minerals .

Pribyl (1933) recorded that hypophosphataemia in blood of cows affected by antepartum paralysis, whereas, both, hypocalcaemia and hypophosphataemia were recorded in serum of cows suffering from post partum paresis.

Robertson et al. (1948) reported that in cases of milk fever which did not respond to calcium therapy, there was a concurrent low phosphorus level.

Gram (1950) noticed that in many downer cows suffered from hypocalcaemia on the first day of illness, but not on subsequent days, despite the fact that they had marked signs of milk fever.

Hallgren (1955) reported that prolonged recumbency after milk fever could be due to, phosphate deficiency, over destination of urinary bladder, or ketosis.

Moodie (1956) thought that hypophosphataemia, after calcium therapy could be used as indicator of some complicating factor in milk fever, but it did not necessarily follow that the artificial raising of the blood Phosphate level would have any beneficial effect.

Mac Intyre et al. (1963) suggested that calcium and magnesium homeostasis will not be maintained with marked abnormalities in plasma magnesium, particularly increased concentration.

Van der Walt (1966) recorded that hypokalaemia associated with delayed recovery of downer cases.

Johnson (1967) reported that hypokalaemia has been suspected as important part in the pathogenesis of downer cow syndrome.

Kraft and Hofman (1967) reported hypophosphataemia [0.6 - 2.74 mg %] and calcium level between 7 and 12 mg % in some paretic cows.

Bjorsell et al. (1969) observed a definite change in the downer cases.

At first, second and third examination between the findings, the mean value of blood calcium had risen from 5.9 to 7.3 to 8.9 mg %.

Fenwick (1969) suggested that the potassium has no therapeutic value for downer cows.

Blum et al. (1971) reported that magnesium concentration increased at parturition and during hypocalcaemia, whereas phosphorous concentration was less than normal, whereas at the nadir of hypocalcaemia only moderate increase occurred.

Hibbs et al. (1972) stated that diets high in phosphorous and low in calcium caused parturient paresis.

Jorgensen (1973) reported that initiation of lactation is the main factor leading to decline in plasma calcium concentration and subsequent development of hypocalcaemia in parturient cows, and both plasma calcium and inorganic phosphorous concentration decline while that of magnesium remain unchanged or increased. He also recorded that the normal plasma calcium concentration 8.5 - 11.4 mg/dl, for phosphorous 3.1 - 6 mg /dl and for magnesium 1.8 - 3.2 mg/dl, and he considered the plasma calcium less than 5 mg/dl are accompanied by paresis.

Luthman and Persson (1975) recorded that low level of inorganic phosphorous was observed beside hypocalcaemia in the paretic cow.

Daniel (1980) demonstrated that enforced recumbency for three hours resulted in significant fall of 0.6 mmol/liter in the mean plasma potassium concentration.

Kronfeld (1980) stated that a number of metabolic disturbances contributed in downer cow such as; hypophosphataemia and hypomagnesaemia. He added that mastitis, or metritis lead to primary recumbency in post parturient cows.

Allen and Davies (1981) stated that hypophosphataemia is alleged to be one of the commonest of the downer cow syndrome, while the role is uncertain.

Curtis et al (1983) observed that high dietary phosphorous in late stage of dry period predisposed to parturient paresis although dietary calcium did not.

Steven and Olson (1984) found that food depriviation caused significant increase in free fattyacid in serum but did not cause clinically important decrease in serum ionized calcium concentration. They concluded that free fatty acid binding of calcium ion did occur but that such binding did not contribute significantly to the etio pathogensic of calcium responsive mid lactation downer cow syndrome.

Fenwick et al (1986) stated that low plasma magnesium concentration are not constant finding in downer cow syndrome.

Siegmund et al (1986) recorded that serum calcium, magnesium, and inorganic phosphorous levels are usually within lower limits of normal range after adequate treatment for initial hypocalcaemia.

Roussel (1986) stated that Hyperkalaemia may be seen if muscle damage is severe.

Shappell et al (1987) observed that heifers, but not cows were able to achieve calcium homeostasis after parturition when fed excess dietary calcium before parturition. They founded no correlation between hypocalcaemia and loss of calcium in colostrum or milk.

Braglioni et al (1987) concluded that the metabolism of older pluriparous animals was already adapted to meet the physiological demands of pregnancy and lactation, where as, the heifers needed to adapt, particularly with regard to lipid.

Pandey and parai (1988) stated that the production disease is cows suffered from a complex metabolic disorders, because of markedly lowered concentration of serum calcium and blood glucose and acompained therapy of intravenous calcium borogluconate 25%, dextrose 5% and intramuscular tonophosphane along with liver and rumen stimulants was effective.

Fenwick (1988) reported that there were no significant differences between the mean concentration of any of the cations in 3 groups of cows in different positions when attend for milk fever; normally standing, sternal recumbency and lateral recumbency.

Jesse et al (1989) recorded that plasma magnesium concentration decreased shortly after parturition.

Greppi et al (1989) found that most serum constituents were affected by stage of lactation while inorganic phosphorous were affected by age.

Marcus et al (1989) recorded that blood calcium concentration decreased within 24 hours after parturition to below 7 mg/100 ml.

Ivanov et al (1990) recorded that calcium concentration in blood serum was very significantly affected by different types of rations depending on the seasons, as well as, the mutual effect of feed. They also found that the lowest serum calcium concentration was in cows recently delivered of calves in autumn and highest in serum of cows in advanced stages of pregnancy in spring.

Mulel and Daniel (1990) concluded that, in animals which have been off food for at least 16 hours both plasma and erythrocyte potassium concentration decreased. On other hand, plasma sodium concentration did not change while that of erythrocyte increased.

Zepperitz (1990) thought that the hypocalcaemia which occur in diseased cows was resulted from excessive withdrawal of milk.

Dolezel et al (1991) observed that the average calcium and phosphorous values in cows increased irregularly until day 21 post parturient, while magnesium content increased from day 25 of parturition.

Barlet and Davicco (1992) reported that plasma phosphorous concentration did not increase following calcium infusion in paretic cows that did not respond calcium therapy.

Davicco et al. (1992) concluded that the omission of an 8-weeks long dry period had no major immediate effect upon calcium and bone metabolism, in young dairy cows, given a balanced calcium and phosphorous daily intake, nevertheless, the lack of the dry period might protect the cow against parturient hypocalcaemia. The decrease in plasma calcium and phosphorous concentration observed 12 hours after calving was severe in non dry cow than in long dry cows.

El-Fadaly and Radwan (1992) observed that Egyptian buffaloes revealed a general tendency for a decrease in serum, calcium, phosphorous, and potassium toward the end of gestation and onset of lactation, while, magnesium, sodium, and chloride were increasing and they concluded that Egyptian buffaloes are highly susceptible to mineral disturbances around the time of parturition or immediately after.

Ivanov et al. (1993) stated that the mean serum calcium values of high yielding Holstein cows in, late pregnancy, up to 10 days after calving, and in second month of lactation were 2.38 ± 0.32, 2.25 ± 0.35 and 2.35 + 0.33 mmol/liter, respectively, while, that of inorganic phosphorous were 1.88 ± 0.38, 1.74 ± 0.43, and 1.87 ± 0.40 mmol/liter respectively, and that of magnesium were 0.98 ± 0.27, 0.39 ± 0.25, and 1.15 ± 0.30 mmol/liter respectively.

Bjorkman et al. (1994) studied concentrations of sodium, potassium, calcium, magnesium, phosphorous, and chlorine in the skeletal muscle fibers of cows with parturient paresis, downer cows, normally calving cows, and unmated heifers. They found that the most consistent finding was an increase in the concentration of chlorine in the muscle samples of downer cows and they added that there were no significant differences between the concentrations of these elements in samples from different groups of cows, but the calcium concentration was higher in the muscle samples collected one month after parturition than in the samples collected close to parturition.

2- Serum glucose and total protein

Hall (1949) thought that intravenous glucose infusion was of value in some cases of downer cows.

Jacobson and Knudson (1952) suggested that hypoprotienaemia resulted from inadequate feeding during a period of increased protein requirement and unspecified digestive disturbances were a cause of downer cow syndrome .

Larson and Kendall (1957) observed that plasma proteins started to increase from 2 month before parturition reaching the maximum at a 4 weeks before parturition and then started to decrease reaching the minimum at parturition .

Rosenberger (1958) suggested that a deficiency in protein metabolism could have been major cause of downers.

Osigna (1963) suggested that atypical form of milk fever due to increased protein in fodder result in auto-intoxication and damage to parenchymatous organs.

Blum et al (1971) reported that glucose concentration in blood serum decreased by 30 ± 5 mg/100 ml in 55 to 270 minutes after calcium borogluconate was infused.

Luthman and person (1975) recorded a high levels of glucose beside the hypocalcaemia in the paretic cows.

Julien and Conard (1977) observed that dietary protein influences incidence of the downer cow syndrome and the dietary mineral imbalance.

Allen and Davies (1981) stated that very high intakes of protein considered as a predisposing factor in the occurrence of downer cow syndrome.

Roussel (1986) recorded that hyperglycaemia is often seen in downer cow.

Greppi et al (1989) found that the total protein concentration in blood serum was affected by age.

Mulel and Daniel (1990) stated that the value of total protein and glucose decreased toward calving.

Dolezel et al. (1991) observed that the average blood glucose level on day of parturition (4.07 mmol/liter)decreased sharply to day 5 (2.79 mmol/liter) then later increased irregularly. They also added that the average total protein values increased slightly from day 20 of parturition.

Chadli et al. (1992) stated that under nutrition during the dry season in Morocco (September to February) was combined by 10 % reduction in total protein of blood in cattle.

El-Fadaly and Radwan (1992) observed that the glucose and total protein revealed a general tendency for a decrease toward the end of gestation and onset of lactation in Egyptian buffaloes.

Setia et al. (1992) concluded that the total plasma protein declined significantly ($p<0.05$) on the day of parturition as compared with prepartum phase in cows, however significant ($p<0.05$) increase in cows and buffaloes was observed with progression of lactation.

3- Serum enzymes

Gould and Grimes (1960) found that the GOT enzyme activity increased in blood serum of downers.

Bjorsell et al. (1969) reported a rise in blood GOT in downer cows from first, to second, and to third examination.

Curtis et al. (1970) stated that SGOT level tended to return normal after cow were recumbent for one week.

Gutler (1976) observed high values of serum GOT activities of cows with parturient paresis at onset of recumbency than in healthy cows at similar stage of puperium.

Allen and Davies (1981) recorded that there are often increased activities in plasma creatine Kinase, SGOT, and other enzymes which are present in high concentration in the liver in case of downers.

Andrews (1986) reported that blood creatin phosphokinase (CPK) and GOT activities increased if there much is muscle damage and there is usually fall in CPK activity after 2 days and in GOT After 3 days in recovered cattle without corresponding drop in those that have to be slaughtered.

Cox et al. (1986) stated that serum creatin kinase (ck) activity of downer cows rises rapidly and peaks after 1.5 to 2 days of recumbency and then falls rapidly even while the cow still down.

Siegmund et al. (1986) recorded that serum enzymes GPT and CPK activities are markedly elevated within 12-36 hours as a result of ischemic muscle necrosis in downers.

Roussel (1986) reported that GOT and CPK activities increased in serum of downer cow. CPK increased rapidly, peaking soon after the insult and falls when muscle damage has ceased, while GOT is slower to rise and remain elevated longer but it is less specific for muscle damage and may be elevated due to hepato cellular damage.

Kikta et al. (1987) reported that brown urine and extremely high CK enzyme value are common with downer cows syndrome due to absorption of muscle breakdown products into systemic circulation.

El-Sebaie (1987) stated that the increase in activities of serum enzymes may be attributed to liver distruction because of high intake of concentrates in late lactation and in dry period.

Greppi et al. (1989) found that GOT activity in blood serum was affected by age.

Dolezel et al. (1991) observed that the activities of serum GPT and GOT slightly decreased from day 25 of parturition.

Sharma et al. (1991) concluded that GOT activity was significantly decreased in serum of cows with retained placenta and significantly increased in cows with dystocia.

El-Fadaly and Radwan (1992) observed that the enzyme GOT activity increased in serum of blood of Egyptian buffaloes toward the end of gestation and onset of lactation.

Materials and Methods

I- Materials

A) Animals

A total number of 122 cows (2-10 years) were used in the present investigation.

42 cows were in downer condition and other 80 cows were apparently healthy cows in different stages of production cycle arranged as following :-

1- 20 animals were non-pregnant lactating cows.

2- 20 animals were pregnant lactating cows.

3- 20 animals were pregnant non lactating cows.

4- 20 animals were non pregnant non lacting cows.

All the animals used in the present investigation are Holstein-Fresian and were belonging to the military dairy farm in Nobaria during 1992 and 1993 under the same environmental and nutritional conditions, distributed in 8 dairy farm (of Magma Alban Gharb El-Nobaria). All animals under investigations were fed during the period of study a formulated ration according to feeding system in military farm as shown in table 1.

Table (1) : Feeding system given in military farm in Nobaria during summer & winter seasons by kilogram.

Ration	Lactating		Dry-Pregnant		Non-Pregnant	
	summer	winter	summer	winter	summer	winter
Concentrates *	8	8	3	3	1	1
Hay	3	-	-	-	-	-
Darawa	30	-	15	-	10	-
Barseem	-	30	-	20	-	15
Rice straw	2	4	2	2	4	3
Bran	1	1	-	-	-	-

The concentrates mixture given to the cows (table 1) were manufactured by factory of concentrates belonging to the military farm of Nobaria and the compositions of concentrates mixture is shown in table 2.

Table (2) : Concentrates mixture manufactured in military factory of concentrates in Nobaria.

Constituents	%	Kg/Ton
Bran	35%	350
yellow corn	35%	350
sun flower seed meal	25%	250
minerals	0.1%	1
molassos	2.9%	29
Sod. Chloride	1%	10
lime stone	1%	10

The concentrates mixture contains not less than 14.35%, crude protein and 2% crude fat and not more than 15.35% crude fibers.

B) Sampling

A total number of 122 blood serum samples were taken from previously mentioned 122 cows.

The blood was allowed to flow gently, after jugular vein puncture, through a clean dry syringe needle into a clean dry and labeled vacutainer tubes. The sample was left to coagulate at room temperature till clot retracted, then, centrifuged at 3000 r.p.m for 10 minutes to remove any residual red cells. The clear non-haemolyzed serum was then transferred carefully to a clean dry and sterile glass vials with stopper.

The serum samples were kept freezed and transported in ice box to the laboratory.

The serum samples were used for determination of; calcium, phosphorous, sodium, potassium, magnesium, chloride, glucose, and total protein, and also used for determination of serum; GPT, GOT and CK activities.

II- Methods

Determination of serum calcium level :-

Serum calcium level was determined using Ca-kit of Bio Merieux according to method described by Gindler (1972).

Determination of serum phosphorous level :-

Serum phosphorous level was determined using P-kit of Bio Merieux according to method described by Goldenberg, et al. (1966).

Determination of serum magnesium level :-

Serum magnesium level was determined using Mg-kit of Bio Merieux according to method described by Gindler (1971).

Determination of serum sodium level :-

Serum sodium level was determined using Na-kit of Teco-Diagnostics according to method described by Henry (1974).

Determination of serum potassium level :-

Serum potassium level was determined using K-kit of Quimica Clinica Aplicada S. A. according to method described by Henry (1974).

Determination of serum chloride level :-

Serum chloride level was determined using Chloride-kit of Quimica Clinica Aplicada S. A. according to method described by Skeggs and Hochstrasser (1964).

Determination of serum glucose level :-

Serum glucose level was determined using special kit of Stanbio according to method described by Howanitz and Howanitz (1984).

Determination of serum total protein level :-

Serum total protein level was determined using special kit of Bio-ADWIC according to method described by Doumas (1975).

Determination of serum GPT and GOT levels :-

Serum GPT and GOT levels were determined using Transaminases Kits of Bio-Merieux according to method described by Reitmans and Frankel (1957).

Determination of Creatine Kinase (CK) activity in serum :-

Serum CK activity was determined using CK-kit of Bio Merieux according to method described by Szasz et al. (1976).

The data were statistically analyzed by Statistical Analysis System (SAS, 1985) in computer of animal husbandry department, Faculty of the Veterinary Medicine, Alexandria University .

Experiments and Results

Experiment I : Incidence of downer cow syndrome among cows under investigation

Epidemiological studies were applied on the cows belonging to the military farm in Nobaria. All (4752) cows were under the same, environmental, managemental, and nutritional conditions, all cows were of the same species (Holstein-Fresian Cattle).

The studies aimed to get the incidence of downer cow syndrome, every month along 1993, within different stages of production cycle, and within different group of ages.

Results :-

1- Incidence of downer cow syndrome every month / year (1993)

It was found that the lowest incidence was in February and March (2 cases/month), whereas, the highest incidence was in August and September (21 cases/month) then October (20 cases /month).

The result is shown in table I-1 and diagram I-1.

Table (I-1) : Incidence of downer cow syndrome /month within 1993

Month of 1993	Downer Cows Occurrence	Total Cow /month	%
January	5	5095	0.098
February	2	5065	0.039
March	2	5011	0.039
April	3	5003	0.06
May	13	4959	0.26
June	15	4828	0.31
July	15	4790	.31
August	21	4700	0.48
September	21	4384	0.48
October	20	4373	0.46
November	10	4380	0.23
December	7	4436	0.16
	134 / year	4752	2.93 %

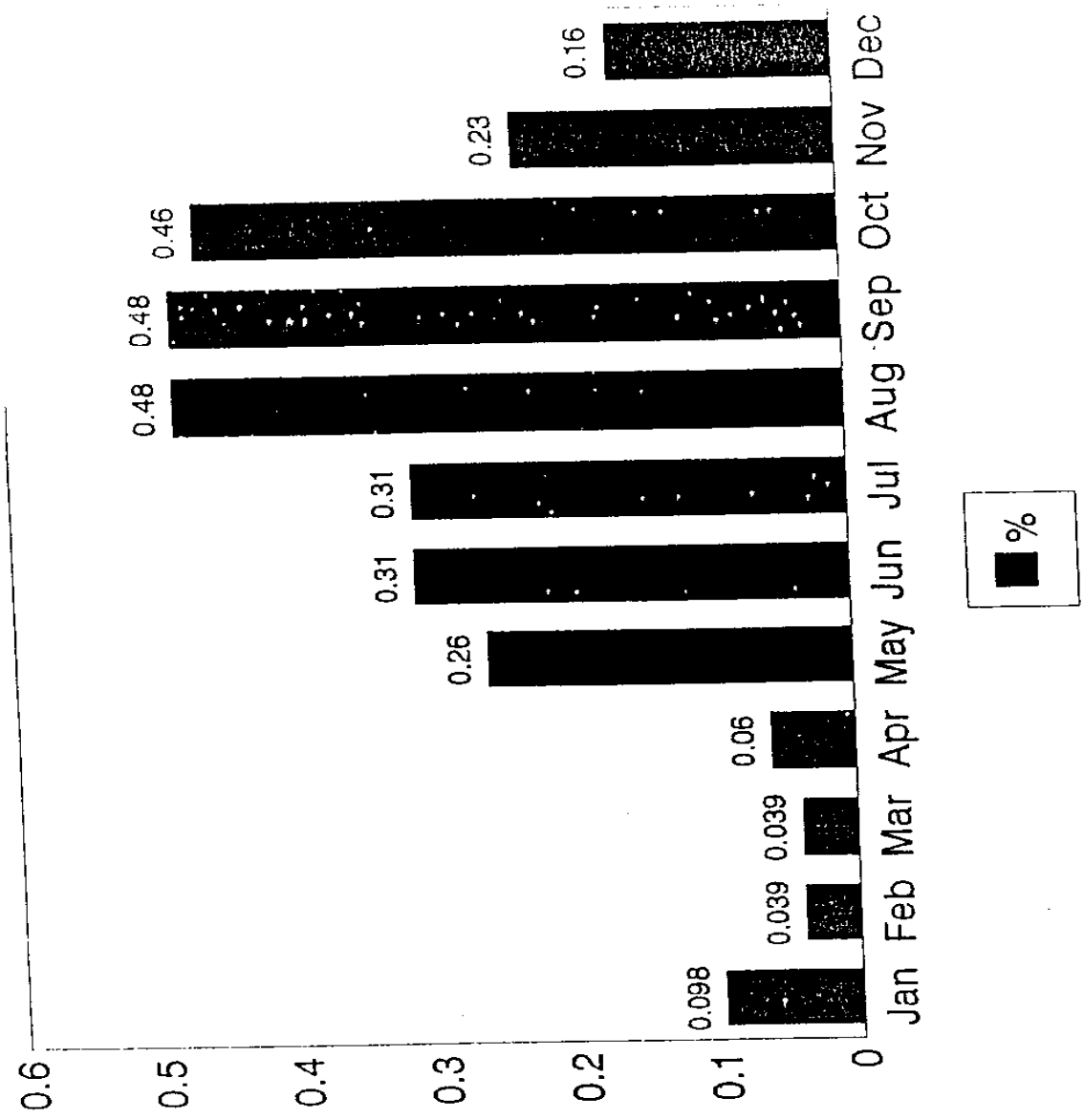


Fig. (I-1) Incidence of Downer cow syndrome monthly in 1993.

2- Incidence of downer cow syndrome according to the stage of production.

It was found that the lowest incidence of downers among lactating pregnant (3 cases/year) cows, where as the highest incidence was among lactating non-pregnant (recently calved) (89 cases /year).

The results are shown in table (I-2) and diagrams (I-2)

Table (I-2) : Incidence of downer cow syndrome within the stages of production .

Stage of production	Occurrence	%
Pregnant heifers	9	6.7
Lactating non-pregnant (recently calved)	89	66.4
Lactating pregnant	3	2.2
Non-lactating pregnant	25	18.6
Non-lactating non-pregnant	8	6.0
	134/year	100%

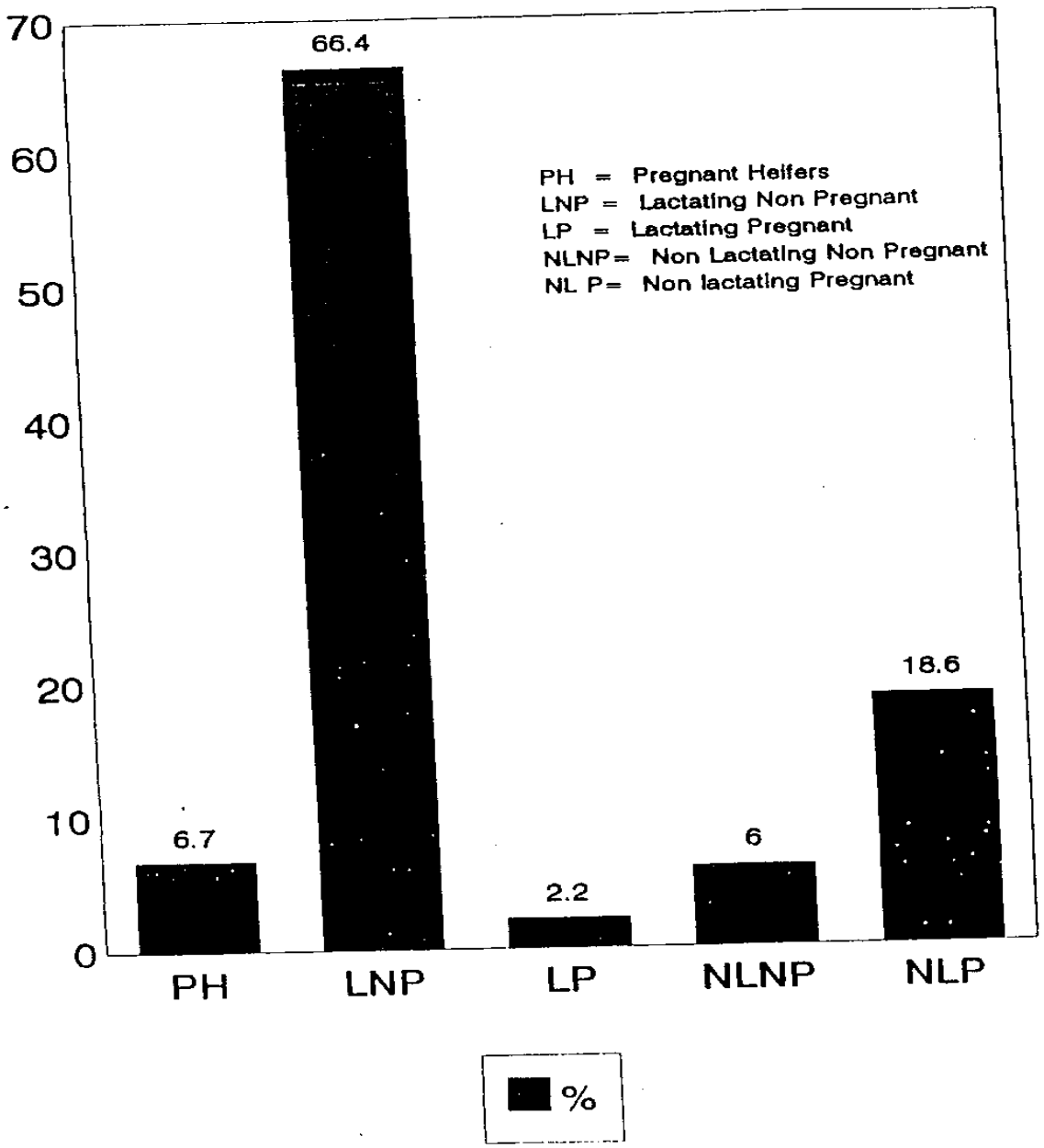


Fig. (I.2) Incidence of Downer cow syndrome according to the stages of production cycle.

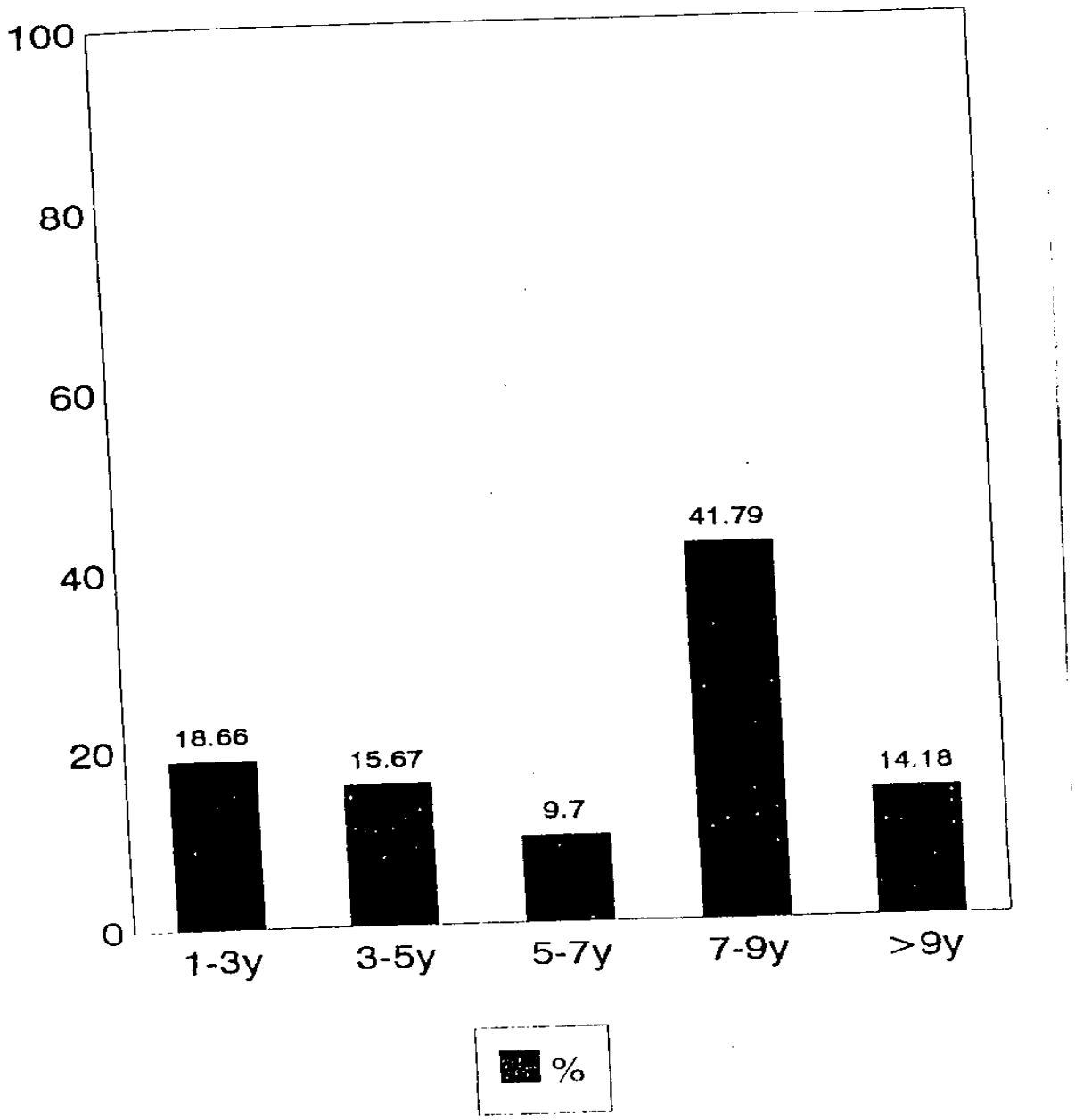
3- Incidence of downer cow syndrome according to different ages

It was found that the lowest incidence (9.7%) was among cows, 5-7 years old [which is the major class % among other classes], the highest incidence (41.79) was among cows 7-9 years old.

The results are shown in table (I-3) and diagram (I-3)

Table (I-3) : Incidence of downer cow syndrome among the different age classes.

Age class	Occurrence	%
1-3 years	25	18.66
3-5 years	21	15.67
5-7 years	13	9.70
7-9 years	56	41.79
> 9 years	19	14.18
	134	100%



Flu (I.3) Incidence of Downer cow syndrome among the different age classes.

Experiment II : Clinical picture

The object of this experiment is to summarize the observed clinical signs among diseased cows under investigation.

Results :-

Most downer cows recumbent after calving or at last stage of pregnancy. Sometimes downers occur at different stages of production cycle, but it usually occurs around parturition. Most of the downers characterized by sternal recumbency, unable to gain on feet, usually alert and bright, eat and drink normally (figure II-1). They urinate and defecate normally, rectal temperature usually normal (37.5-38.5 ^{o}C) unless there was other secondary infectious problem. The cow still calm normal, unless she felt fear or something strange it protrudes her eyes and becomes more sensitive; furthermore, if the downer was excited severely, she will try to stand using her fore limbs only but could not use her hind limbs which became functionless. Due to long recumbency, some injuries in the thigh regions could be seen (figure II-2). Fore limbs are usually flexed under the thoracic region, The neck is extended (figure II-3), one of hind limbs could be observed under the body and the other limb is extended out the body (figures II-4, II-5), with extension of the fetlock which is difficult to be flexed. Mastitis and Metritis occasionally developed in some cows due to recumbency where the udder and vulva are touching the ground, so, turbid discharge could be seen coming out the vulva (figure II-6). Sometimes systemic infections occurred e.g. pneumonia, hepatitis, ... etc.

Finally death usually occurs, so, there is local expression in the farm says "cow lie to die".

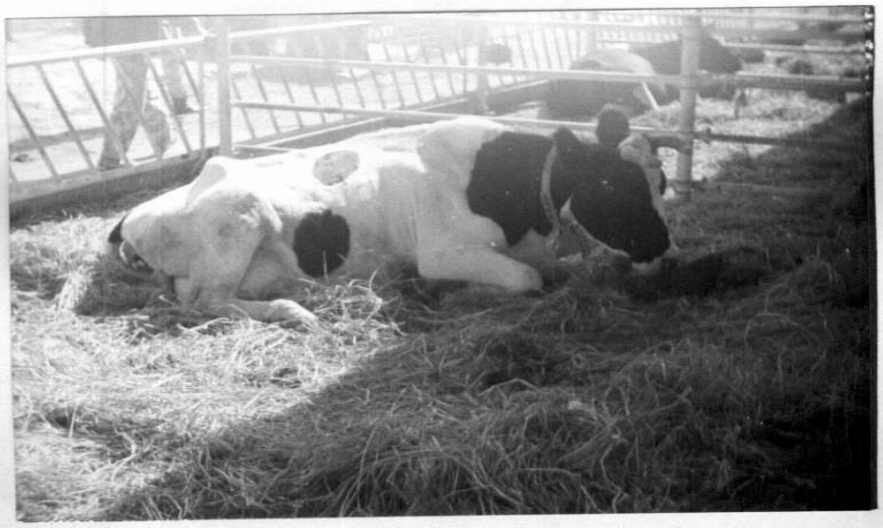


Fig. (II-1) Downer cow in sternal recumbancy eat well

Fig. (II-2) Downer cow with injuries in the thigh region

Fig. (II-3) Alert and bright downer cow with flexed fore limbs under the body

Fig. (II-4) Downer cow with flexed hind limbs under the body

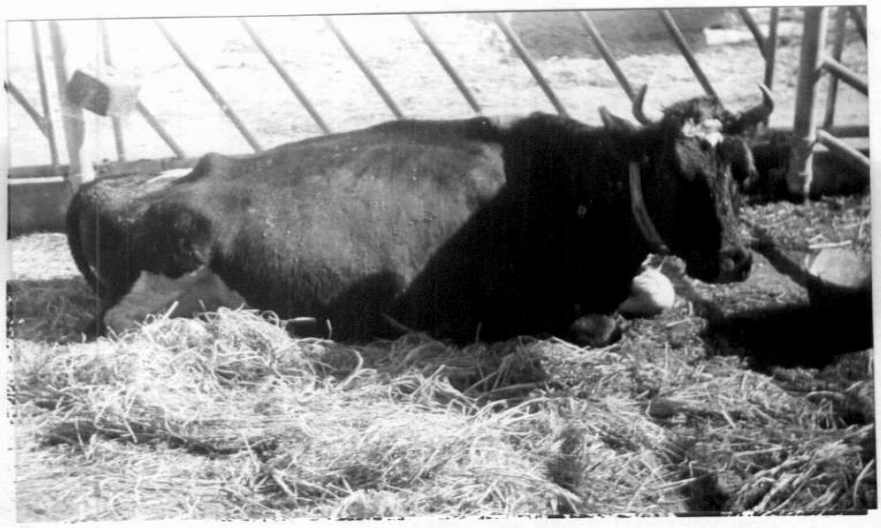


Fig. (II-5) Downer cow extended head with one of hind limbs out the body and the other one flexed under the body

Fig. (II-6) Downer cow with discharge comming out the vulva

Experiment III : The Changes of the biochemical constituents of the blood in Downer Cows

42 serum samples were collected from recumbent cows and 80 serum samples were collected from apparently healthy cows in different stages of production cycle (122 serum samples).

The serum samples were used for determination of :calcium, phosphorous, magnesium, sodium, potassium, chloride, glucose, total protein, as well as, enzymes, GPT, GOT and CK activities. Ca : P ratio also was calculated.

Results :-

The results obtained showed that the mean serum calcium, phosphorous, magnesium, sodium, potassium, chloride, glucose, total protein, GPT, GOT, and CK in the downer cows were 6.79 ± 0.38 mg % , 4.0 ± 0.3 mg %, 2.41 ± 0.10 mg %, 98.6 ± 7.7 m Eq /liter, 4.1 ± 0.12 mEq /liter, 120.2 ± 5.75 m Eq/liter, 98.8 ±3.6 mg %, 6.42 ± 0.23 g %, 23.5 ± 1.8 unit/ml, 41.38 ± 3.9 unit/ml, and 178.3 ± 29 unit /liter, respectively.

The results are shown in tables III-1, III-2, III-3,and diagrams III-1, III-2, III-3.

Table III-1 : The mean values of serum calcium, phosphorous, magnesium and CA/P ratio in downers and control group

parameter	unit	Downer Cows			App. Healthy Cows		
		min.	max.	mean ± SE	min.	max.	mean ± SE
Calcium	mg%	3	14.7	6.79 ± 0.38 ***	5.6	12.8	8.49±0.30
Phosphorous	mg %	1.8	8.6	4.13±0.30 **	1.7	9.9	5.36±0.24
Magnesium	mg %	0.62	4.17	2.41±0.10	0.8	3.56	2.52±0.09
Ca/p	:	0.55	5	2.13±1.27	0.63	4.52	1.81±0.13

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

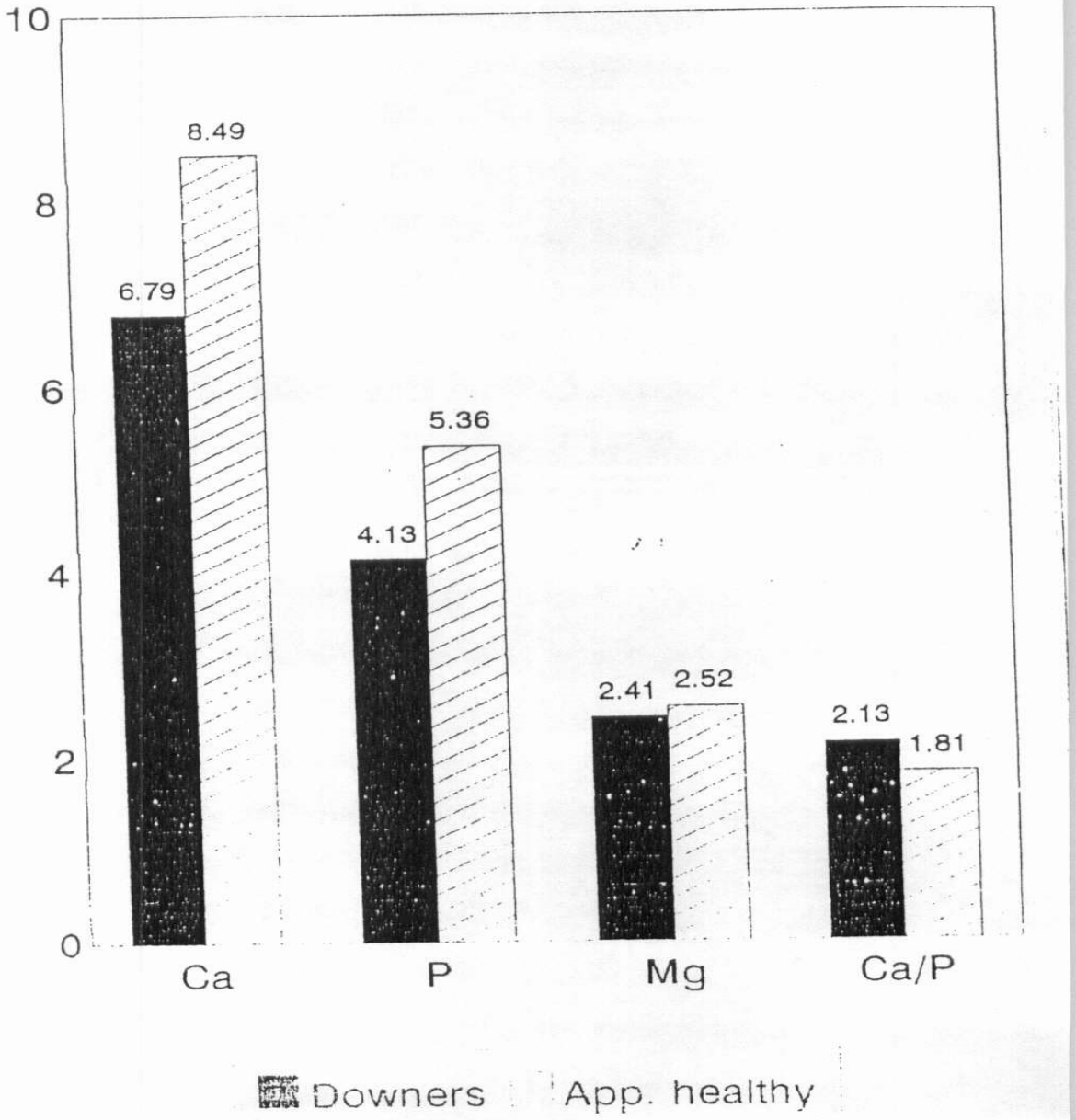


Fig.(III-1) The mean values of serum Ca, P, Mg and Ca/P ratio in Downers and control grou

Table III-2 : The mean values of serum electrolytes, glucose, and total protein in downers and control group

parameter	unit	Downer Cows			App. Healthy Cows		
		min.	max.	mean ±SE	min.	max.	mean±SE
Sodium	mEq/liter	35	185	98.6±7.7	33	214	111.7±6.3
Potassium	mEq/liter	2.72	6.25	4.11±0.12 ***	3.82	6.93	4.95±0.10
Chloride	mEq/liter	23.1	205.6	120.1±5.75 ***	28.8	180	93.4±4.73
Glucose	mg%	85.7	117.3	98.6±4.98	82.3	145.2	107.6±3.46
Total protein	g%	4.3	10.1	6.42±0.23	4.2	9.9	6.86±0.14

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

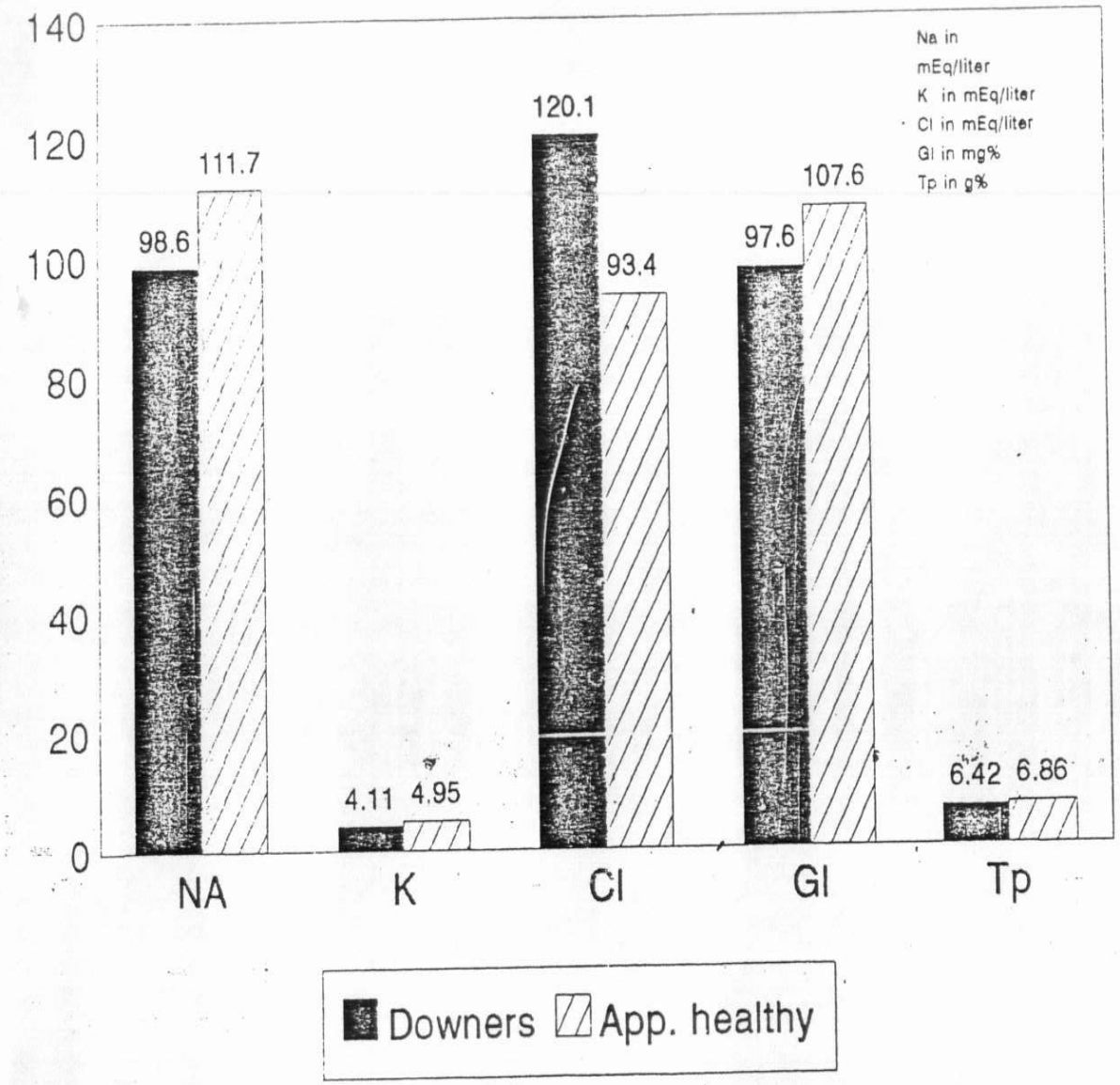


Fig.(III-2) The mean values of serum elctrolytes, Gl and Tp in Downer and control group.

Table III-3 : The activities of serum enzymes in the downers and control groups.

Enzyme	Unit	Downer Cows			App. Healthy Cows		
		min.	max.	mean ± SE	min.	max.	mean ±SE
GPT	u/ml	12	54	23.5±1.8	4	38	19.5±1.08
GOT	u/ml	10	142	41±3.9	10	68	33±2.4
CK	u/liter	28.9	466	178±29 **	4.1	160.9	51±20

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

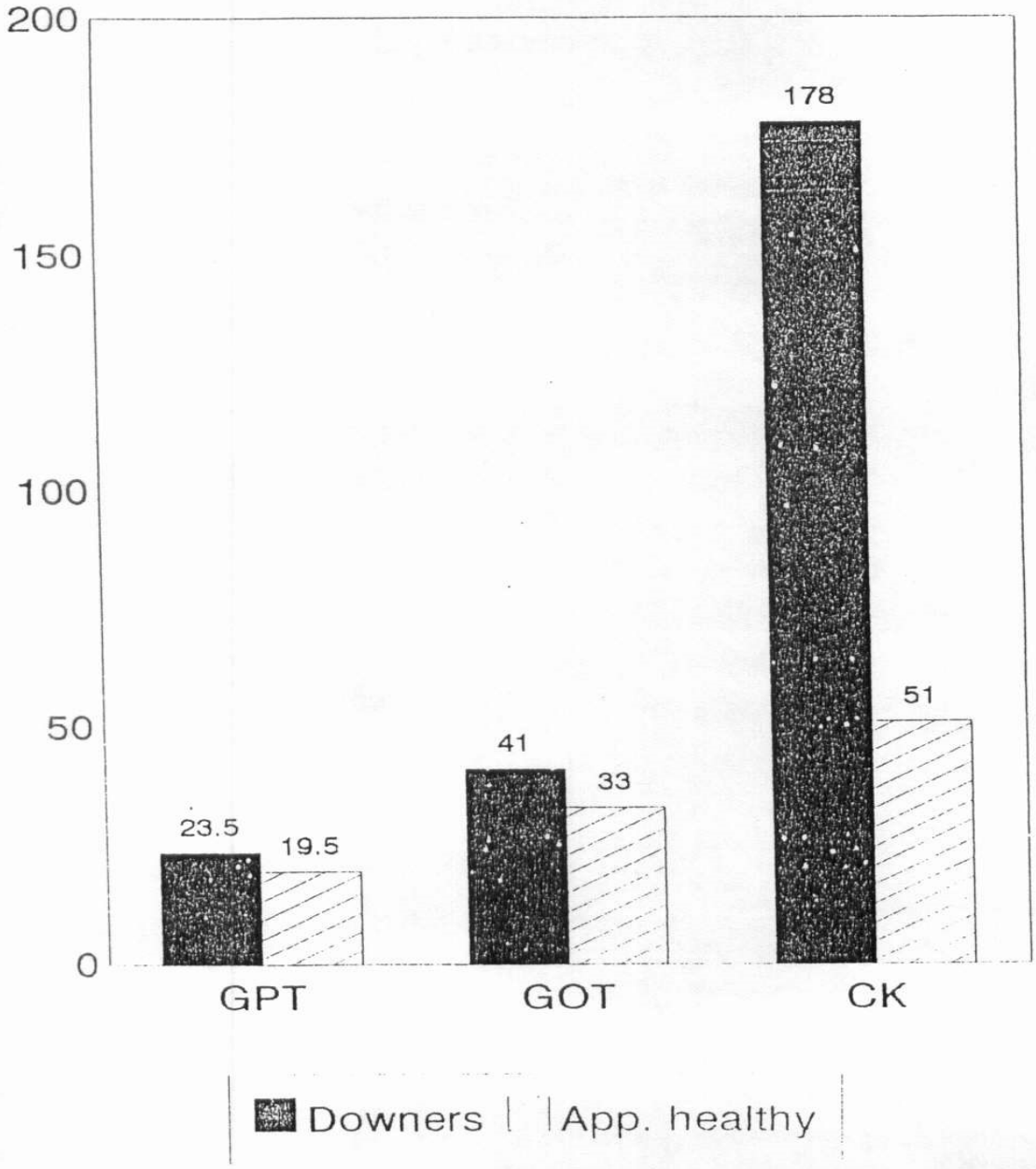


Fig (III-3) The activities of serum enzymes in Downers and control group.

Experiment IV : Effect of different stages of production cycle on the biochemical constituents of the blood

The eighty serum samples which were collected from the apparently healthy cows were divided into four groups according to the stage of production of the cow as following :

Group 1 20 serum sample from lactating non-pregnant
Group 2 20 serum sample from lactating pregnant
Group 3 20 serum sample from non-lactating non-pregnant
Group 4 20 serum sample from non-lactating pregnant

All these samples were analyzed for determination of serum calcium, phosphorous, magnesium, sodium, potassium, chloride, glucose, total protein and activities of GPT, GOT and CK serum.
Comparison was done in relation to the different stages of production.

Results :-

The results are shown in table IV-1, IV-2, IV-3 and diagram IV-1, IV-2, IV-3.

Table (IV-1): The mean serum calcium, phosphorous, magnesium, and Ca/p ratio in cows in different stages of production

	Lactating						non-lactating					
	non-pregnant			pregnant			pregnant			non-pregnant		
	min.	max.	mean ± SE	min.	max.	mean ± SE	min.	max.	mean ± SE	mean	max.	mean ±SE
Calcium mg%	5.6	10.5	7.94±0.61	5.9	12.8	8.42±0.61 *	6.5	11.3	9.35 ±0.61 ***	6.9	12.2	8.22±0.61 *
Phosphorous mg%	3.2	9.1	5.16±0.47	2.6	9.4	6.05±0.47**	2	9.9	5.56±0.47 *	1.7	8.7	4.64 ±0.48
Magnesium mg%	1.95	3.65	2.65±0.17	2.02	3.36	2.46±0.17	0.8	2.96	2.2±0.17	2.19	3.16	2.8±0.17
Ca / P ratio	0.68	2.4	1.66±0.57	0.7	3.83	1.59±0.68	0.75	3.48	1.98±0.9	1.22	4.52	2±0.27

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

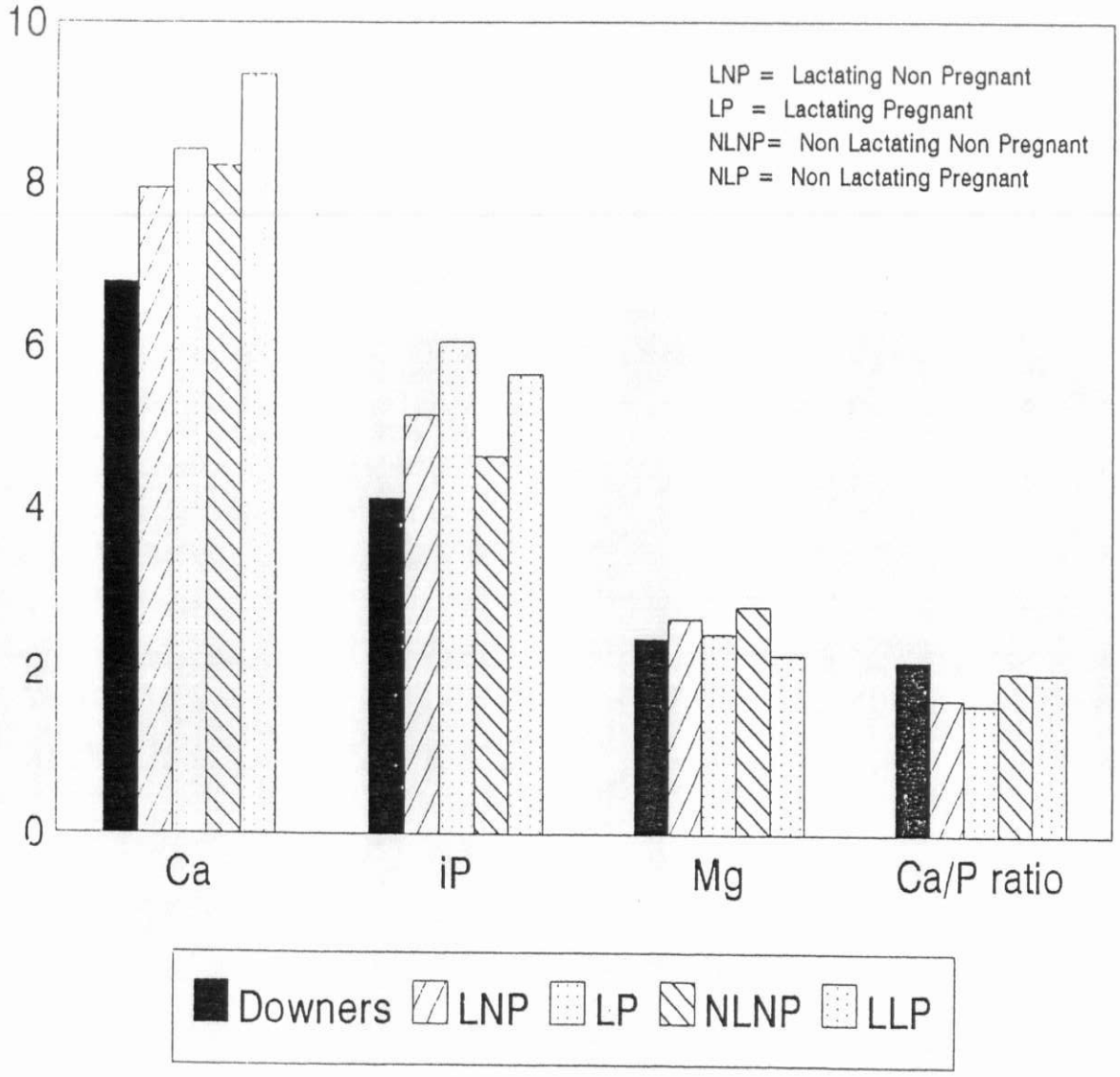


Fig.(IV-1) The mean values of serum Ca, iP, Mg and Ca/P ratio in Downers and four groups of different stages of production

Table (IV-2): The mean serum sodium, potassium, chloride, glucose, and total protein in cows in different stages of production

	Lactating						non-lactating					
	non-pregnant			pregnant			pregnant			non-pregnant		
	min.	max.	mean ± SE	min.	max.	mean ± SE	min.	max.	mean ± SE	mean	max.	mean ±SE
Sodium mEq/l	42	162	91.1 ± 11.6	33	193	102.2 ± 11.7	40	206	107.4 ± 11.7 ***	78	214	147 ± 11.8 ***
Potassium m Eq/l	4.07	6.93	5.39 ± 0.16 ***	3.82	4.67	4.14 ± 0.16	4.52	6.8	5.2 ± 0.16 ***	4.41	6.45	5.07 ± 0.16 ***
Chloride m Eq/l	28.8	130.3	86±8.7 **	96	180	117 ± 8.7	32.3	127.9	72.9±8.7 ***	75.7	120.5	97.9±8.8 *
Glucose mg%	101	123.8	112.3 ± 5 *	106.1	145.2	125.7 ± 5 ***	82.3	103.4	91.8 ± 3.5	93.2	126.5	99.2 ± 5.2
Total protein mg %	4.2	9.9	6.72±0.28	5	8.6	6.5±0.28	4.4	9.9	7.05±0.28	5	8.4	7.18±0.28 *

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

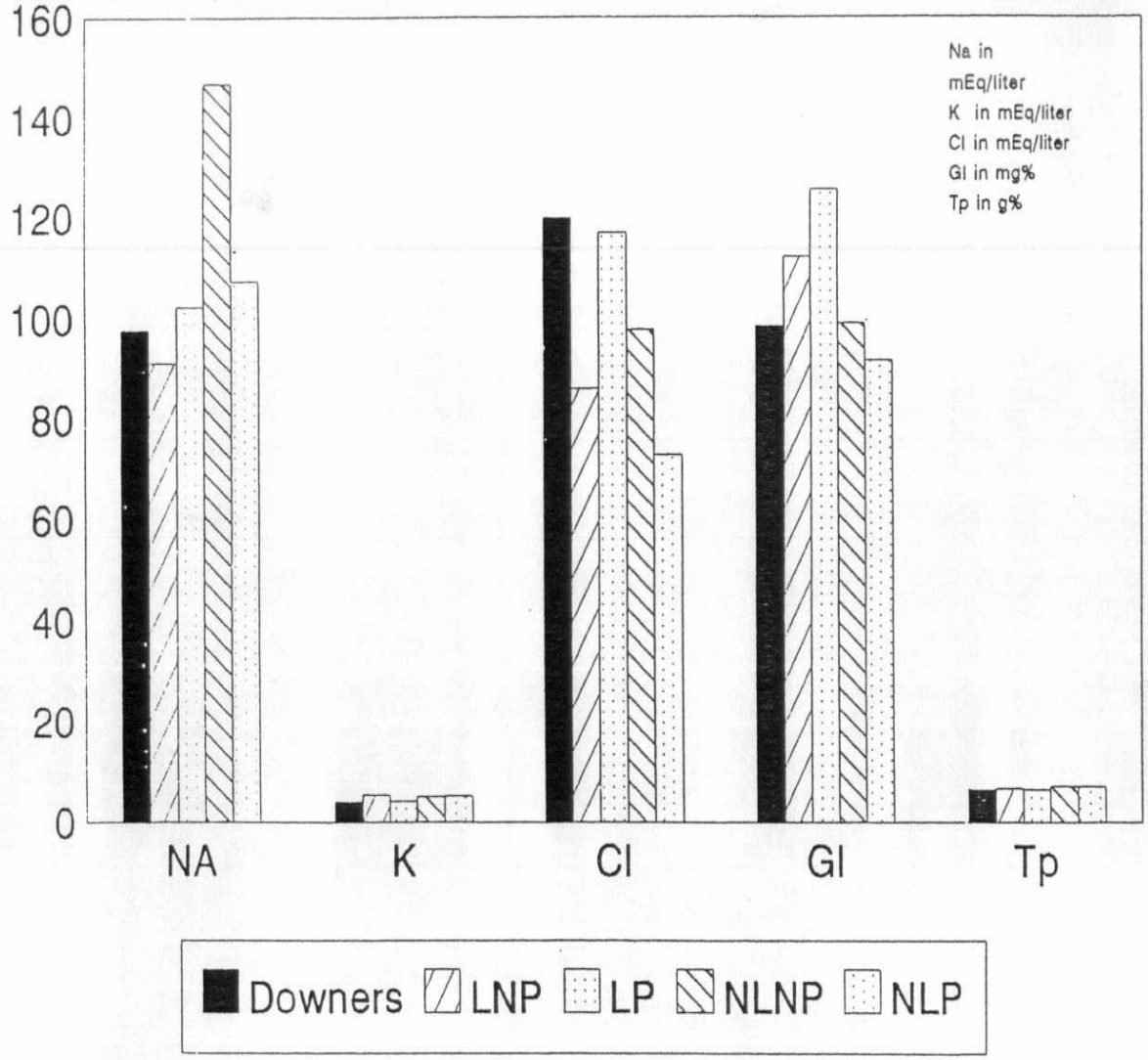


Fig.(IV-2) The mean values of serum elctrolytes, Gl and Tp in Downer and four four groups of different stages of production.

Table (IV-3): The activities of serum enzymes; GPT, GOT and CK in cows in different stages of production

	Lactating						non-lactating					
	non-pregnant			pregnant			pregnant			non-pregnant		
	min.	max.	mean ± SE	min.	max.	mean ± SE	min.	max.	mean ± SE	mean	max.	mean ±SE
GPT u/ml	10	38	25.8 ± 2	6	38	20.1±2	4	30	17.9±2 *	4	28	14.4±2 **
GOT u/ml	10	68	38.8±4.7	16	62	35.1±4.7	12	46	28.9±4.6 ~*	10	46	29.8±4.7
CK u/l	37.1	160.9	84.8±42 ~*	8.25	114.6	48.4±42 *	20.6	103.2	50.5±42*	4.1	86.6	44.1±44 *

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

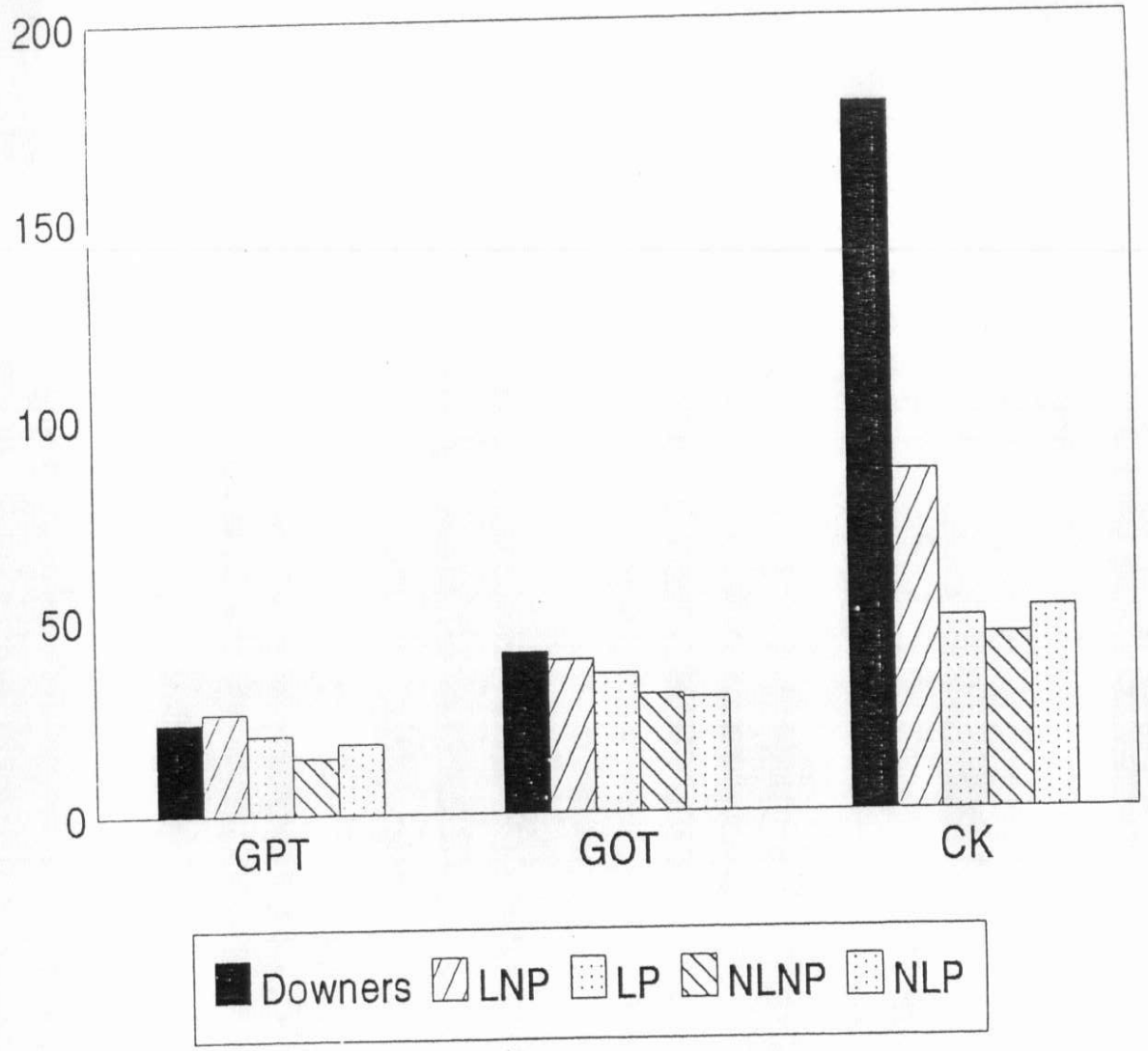


Fig.(IV-3) The activities of serum enzymes in Downers and four groups of different stages of production.

Discussion

Experiment I : Incidence of downer cow syndrome among cows under investigation

This experiment was planned to throw some light on the epidemiology of the downer cow syndrome among animals under our environmental condition during the period from January to December 1993.

The study of the incidence of downer cow syndrome every month / 1993 revealed that : the highest incidence of the disease was in August, September and October (0.48 %, 0.48 % and 0.46 % respectively), while the lowest incidence was in February, March, and April (0.039 %, 0.039 % and 0.06 % respectively). The high incidence during August, September and October could be attributed to the dry seasons in which there is drop of green fodder and the animals depend on dry food only. These dry seasons are from 15 May to 15 July and from 15 September to 15 November. Because of these seasons there is stress due to sudden changes in nature of ration, and also imbalanced ration could be occurred. Due to this stress the emergency slaughter increased around the same months nearly, it was at July, August, September and November : 0.77 %, 1.19%, 0.9 % and 0.77 % respectively, especially in older cows at the end of productive age (0.77 %, 1.04 %, 0.9 % and 0.7 %). It was found that the incidence of the disease started to increase from May to reach the maximum at August, and started to decrease from November and forward and the incidence / year 1993 was 2.93 %. The high incidence of the disease among animals in the present investigation could be attributed to extreme desert weather of Nobaria, drop in green fodder in dry seasons and other managemental problem like labour expensive.

The results obtained were summerized in table (I-1) and illustrated in fig. (I-1).

The obtained results were in close agreement with that of Ivanov et al. (1990) who found that the lowest calcium concentration was in blood serum of cows recently delivered in automn, and the highest calcium concentration was in serum of cows in advanced stages of pregnancy in spring. The results agree also with that of Madel et al. (1993) who considered sudden introducing of concentrates was a stress lead to metabolic disorders.

On the other hand, the results disagree with that of Curtis et al. (1970) who recorded 70 out of 82 cases occurred from November to April, Cox et al. (1986) who found a significant increase in downers in winter [December to February], and decrease in spring [April to June], While Erb and Grohn (1988) found the risk of milk fever did not increase in winter.

The incidence 2.93 % /year differs with that of Cox et al. (1986) who found the incidence 2.14 % , Correa et al. (1993) who found it 0.4 %, and with that of Jordan and Fourdrain (1993) who found it 1.1 % .

Concerning to the incidence of downer cows in relation to the stage of production; it was found that the highest incidence was among lactating non-pregnant cows (recently calved up to 100 days), it represented 66.4 % from all downers, 18.6 % among non-lactating pregnant cows (heavy pregnant), 6.7 % among pregnant heifers, 6 % among non-lactating non-pregnant cows and 2.2 % among lactating pregnant cows.

The results obtained were summerized in table (I-2) and illustrated in fig. (I-2).

The highest incidence of downers around parturition could be attributed to the stresses occurred by pregnancy, parturition, and lactation when the animals needed more demands and more comfort, and due to these stresses some animals could not adapt themselves so supposed to injuries in locomotor system or became more susceptable to infectious disease like metritis, or pneumonia. The results indicated also that the disease could also occur at any stage.

Our findings agree in general with that of Johnson (1963), Radwan (1979), Cox (1982), Andrews (1986), Rao et al. (1987), Grohn and Erb (1988), Zepperitz (1990), El-Fadaly and Radwan (1992), Kumar et al. (1992), Correa et al. (1993), and Steffen et al. (1994) finding which agrees with that of Steven and Olson (1984) who concluded that dairy cattel in midlactation go down reffered as midlactation downer, and Cox et al. (1986) who found that 41 % of downer cows went down within 1 day of calving had dystocia.

According to the age, the obtained results revealed that; the highest incidence was 41.79 % among 7.9 years group [which represented 12.8 % of the herd], 18.66 % among 1 - 3 years group [which represented 25 % of the herd], 14.18 % among cows over 9 years group [which represented 5.4 % of the herd], and 9.7 % among 5 - 7 years group [which represented 23.4 % of the herd]. As regard to the percentage of each age class in the herd, the real highest incidence was among 7 - 9 years group, and over 9 years group, so the older cows are more susceptable to the disease because they are more susceptable to the metabolic disorders and other health problems and could not adapt herself to mineral deficiencies.

The results were in agreement with that of Radwan (1979), Curtis et al. (1985), Erb et al. (1985) and Grohn et al. (1986).

Shappel et al. (1985) recorded that heifers, but not cows were able to achieve calcium homeostasis after parturtion. So older cows were more susceptable to hypocalcaemia and became more susceptable to be downers.

The findings disagree with that of Baglioni et al. (1987) who concluded that the metabolism of older pluriparous animals were already adapted to meet physiological demands of pregnancy and lactation.

Experiment II : Clinical picture of the Downer Cows

In this experiment the clinical findings of the diseased animals were studied, the diseased cows showed brightness and lied in sternal position mostly, while few cases were in lateral recumbency. Although the animals were alert, they were unable to rise because that the pelvic limbs showed functionless. All cases were within normal range of temperature (37.5 - 38.5), except those were going to die showed a decreased temperature and those with infectious problems like mastitis or metritis had high temperature.

A common observation of the downer cows was that all animals were over conditioned due to unknown causes. Some downers lied due to another problem than metabolic disorders like mastits, metritis, pneumonia or lamness and the affected cows showed the clinical signs of these diseases. Not few cases showed these diseases as complication of recumbency. The mastitis and metritis could be attributed to ascending infection through teats and vulva which were touching the ground, and pneumonia and injuries in the thigh region could be attributed to long recumbency on soiled floor. The end of the case usually was death due to permanent damage occurred in muscles and nerves which is too harm to be repaired, beside other complications could be occurred.

These findings agree with that of Julien and Conard (1977) who observed that downer cows were over conditioned, Cox (1982) who attributed the recumbency and non functioning pelvic limbs to muscular and nerve damage resulted from the pressure damage of the body weight, Andrews (1983), Cox et al. (1986), and Cox (1988) who recorded many problems other than metabolic disorders caused or resulted from the disease. It agrees also with Grohn and Erb (1989), and Milian et al. (1989) who considered the death was normal end of the disease.

The findings disagree with that of Fenwick (1969) who found that prolonged recumbency may lead to hypothermia. Allen and Davies (1981) who considered the lateral recumbency was a normal picture of downer cow, and Clark et al. (1987) who stated that 39 % of downer cows recovered.

Experiment III : The changes of the biochemical constituents of the blood in downer cows

The mean serum calcium of downers (6.79 ± 0.38 mg %) was decreased significantly ($p < 0.001$) than that of apparent healthy cows (8.49 ± 0.3 mg %) . There were 27 cases out of the 42 downer cases had serum calcium less than 5 mg %, 8 cases had serum calcium 5 - 7 mg %, and 7 cases had serum calcium over 7 mg %.

The findings proved that there is a relation between downer cow syndrome and hypocalcaemia although there were some downers could not be considered as hypocalcaemic, indicating that another disorders could be involved in case of downer cow syndrome.

These findings were in agreement with that of Steven and Olson (1984), Siegmund et al. (1986), Pandey and Parai (1988), Cox (1988), Marcus et al. (1989). It also agrees with that of Zepperitz (1990) who attributed the hypocalcaemia to excessive withdrowal of milk, and Ahmed et al. (1992) who found that normal serum calcium was 8.16 - 8.7 mg %.

On the other hand our findings disagree with that of Bjorsell et al. (1969), and Fenwick (1969) who considered all downers were siquelae to milk fever. It also disagree with that of Rao et al. (1987) who found the mean serum calcium of downer cow was 8 mg % .

The mean serum phophorous of downer cows (4.13 ± 0.29 mg %) decreased significantly ($p < 0.01$) than that of apparent healthy cows (5.36 ± 0.24 mg %) . This indicated that there was a decrease in serum phosphorous in case of downers. The obtained results were in agreement with that of Pribyl (1933), Robertson et al. (1948) Hallgren (1955), Moodie (1956), Kraft and Hofman (1967), Jorgenson (1973), Luthman and Persson (1975), Kronfeld (1980), Allen and Davies (1981) and El-Fadaly and Radwan (1992).

The results of this experiment and that of experiment (I-3) agree with that of Greppi et al. (1989) who found that the serum phosphorous was affected by age.

The mean serum magnesium of downer cows (2.41 ± 0.1 mg %) did not differ significantly than that of apparent healthy cows (2.52 ± 0.09 mg %). The results were agree with that of Jorgensen (1973) who foundthe normal plasma magnesium concentration was 1.8 - 3.2 mg %, Fenwick et al. (1986) who considered the low plasma magnesium concentration was not constant finding in the downer cow syndrome, and Bjorkman et al. (1994).
The results disagree with that of Kronfeld (1980) who considered hypomagnesaemia one of metabolic disorders contributed in downer cow.

The calcium-phosphorous ratio did not differ significantly between downers (2.13 ± 0.17) and apparent healthy cows (1.81 ± 0.13). Ahmed et al. (1992) found the average calcium-phosphorous ratio 1.22-1.37.

The mean serum potassium of downers (4.11 ± 0.1 mEq /L) decreased significantly ($p < 0.001$) than that of apparent healthy
cows (4.95 ± 0.09 m Eq /L) , so the downers suffered from hypokalaemia.
This finding agrees with that of; Van der Walt (1966), Johnson (1967), Fenwick (1969), Daniel (1980), Mulel (1991), and El-Fadaly and Radwan (1992). But Fenwick (1969) considered potassium of no therapeutic value for downers and attributed the low potassium concentration was due to prolonged recumbency. On the other hand our findings disagree with Roussel (1986) who stated hyperkalaemia may be seen if muscle damage is severe. Our results revealed a high significant correlation ($p < 0.01$) between potassium and phosphorous ($r = 41$ %) and this agree with finding of Allen and Davies (1981).

The mean Serum chloride of downer cows (120 ± 5 m Eq/L) increased significantly ($p<0.001$) than that of apparent healthy cows (93 ± 4.7 m Eq/l), so there was hyperchloraemia in downers.

This finding agrees with that of Bjorkman et al. (1994) who found an increase in concentration of chlorine in the muscle samples of the downers.

The mean serum glucose of downer cows (98.8 ± 3.6 mg %) was non significant with that of apparent healthy cows (107.6 ± 3.4 mg %). This finding disagree with that of Blum et al. (1971), Luthman and Persson (1975), and Roussel (1986) who recorded hyperglycaemia in case of downer cow syndrome.

Concerning serum protein our results revealed that the mean serrum protein of downer cows (6.43 ± 0.23 gm %) was non significantwith that of apparent healthy cows (6.86 ± 0.14 gm %) and there was no correlation between protein and other elements in the serum.

This finding disagree with that of Rosenberger (1958), and Jacobson and Knudson (1952) who considered hypoproteinaemia was a cause of downer cow syndrome, and with that of Osigna (1963), and Julien and Conard (1977) who considered the dietary protein influenced incidence of downer cow syndrome and dietary mineral imbalance.

Concerning serum enzymes the obtained results revealed that the serum GPT and GOT of downer cows (23.5 ± 1.67 , 41 ± 4 u/ml) were non significant with that of apparent healthy cows (19.5 ± 1.09 , 33 ± 13 u/ml).

These findings disagree with that of Gould and Grimes (1960), Bjorsell et al. (1969), Gulter (1976), Allen and Davies (1981), and Roussel (1986).

Significant increase in serum CK activity in serum of downers (178 ± 30 u/l) was obtained.

This finding agree with that of Andrews (1986), Cox et al. (1986), who found that CPK increased rapidly, peaking soon after insult, and falt after muscle damage had ceased, and agree with that of Kikta et al. (1987).

Experiment IV : Effect of different stages of production cycle on the biochemical constituents of the blood

This experiment was carried out to study the biochemical constituents of the blood serum of cows in different stages of production cycle compared with the biochemical constituents of downers.

The study revealed that lactating non-pregnant (recently calved) had a significant increase in serum potassium ($p < 0.001$), serum glucose ($p < 0.05$), and a significant decrease in serum chloride ($p < 0.001$) than that of downer cows.

The mean serum calcium in cows recently calved (7.94 ± 0.6 mg %) was the lowest among other stages of production cycle and this could be attributed to stresses of pregnancy, parturition and initiation of lactation as there is drain of calcium in colostrum and milk. This indicated that animals at this stage became more susceptable to hypocalcaemia and therefore to downer cow syndrome.

At this stage it was found that the mean serum enzymes activities were the highest among other stages of production, and this could be attributed to damage occurred in the tissue during parturition abd the body functions werte at maximum at this stage.

The obtained results agree in general with that of Shappel et al. (1987), Marcus et al. (1989),Zepperitz et al. (1990), Dolezel et al. (1991), Ivanov et al. (1993) and Bjorkman et al. (1994). This finding also agree with El-Fadaly and Radwan (1992) and Sharma et al. (1991) who recorded no significant changes in serum enzymes in cows in early lactation. On other hand the finding disagree with that of Larson and Kandall (1957) who obseved a decrease in plasma magnesium shortly after parturition, and Setia et al. (1992) who recorded decline in total plasma protein after parturition. Concerning lactating pregnant cows the study revolved that the had a significant increase in the mean serum calcium

($P< 0.05$), phosphorous ($p < 0.01$) and glucose ($p< 0.001$) than that of downers. The cows of this stage had a significant decrease in the mean serum CK ($p < 0.05$) than that of downers. The mean serum potassium (4.14 ± 0.16 m Eq/L) was the lowest among those of other stages, and did not differ significantly than that of downers (4.11 ± 0.1 m Eq/L). The cows at this stage considered to be returned to normal balanced state after parturition and become more adapted to the needs of production and so more differed than downers.

The obtained results agree in general with that of Ivanov et al. (1993), and Bjorkman et al. (1994). On the other hand it disagrees with that of Dolezel et al. (1991) who recorded an increase in serum magnesium after day 25 of parturition.

Concerning non-lactating non-pregnant cows it was found that they had a significant increase in the mean serum calcium ($p < 0.05$), sodium ($p < 0.001$), potassium ($p < 0.001$), and total protein ($p < 0.05$), and a significant decrease in serum chloride ($p < 0.05$), GPT ($p < 0.01$) and CK ($p < 0.05$). The cows at this stage considered non-functioning or non-productive from practical point of view, because there were neither milk nor foetus formation, also the cows at this stage suffered infertility mostly which attributed to mineral disorders or harmonal disorders which also reflected on mineral metabolism. So it is considered abnormal stage in production cycle where the production is the aim. Radwan et al. (1979) used blood constituents of this stage as stander for changes in other stages, and the mean serum calcium was 9.78 mg %, and mean serum phosphorous was 5.75 mg %.

Concerning the non-lactating pregnant (heavy pregnant) cows had the highest mean serum calcium (9.34 ± 0.6 mg %) and lowest mean serum glucose (91.8 ± 3.5 mg %) among other stages of production. There were significant increases in serum calcium ($p < 0.001$), phosphorous ($p < 0.05$), and potassium ($p < 0.001$), and significant decrease in serum chloride ($p < 0.001$), GOT ($p < 0.05$) and CK ($p < 0.05$) than that of downers.

The obtained results agree with that of Setia et al. (1992) who concluded that plasma protein decline after parturition as compared with preportum phase. On the other hand the obtained results disagree with that of Radwan (1979). and El-Fadaly and Radwan (1992) who found a tendency for decrease toward the end of gestation in serum; calcium, phosphorous, and total protein. The findings disagree with that of Mulel (1991) who found that total protein decreased precalving.

From the present investigation it can be generally concluded that; the downer cow syndrome is a complicated state that could occur at any time during the year but the highest incidence was in fall, the disease may occur at any stage of production, but it usually occurs around parturition particularly in older cows.

The main clinical finding of downer cows were sternal recumbency (more than 24 hours) without known cause, and the main biochemical findings were a significant decrease in the mean serum calcium, phosphorous and potassium and significant increase in the mean serum chloride, and CK enzyme. It was found that the pressure damage was a common dominator regardless of what causes are involved.

It is concluded that there is no universal cause of the case, whereas hypocalcaemia had a major role in most of the cases.

SUMMARY

The present investigation was done on 122 dairy cows belonging to the army farm in Nobaria 42 of them were downers and the other 80 cases represented apparent healthy cows at different stages of production cycle :-

20 Lactating non-Pregnant (recently calved)

20 Lactating Pregnant

20 Non-Lactating non-Pregnant

20 Non-Lactating Pregnant (heavy pregnant)

The epidemiological study of the downer cow syndrome under our environmental condition revealed that the disease occurred all over the year but the highest incidence was in August, September and October (0.48 %, 0.48 % and 0.46 %) which represented half of all downers per the year.

The incidence of downer cow syndrome during 1993 in animals under investigation was 2.93 %. The high incidence during these months could be attributed to the stresses of drop in green fodder, sudden changes in nature of ration and imbalanced ration could be occurred at dry seasons around these months . Also the high incidence rate per the year (1993) (2.93 %) could be attributed to extreme desert weather, drop in green fodder and managmental problems like untrained or expensive labour . The syndrome occurred at all stages of production cycle, but the high incidence was found among recently calved cows (66.4 %) when the animal was already under stresses of pregnancy, parturition and lactating. The older cows over 7 years was found to be more susceptible to be downer than younger cows because they more susceptible to metabolic disorders, and injuries during parturition.

The main clinical findings of the affected cows were sternal recumbency for more than 24 hours with non-functioning pelvic limbs, without obvious causes .

The study of biochemical constituents of blood serum in animals revealed that there were significant decreases in the mean serum calcium ($p < 0.001$), and phosphorous ($p < 0.01$), and potassium ($p < 0.001$) while there were significant increases in the mean serum chloride ($p < 0.001$), and CK activity ($p < 0.01$) these indicated that the affected cows suffered from hypocalcaemia and/or disturbance in other minerals metabolism, and the increased CK activities in the serum of downers indicated the damage in the muscles of the downers due to the affect of long recumbency .

The study of changes in biochemical constituents in different stages of production cycle revealed that; the cow recently calved (Lactating non-Pregnant) had the lowest mean serum calcium (7.94 ± 0.6 mg %) and the highest serum enzymes activities among other groups of production cycle and there serum calcium and serum CK (84.81 ± 42 U/L) were not significant with that of downer cows (Ca : 6.97 ± 0.38 mg %, CK : 178 ± 29 U/L.

It is concluded that the cows lactating non-pregnant (recently calved up to 100 days after parturition) were more susceptible to be downer than cows of other groups of production cycle.

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الملخص العربى

إن ظاهرة الرقاد فى الحيوانات هى أحدى التحديات التى يمكن أن يقابلها المربى والطبيب البيطرى فى المزرعة وذلك لأنها تمثل مشكلة متعددة ومتداخلة أو مجهولة الأسباب وهذا يؤدى غالبا" لفقد الحيوان الراقد مما يترتب عليه خسارة أقتصادية وأحباط نفسى للمربى والطبيب البيطرى .

وخططت هذه الدراسة على ظاهرة الرقاد بالأبقارالفريزيان بمجمع البان غرب النوبارية بمزرعة ٦ أكتوبر التابعة للقوات المسلحة وتضمنت الأتى :-

١- دراسة وبائية ظهور الرقاد تحت الظروف المحلية خلال :

أ - شهور السنة .

ب - المراحل الأنتاجية .

جـ - المراحل السنية .

٢- دراسة الأعراض الأكلينيكية للحيوانات الراقدة .

٣- دراسة التغيرات الموجودة فى الدم بالنسبة للعناصرالأتية :-

الكالسيوم - الفوسفور- الماغنسيوم - نسبة الكالسيوم للفسفور- الصوديوم - البوتاسيوم - الكلوريد - الجلوكوز - البروتين - أنزيمات الكبد - أنزيم الكرياتين كيناز فى الحيوانات الراقدة عن الحيوانات السليمة ظاهريا" .

٤- تأثير المراحل الأنتاجية المختلفة على محتوى الدم من العناصر المختلفة (المذكورة سابقا") للحيوانات السليمة ظاهريا" مقارنة مع تلك للأبقار الراقدة .

وقد أوضحت النتائج مايلى :-

١- إن ظاهرة الرقاد فى الأبقارتحدث طوال العام ولكن نسبة الحدوث عالية فى شهور أغسطس وسبتمبر وأكتوبر(٤٨٪ ، ٤٨٪ ، ٤٦٪) عن الشهور الأخرى وهو مايمثل نصف حالات الرقاد خلال العام كله وقد أوضحت الدراسة أن هذا يعزى الى حدوث فترتى العروة الصيفية (١٥مايو - ١٥يوليو) والعروة

الشتوية (١٥سبتمبر - ١٥نوفمبر) وخلال هذه الشهور ممايتنتج عنه نقص فى العلائق الخضراء وتحول العليقة المقدمة للحيوان الى عليقة جافة مما يؤدى الى ضغوط على الحيوانات خلال هذه الفترة وكانت نسبة ظهور المرض خلال السنة ٢،٩٣٪ وأوضحت الدراسة أنها ترتفع عنها فى الدول المتقدمة وذلك يرجع الى الظروف الجوية والمناخ الصحراوى للمنطقة ووجود فترتى العروة وما ينتج عنه من نقص فى العليقة الخضراء المقدمة للحيوان وكذلك لبعض المشاكل فى عملية الأدارة ومنها نقص العمالة المدربة والتكلفة العالية للعلاج وقد أوضحت الدراسة أن أكثر مرحلة تحدث فيها هذه الظاهرة هى مرحلة مابعد الولادة (حلاب - غير عشار) لما يصاحب هذه المرحلة من نقص فى محتوى الدم من عنصرى الكالسيوم والفوسفور ولأن الحيوان يكون قد تعرض لأتعاب خلال فترة الحمل والولادة وبداية الرضاعة مما يجعله أكثر عرضه لنقص الكالسيوم والعناصر الأخرى بالدم .

وكذلك أوضحت الدراسة أن الأبقار من عمر٧ سنوات فأكثر تكون نسبة حدوث ظاهرة الرقاد أعلى من المراحل السنية الأخرى لأن الحيوان فى السن الكبيرة يكون أكثر تعرضا" لنقص محتوى الدم من الكالسيوم والفوسفور والعناصر الأخرى .

٢- إن أهم الأعراض الأكلينيكية المميزة للرقاد فى الأبقار هى رقود الحيوان فى الوضع جالسا" مع أمتداد الرقبة مع عدم قدرة الأرجل الخلفية على القيام بوظائفها من حيث تحمل وزن الحيوان وقدرته على الوقوف وغالبا" بدون أى أسباب ظاهرة .

٣- فى الأبقار الراقدة وجد أن هناك نقص معنوى فى محتوى الدم من الكالسيوم والفوسفور والبوتاسيوم عن الأبقار السليمة ظاهريا"ووجد زيادة معنوية من الكلوريد وأنزيم الكرياتين كينازفي دم الأبقار الراقدة عن السليمة ظاهريا .

وأوضح ذلك أن ظاهرة الرقاد غالبا ماينتج لخلل يتبع نقص الكالسيوم ومعه نقص أو خلل فى نسب عناصر أخرى وفى بعض الأحيان تكون لاسباب أخرى غير نقص عنصر الكالسيوم وأن عنصر الفوسفور والبوتاسيوم يلعبان دورا" فى حدوث هذه الظاهرة . والزيادة المعنوية فى كل من الكلوريد وأنزيم الكرياتينين كيناز يعزى الى التكسير فى خلايا عضلات الجسم نتيجة ضغط وزن الحيوان على العضلات طوال فترة الرقاد .

٤- وجد أن الأبقار مابعد الولادة (حتى ١٠٠يوم) تحتوى على أقل مستوى لعنصر الكالسيوم وأعلى مستوى لنشاط الأنزيمات فى الدم عن المراحل الأنتاجية الأخرى كما لايوجد أختلاف معنوى بينها وبين الأبقار الرقاد بالنسبة للكالسيوم والفوسفور والنشاط الأنزيمى لانزيمات الكبد وأنزيم الكرياتين كيناز بالدم وهذا يوضح أن الأبقار مابعد الولادة تكون أكثر تعرضا" لحدوث ظاهرة الرقاد عن الأبقار فى المراحل الأخرى رغما" من أن أعلى محتوى لعنصر الكالسيوم فى الدم كاف لدى الأبقار العشار الثقيل مما يدل أن عملية الولادة والرضاعة لها دور مهم فى حدوث هذه الظاهرة .

ومن الدراسة نوصى بالأتى :-

١- الأهتمام بتغذية الأبقار الغذاء المتكامل المتناسق (عليقة جافة - خضراء) وخاصة خلال فترتى العروة الصيفية والعروة الشتوية .

٢- الأهتمام بوجود عمالة مدربة وبأعداد كافية للعلاج السريع عند ظهورظاهرة الرقاد لحيوان ما لأن إزالة تأثير ضغط وزن الحيوان يعتبر أهم نواحى العلاج

٣- تقديم العناية الكافية والرعاية الكاملة للأبقار وخاصة خلال فترة الولادة ومابعدها .

٤- الأخذ بالأعراض الأكلينيكية مع التشخيص المعملى السريع عند علاج الأبقار المريضة مع الملاحظة الجيدة للحيوان .

بسم الله الرحمن الرحيم

سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم

صدق الله العظيم

بعض الدراسات على ظاهره الرقاد في ماشية اللبن

رسـالة مقدمـة

مـن

ط.ب/ أحمـد محمـد خليـل

بكالوريوس العلـوم الطبية البيطرية

(كلية الطب البيطرى ـ جامعة القاهرة ١٩٨٥)

الـى

كليـة الطب البيطرى ـ جامعـة الأسكندريـة

للحصول على درجة الماجستير فى العلوم الطبية البيطرية

طب عام وعلاجى

تحـت أشـراف

الأستاذ الدكتور / محمود أسماعيل محمد

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