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CLINICAL AND LABORATORY STUDIES OF PROLONGED RECUMBENCY OF CATTLE AND BUFFALO-COWS IN ASSIUT GOVERNORATE

(With 8 Tables)

By

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دراسات اكلينيكية ومعملية للرقاد الممتد فى الأبقار و الجاموس فى محافظة أسيوط

عرفات صادق سيد ، على حسن صديق ، عبد الرحمن أحمد على

أجريت هذه الدراسة فى محافظة اسيوط على عدد ٧٨ من الأبقار و الجاموس المحلية (عمر ٦-١١ سنة) . كان من بينهم عدد ١٢ حيوان (٦ من الابقار عشر ٧-٩ شهور و ٦ من الجاموس عشر ٨-١٠ شهور) أصحاء اكلنيكيا و معمليا حيث استخدموا كضوابط، وعدد ٦٦ حالة (٣١ بقرة و ٣٥ جاموسة) بعضهم فى الأشهر الأخيرة من الحمل و بعضهم بعد الولادة و كن تعانين من الرقود القصى أو الجانبى و عدم القدرة على النهوض لمدة تتراوح بين ٢-٣٠ يوم، بالاضافة الى الكسل و الهزال الشديدين وفقدان الشهية ودرجات مختلفة من النحافة. هذا و قد أظهرت بعض الحيوانات أعراض عصبية متفاوتة و بعضها كان يعانى من الاسهال الأسود و فقر الدم الحاد و حالات اجهاض مصحوبه باحتباس المشيمة وافرازات مهبلية صديدية والبعض كان يعانى من ورم رضى موضعى فى بعض أجزاء القوائم واحتجاب ضربات القلب فى بعضها الأخر. طبقا للفحص الاكلينيكى و المعملى تم تقسيم الحالات المريضة الى ٧ مجموعات : المجموعة ١: حيوانات تعانى من الرقاد بسبب نقص الكالسيوم فى اشهر الحمل الأخيرة، المجموعة ٢: حيوانات تعانى من حمى اللبن، المجموعة ٣: حيوانات تعانى من الرقاد بسبب نقص

الماغنيسيوم بعد الولادة ، المجموعة ٤: حالات تقرح المنفحة ، المجموعة ٥ : حيوانات تعانى من تسمم الدم بسبب عدوى الاجهاض ، المجموعة ٦: حيوانات تعانى من الرقاد بسبب كسور القوائم ، المجموعة ٧: حيوانات تعانى من الرقاد التالى لحالات الاتهاب التاموري الوخذى . أظهر الفحص المعملى نقصا معنويا فى قيم الكالسيوم ، الفوسفور، البوتاسيوم و الحديد فى كل المجموعات الراقدة الا ان نقص مستوى الكالسيوم كان شديدا فى المجموعة ٢ و انخفض مستوى الماغنسيوم فقط فى المجموعة ٣ . أظهر مستوى النحاس نقصا معنويا فى كل مجموعات الجاموس الراقدة بينما كان النقص غير معنوى فى مجموعات الأبقار و قد حدث أيضا نقصا معنويا فى مستوى الزنك فى أبقار المجموعة ١،٣، ٦ و كذلك الجاموس فى المجموعات ٢، ٦،٧ .بالنسبة لمستوى النشاط الانزيمى لكل من الاسبرتات أمينو ترانسفيريز و الكرياتين فوسفوكاينيز فقد أظهرت ارتفاعا معنويا فى كل المجموعات المريضة بينما أظهرت مستويات البروتينات الكلية و الألبيومين و الجلوكوز نقصا معنويا فى هذه المجموعات كلها . أظهرت الدراسة انخفاضا فى العدد الكلى لخلايا الدم الحمراء وتركيز الهيموجلوبين وكذلك حجم خلايا الدم المصمتة فى المجموعات ١،٢،٣،٤ بينما ارتفع العدد الكلى لكرات الدم البيضاء فى جميع الحالات الراقدة والمصحوبة بالتهابات بكتيرية. وقد أفادت المحاولات العلاجية فى المجموعات ١،٢،٣ تحسنا ملحوظا فى هذة الحالات وقد نوقشت النتائج الاكلينيكية و المعملية والعلاجية فى سياق البحث. و خلصت الدراسة بأن حالات الرقود الممتد فى الأبقار و الجاموس المحلية واردة الحدوث و تمثل مشكلة اقتصادية بالنسبة للمربين و مشكلة تشخيصية علاجية بالنسبة للبيطريين وذلك لتعدد أسبابها وتشابه أعراضها الى حد كبير . و قد أفادت الدراسة أن التشخيص المبكر لهذه الحالات و التدخل العلاجى المناسب و المكثف يزيد من فرصة التحسن الاكلينيكى لهذه الحالات.

SUMMARY

A total number of 78 animals (6-11 years old) of both native cattle and buffaloes (37 cows and 41 buffalo-cows) were used. Out of these 78 animals, 6 cows pregnant in 7-9 months and 6 buffalo-cows, pregnant in 8-10 months were clinically healthy and kept as control. 31 cows and 35 buffalo-cows were recumbent and unable to rise for a period varied from 2-30 days. The recumbent animals were either in the late stage of pregnancy or after parturition. The

recumbent cases showed anorexia, emaciation, weakness and depression, in addition to these symptoms some cases showed variable nervous signs, others showed blackish diarrhoea, severe anaemia, dehydration, emaciation and complete loss of appetite. There were other 3 groups of recumbent cases: those suffering from late abortion, retained placenta and pyometra, those suffering from traumatic fractures in the pelvic and femur bones and others suffering from edema in the dewlap and lower limbs, strong jugular pulsation, muffling of the heart sounds, emaciation and anorexia. On the basis of clinical examination, in association with laboratory findings, the causes of recumbency were attributed to hypocalcaemia in late stage of pregnancy (non parturient hypocalcaemia), parturient paresis, hypomagnesaemia, abomasal ulcer, post-abortion toxaemia, traumatic fractures and pericarditis. Blood serum levels of Ca, was significantly decreased in all recumbent cattle and buffalo-cows. Severe drop of Ca, in blood serum of the group of parturient paresis. Magnesium level was significantly decreased only in hypomagnaesemic cows. Blood serum levels of P, K and Fe were significantly decreased in cows suffering from non parturient hypocalcaemia, parturient paresis, hypomagnesaemia and abomasal ulcer and in buffalo-cows with non-parturient hypocalcaemia and parturient pariesis. Blood serum iron was also significantly decreased in cattle and buffalo- cows suffering from traumatic fracture and in buffalo-cows with pericarditis. There were a significant decrease in blood serum copper of recumbent buffaloes. Serum zinc was significantly decreased in cows with non parturient hypocalcaemia, hypomagnesaemia and traumatic fracture and in buffaloes suffering from parturient paresis, traumatic fractures and pericarditis. High significant increase in the activities of aspartate amino transferase (AST) and creatinine phosphokinase (CPK) have been observed in all recumbent groups. There were a significant reduction in serum total protein, albumin and glucose in all recumbent groups. Total erythrocytic counts, Hb and PCV were significantly decreased in non parturient hypocalcaemia, parturient paresis, hypomagnaesemia and abomasal ulcer. Fatal hemorrhagic anaemia was observed in cows with abomasal ulcer. Leucocytosis was observed in abomasal ulcers, post abortion toxaemia, bone fracture and pericarditis. Extensive supplemental therapy with mineral elements, vitamins and anti-

inflammatory for a long period proved a good response when administered as early as possible.

Keywords: *Recumbency, Downer, Cattle , buffaloes.*

INTRODUCTION

Prolonged recumbency is considered as one of the major problems in dairy cattle medicine, where the cows lay down and unable to rise again. The causes of such condition is largely unexplained and the syndrome occurs rarely in animals other than ruminants (Kronfeld, 1976; Radostits et al., 1994). Due to the lack of the exact cause of the condition, many authors had suggested that hypocalcaemia, hypophosphataemia, hypomagnesaemia, trace elements deficiency, impaired liver function, myocarditis, pyelonephritis, mastitis, leukemia and metritis may be the primary cause (Jonsson and Pehrson, 1969; Bailey 1972; Arthur 1975; Siedel and Schroter, 1977 and Radostits et al., 1994). Moreover, muscle and/or nerve injury, broken bones, dislocated joints and pressure on the spinal cord were detected in the majority of the paretic cows examined at slaughtering

Downer cow is that cow which lay down in sternal recumbency for more than 24-48 hours with no evidence of a systemic illness (Curtis et al., 1970 and Cox, 1982). The condition occurs usually following hypocalcaemic parturient paresis and characterized clinically by prolonged recumbency even after two successive treatments with calcium (Jonsson and Pehrson,1969 and Radostits et al., 1994). Prolonged transport of cows in late pregnancy lead to transit recumbency and most of the affected animals may died quickly or within 2-3 days of recumbency (Radostits et al., 1994).

Parturient paresis is one of the important defined metabolic diseases occurring most commonly around the time of parturition in adult cows and characterized by general muscular weakness, recumbency, circulatory collapse and depression of consciousness (Allen and Davies, 1981, Radostits et al., 1994). It is mainly due to the depression of the level of ionized calcium in the tissue fluids where affected cows respond rapidly to the parentral administration of calcium solutions (McMurray et al., 1980 and Allen and Davies, 1981).

Serum electrolyte imbalance or deficits have been suggested as a cause of recumbency following treatment of parturient paresis (Johnson,

1963 & 1967). Prolonged recumbency (more than 4-6 hours) can result in ischemic necrosis due to obstruction of the blood supply especially in a heavy cow if she lies on one leg for a long period (Fenwick, 1969 ; Cox et al., 1982). A persistent hypophosphataemia is regarded as a common cause in some regions (Kraft and Hofmann, 1976 and Radostits et al., 1994). A long term low level of hypomagnesaemia has been suggested as a cause especially when it accompanies hypocalcaemia (Allen and Davies, 1981 & Radostits et al., 1994).

There were no differences in the serum biochemistry between cows which have had hypocalcaemic parturient paresis and become downers and those which do not become downers that called uncomplicated hypocalcaemiac parturient paresis (Jonsson and Pehrson 1969). The levels of creatine phosphokinase (CPK) and serum aspartate amino trnsferase (AST) are usually markedly elevated by 18-24 hours after the onset of recumbency and continue to elevate within the next few days. There may be moderate ketonurea, marked proteinurea and in severe cases myoglobinurea (Guertler et al., 1976; Cox, 1988 and Radostits et al., 1994). A significant rise in the AST activity in the post-parturient recumbent cows was also reported (El-Amrousi and Hofmann (1972). Moreover there were a higher activity of AST and LDH enzymes in blood serum of cow with traumatic paresis and that the longer the paresis had lasted the higher the serum enzyme activities (Bostedt, 1973). However, Fenwick et al (1986) found that all cases of downer cow syndrome had lower concentrations of plasma potassium, calcium and magnesium and higher levels of inorganic phosphorus and sodium in non alert downer cases.

The calcium, phosphorus, magnesium and glucose levels in the blood of some downer cows were within the normal range and the result of haematological examination are usually constant with those found in normal cows which have recently calved (Radostits et al., 1994). A similar problems has been observed in the buffaloes in which the aged animals goes down most commonly in the periparturient period and the incidence was increased in the mid term of the relatively long gestation period (El sayed et al., 1994).

The available literature indicated that few research work has been cited regarding the causes and diagnosis of the prolonged recumbency in cattle and nearly lacking in buffaloes.

This work aimed to: 1-Screening of the most common causes of recumbency in cattle and buffalo-cows in two big cities of Assiut Governorate, Egypt. 2-Tracing the factors that may predispose the cattle and

buffalo-cows for laying down, 3-Studying the clinical, haematological and biochemical chasnges of recumbent cattle and buffalo-cows, 4-Carrying out of therapeutical trials for treatment of the affected animals.

MATERIALS and METHODS

Animals:

A total number of 78 animals (6-11 years old) of both native cattle and buffaloes (37 cows and 41 buffalo-cows) were used in this study. Out of these animals, 6 cows (pregnant in 7-9 months) and 6 buffalo-cows (pregnant in 8-10 months) were in good condition and proved to be healthy after clinical and laboratory investigations and were kept as two control groups (control cattle and control buffaloes). The milk yield of the last season for the examined cattle and buffalo-cows were variable and were ranging between 8-13 L and 6-10 L /daily respectively. Management and feeding of these animals were unsatisfactory. These animals were fed insufficient concentrate mixture and wheat straw in summer, however, they were fed insufficient green fodder (barseem) and little concentrate mixture in winter.

31 cows and 35 buffalo-cows were recumbent and unable to rise for a period varying from 2-30 days and suffering from muscular weakness and exhaustion. The recumbent cases were at the peripartum period either in the late stage of pregnancy or after parturition (table, 1) and were studied over a 3-years period during the years 1995-1997 at the villages of Abnoub and Sedfa cities, Assiut Governorate-Egypt. Clinical examination of recumbent animals was carried out according to Rosenberger (1990) and Radostits et al., (1994. On the basis of clinical examination, in association with laboratory findings, the recumbent cases were classified into seven groups (Table 1).

Samples and adopted methods:

1-Whole blood samples without anticoagulants were collected for separation of serum to estimate blood serum levels of calcium (Ca), phosphorus (P), magnesium (Mg), copper (Cu), iron (Fe), Zinc (Zn), manganese (Mn) sodium (Na^+), potassium (K^+), total protein, albumin, globulin, A/G ratio, aspartate amino transferase (AST), gama glutamyl transferase (GGT), Creatine phosphokinase (CPK), alanine amino-transferase (ALT) and glucose.

Blood serum levels of Ca, P, Mg, total protein, albumin, AST, GGT, CPK, ALT and glucose were determined colorometerically by means of test kits supplied by Boehringer Mannheim GmbH Diagnostica. Blood

serum levels of Cu, Fe, Mn and Zn (ug%) were estimated by means of Atomic Absorption Spectrophotometer (Perkin Elmer Model 2380 USA).

Blood serum electrolytes (Na^+ and K^+) were determined by means of Flame Photometer Corning 400.

2-Whole blood samples with anticoagulant (disodium salts of EDTA) were collected for the determination of blood picture by means of Automated Cell Dyne Electronic counter.

3-Statistical analysis: Statistical analysis of the obtained data were done by means of Soft ware computer program (SPSSWIN, 1995).

4-Therapeutic trials: The recumbent cases were exposed to extensive therapy based on their clinical status, period of recumbency and the results of laboratory examination (Table 3).

RESULTS

1- Clinical findings:

Sixty six animals (31 cows and 35 buffalo-cows) were recumbent and unable to rise for a period varied from 2-30 days and suffering from muscular weakness and exhaustion. In addition to recumbency several animals showed severe emaciation, weakness, dehydration and depression, while some cases suffering from nervous manifestations, others showing blackish diarrhoea, severe anaemia, dehydration, emaciation and complete loss of appetite. There were other 3 groups of recumbent cases: those suffering from late abortion, retained placenta and pyometra, those suffering from fracture in the pelvis and femur bones and the last group were suffering from edema in the dewlap and the lower limbs, strong jugular pulsation, muffling of the heart sounds, emaciation and anorexia. The clinical signs, the results of treatments and the classification of the recumbent cases are shown in tables 1 & 2.

2- Laboratory findings:

The results of blood serum analysis of Ca, P and Mg (mg%), Na^+, K^+, (mmol/l), Cu, Fe, Zn, and Mn, (ug%) in cattle and buffaloes are illustrated in tables 3 & 4.

Blood serum levels of AST, ALT, GGT, CPK (U/l), total protein, albumin , globulin (g/l), albumin / globulin ratio (A/G) and Glucose (mg%) of cattle and buffaloes are shown in tables 5 & 6.

Total red blood cells (T/l), Hb (g/l), PCV (%), MCV (fl), MCH (pg), MCHC (g/dl), total WBC (G/l) and platelets (10^3/mm^3) are shown in tables 7 & 8.

DISCUSSION

Pregnancy and parturition constitutes two of the main physiological events that occur in females during reproductive life (Radostits et al., 1994). Moreover, during pregnancy, the fetus depends entirely upon its dam for the nutrient supplement. It has been reported that the buffaloe fetus reach an average weight of 25 kg during the last month of pregnancy (El-Naggar (1975). This progressive increase in fetal weight especially during the last third of pregnancy, impose a large demand upon the mother. Furthermore and immediately after delivery, the formation of colostrum and the beginning of lactation, constitute a heavy load upon the animal body that may affect some cows or buffaloes especially the aged one beyond their physiological capacity (El-Naggar, 1967 and 1975 & Radostits et al., 1994).

The examined recumbent cases in this work were either in the late stage of pregnancy or just after parturition. The observed signs on recumbent cattle and buffalo-cows were varied according to the causes and duration of recumbency (Table, 2). On the bases of clinical observations and laboratory findings seven etiological factors were claimed to be the most common causes of recumbency among cattle and buffaloes (Table 1). The sugested causes of recumbency in the all 7 groups are previously encountered as a possible etiological factors of prolonged recumbency in cattle (Kronfeld, 1967 and Radostits et al., 1994) and in buffaloes ((El-Sayed et al., 1994).

1- Non parturient hypocalcaemia:

The cattle and buffalo-cows in this group were recumbent during the late stage of pregnancy. The animals fed low grade quality rations, not sufficienct to supply them with the required nutrients. They were suffering from nutritional deficiency and showed severe emaciation and weakness. The high demand for calcium required for these animals in the late stage of pregnancy has led to hypocalcaemia. High significant decreases ($p< 0.01$) in the levels of calcium and significant decreases ($P<0.05$) in the levels of blood serum phosphorus, copper and iron in both cattle and buffalo-cows were evident. The hypocalcaemia may lead to atony of the skeletal and plain muscles resulting in paresis and recumbency. There were a significant decrease in the blood serum levels of zinc in cows and an insignificant

decreases in its levels in buffalo-cows. These results proved that an attack of syndrome similar to parturient paresis (non parturient hypocalcaemia) may be the cause of recumbency. Similar observations on cattle in late stage of pregnancy were recorded by Smith, (1990) and Radostits et al., (1994). Undernutrition, adverse weather, poor harvest or poor managments may lead to malnutrition and prolonged recumbency (Allen and Davies, 1981).

11- Parturient paresis

There were a severe reduction in blood serum levels of calcium in the examined cattle and buffalo-cows, 1-7 days after parturition. The average mean of calcium level in cattle and buffalo-cows reached 3.39 and 3.7 mg /dl respectively. The severe reduction of calcium levels may results in atony of the skeletal and plain muscles, weakness, paresis and recumbency. These findings agreed with Stott (1968). There is a fall in serum calcium levels in all cows at calving due to the onset of lactation and significally greater fall occurs in cows which develop the disease (Bjorsell et al., 1969 and Littledike, 1976). The excess of calcium in the colostrum, the variations in the concentration of calcium in the milk secreted beyond the reduced capacity of calcium absorption from the intestine and the little or the insufficient mobilization of calcium from the bone may be the causes of parturient paresis in dairy animals (Yarrington et al., 1976; Larsen et al., 1986 and Radostits et al., 1994). Blood serum levels of phosphorus and iron were significantly decreased in recumbent cattle and buffaloes while insignificant decrease was found in blood serum copper of cows and significant decrease was found in blood serum copper and zinc of buffalo-cows. Again these findings may give an explanation that deficiency of trace elements was implicated in the causes and pathogenesis of recumbency in cows which come in agreement with Baily, (1972) & Radostits et al. (1994).

111- Hypomagnesaemia

Among the examined recumbent cows, 6 lactating cows (1-3 months after parturition) showed signs of excitement, hyperaethesia and attack of convulsions (table 2). Blood serum levels of magnesium and calcium were severely decreased (hypomagnesaemia and hypocalcaemia) while the level of potassium was significantly increased. These animals were fed on little amounts of feedstuffs (under nutrition) and mainly insufficient amounts of green fodders (barseem and grasses). The grasses may contain high ratio of potassium to calcium and magnesium, where potassium interfere with magnesium absorption from the alimentary tract leading to hypomagneseamia (Wilson,1964 & Field and Suttle, 1979). The hypomagnesaemia when occurs

in association to hypocalcaemia and hyperkalaemia may lead to recumbency with hyperaethesia and convulsions. Two cows were severely affected and did not respond to treatment while the other 4 cows recovered rapidly and responded will to treatments (Table, 2). Hypomagnesaemia is a highly fatal disease of all classes of ruminants and reaches its highest incidence in lactating cows (Allen and Davies, 1981 and Radostits et al., 1994). The authors reported that a long term hypomagnesaemia has been suggested as a cause of downer cows especially when it accompanies hypocalceamia. Blood serum levels of phosphorus, iron and zinc were significantly decreased while insignificant decrease were found in blood serum copper and manganese. The reduced values of these elements in blood serum may be attributed mainly to malnutrition and the inappetance of recumbent cows, which aggravate the recumbency state.

1V- Abomasal ulcers:

Three recumbent cows (20-30 days after parturition) showed the clinical signs of abomasal ulcers (Table, 1 and 2). Marked anaemia with palness of the visible mucous membranes, depression, passage of scanty black faeces were the suggestive signs. Irrespective to the cause, the blood serum levels of calcium, phosphorus, potassium and iron were significantly reduced. Insignificant decrease was found in blood serum copper (table, 3). The execration of calcium, phosphorus and other minerals in milk after parturition may reduced the levels of these minerals in blood serum and lead to hypocalcaemia and hypophosphataemia (Curtis et al.,1983). Calcium ions play an important role in hemostasis and coagulation of blood (Factor 1V). They are responsible for the formation of intrinsic and extrinsic thromboplastin, and the activation of all the processes essential for the mechanism of blood coagulation (Coles, 1986). Additionally calcium deficiency inhibits coagulation of blood and hinder clot formation. After parturition hypocalcaemia is common and animals susceptible to abomasal ulcer may suffer from acute haemorrhagic abomasal ulceration and evantually death. Some studies have shown that acute haemorrhagic abomasal ulcers occur in high producing mature dairy cows within the first few weeks after parturition (Tasker et al., 1958; Aukema and Breukink, 1974; Breukink, 1976; and Radostits et al., 1994). Abomasal ulcers occasionally occurs in association with stress of long transportation, parturition, prolonged surgical procedures and painful condition such as fractured limb or rupture of the cruciate ligaments of stifle joints (Jensen et al., 1976 and Radostits et al., 1994). In abomasal ulcers the potassium ions were sequestered in the

abomasum along with hydrogen and chloride resulting in hypokalemia (McGuirk and Butler, 1980). The result of this work support these findings.

V- Post-abortion toxaemia:

4 cows (aborted in the 8th -9th months of pregnancy) and 7 buffaloes (aborted in the 9th.-10th. months of pregnancy) were found recumbent and showed complete anorexia, emaciation, weakness, depression and other signs of toxemia (Table, 2). Significant reduction in the level of blood serum calcium was observed. Irrespective to the cause of abortion the reduced calcium levels may predispose the animals to the retention of placenta, muscular weakness and recumbency. These findings and interpretations agreed with Curtis et al. (1983) who reported that dystocia, retained fetal membranes, ketosis and mastitis were found to be significally associated with hypocalcaemia.

Blood serum levels of phosphorus, magnesium, iron, zinc and manganese were not affected in both cattle and buffalo-cows while copper was decreased only in recumbent buffaloes. The present post-abortion toxaemia may be due to delayed uterine involution which hinder the normal expulsion of uterine secretion and by turn its retention facilitates post uterine infection leading to toxaemia and recumbency. These explanations agreed with that obtained by Jackson and Knudson, 1962 and Sadiek, 1992.

V1- Traumatic fractures:

3 cows (2 cows, 4-8 months pregnancy and 1 cow after parturition) and 4 buffaloes (8 -10 months pregnancy) were found recumbent and suffering from complete traumatic fracture in the pelvic bones, femur and one buffaloe was found suffering from traumatic fracture (Tables 1 and 2). in the fore limbs (Radius and ulna). Blood serum analysis revealed high significant decrease ($p < 0.01$) in the levels of calcium (hypocalcaemia) and significant decrease ($p < 0.05$) in the level of iron and zinc in all fractured cows and buffalo-cows. The deficiency of these minerals especially calcium lead to fragility of the bones and make it easily fractured even with mild trauma. Records of calcium deficiency in grazing cattle were lacking , however low calcium intake in feedlots accompanied by clinical oesteodystrophy were previously reported (Curtis et al., 1969). The blood serum levels of phosphorus, magnesium, copper and manganese were not altered when compared with those of control groups. This again emphasized that occurred traumatic fractures was mainly due to hypocalcaemia and hypophosphataemia.

V11- Traumatic Pericarditis:

4 pregnant cows (7-8 months pregnancy) and 5 pregnant buffaloes (8-9 months pregnancy) were found recumbent and showed clinical signs of traumatic pericarditis (Tables, 1 & 2). Oedematous swelling of dewelap with exaggerated respiration, positive jugular pulsation, irregularities and muffling of heart sounds were the main observed signs on recumbent cases. Significant decrease in the levels of calcium (hypocalcaemia) zinc and copper in both cattle and buffalo-cows were observed. Iron was also significantly decreased ($p < 0.05$) in buffaloes. These findings may be explained on the bases that deficiency of minerals specially calcium and copper cause weakness of muscles and aggravate the condition of pericarditis leading to recumbency. Congestive heart failure due to traumatic pericarditis was reported to cause recumbency in cows (Radostits et al., 1994).

Regarding electrolytes, the serum levels of sodium were not affected in all the examined cases while potassium levels were significally decreased in non parturient hypocalcaemia, parturient paresis and abomasal ulcer. These disorders were manifested clinically by ruminal and abomasal stasis which lead to sequestration of potassium in the abomasum with hydrogen and chloride resulting in hypokalemia. The hypokalaemia causes muscle weakness by lowering the resting potential of membranes resulting in decreaseing of the excitability of neuromuscular tissues and lead to recumbency depression muscle tremors, cardiac arrhythmia and coma (McGuirk and Butler, 1980; Radostits et al., 1994).

Markedly highly significant increase in serum levels of (AST) and (CPK) have been observed in all recumbent cattle and buffalo-cows, which may be related to muscle damage of recumbent animals and continued elevations of the enzymes activities which occur with the continuous recumbency and muscle damage (Bostedt, 1974; Andrews, 1983 ; Waage, 1984 and Cox, 1988). The activities of ALT and GGT in recumbent cattle and buffaloes were not altered and their values were within physiological limits.

Blood serum levels of total protein, albumin and glucose were significantly decreased ($p<0.05$) in all recumbent groups of cattle and buffaloes reflecting a condition of decreased feed intake and decreased synthesis of protein and glucose in diseased animals. In cows the globulin levels were elevated and consequently A/G ratio were decreased in the groups of cows that suffering from post-abortion infections, pericarditis and hypomagnesaemia. However globulin levels were decreased and

consequently A/G ratio were increased in cows suffering from non parturient hypocalcaemia, abomasal ulcers and bone fracture. Insignificant increases were observed in blood serum levels of globulin in all groups of recumbent buffaloes. These findings revealed that the total levels of protein, albumin and globulin were severely decreased in all the recumbent cases not associated with infectious agents. On the other hand severe reduction in total protein and albumin and elevation of serum globulin were observed in recumbent cases associated with infectious agents. The decreased levels of total protein, albumin and glucose in blood serum of recumbent cattle and buffalo-cows may be attributed to the inappetance, malnutrition and the reduction in ruminal and abomasal tone and motility of the affected cases. Daniel (1983) reported that cows ruminal and abomasal motility and tones were reduced in parturient paresis. The elevated blood serum levels of globulin was mainly due to primary or secondary infections which infect the recumbent animals. Blood serum levels of glucose were significally decreased ($p < 0.05$) in all groups of recumbent cows and buffaloes. The significant decrease of the blood serum levels of glucose in all the recumbent animals whether cows or buffaloes agreed with findings of EL-Sayed et al. (1994). In addition the author declared that hypoproteinaemia, hypoalbuminaemia and hypoglycemia with high elevation in the activity of CPK were the essential biochemical findings in downer cows and buffaloes.

Regarding the haematological investigations, the total erythrocytic counts and haemoglobin concentrations were significantly decreased in all recumbent cows and buffaloes except cows suffering from pericarditis and buffaloes suffering from pericarditis and bone fractures, they showed normal total erythrocytic count. Pericarditis leads to restriction of cardiac movements and probably be followed by congestive heart failure (Radostits et al., 1994). Anoxia developed usually secondary to congestive heart failure and continuous stimulation of bone marrow with consequent occurring erythrogenesis leading to an increases in the total erythrocytic count (Coles, 1986). Packed cell volume was significantly decreased in recumbent cattle and buffalo-cows suffering from parturient paresis, abomasal ulcer, post abortion infections and hypomagnesaemia. The decreased level of PCV occurred secondary to the reduced erythrocytic count. In non parturient hypocalcaemia the animal suffering from microcytic anaemia with resultant decrease in the total erythrocytic count, Hb., PCV and MCV were found. The deficiency of micro and macroelements may be claimed as a cause of such type of anaemia.

Severe haemorrhagic anaemia observed in cows suffering from abomasal ulcers, where the total erythrocytic counts (RBC) and haemoglobin concentration (Hb) were lowered as to 0.9 T/l and 20 g/l respectively in some cases (the average mean of RBCs and Hb were 2.6 T/l and 67 g/l). MCV, MCH, MCHC and platelets values were not altered in all recumbent animals except MCV which was slightly decreased in non parturient hypocalcaemia. Total leucocytic counts were significally increased (leucocytosis) in animals suffering from abomasal ulcers, post abortion infections, bone fracture and pericarditis. The increased total leucocytic counts (leucocytosis) were mainly occured due to the secondary infections occurring to the recumbent animals.

It could be concluded that recumbency in cattle and buffalo-cows are not uncommon and contribute to a managemental, diagnostic and therapeutic challenges to both owners and veterinarian. The causes are multifactorial and are not confined to the imported highly lactating breeds of cattle. It is mainly due to under-nutrtion (energy and mineral deficiencies) either in the late stage of pregnancy or recently after parturition. In addition the metabolic disorders, periparturient stress factors such as stress of infection and toxaemia and direct trauma should not be neglected. Extensive supplemental therapy with mineral elements, vitamins and anti-inflammatory agents for a long period proved to have a good response when administered as early as possible.

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Tables

Table 1: Showing causes, numbers and reproductive status of recumbent cattle and buffalo-cows as well as the number of treated and slaughtered or died ones.

Animal spp.	Cattle (No.= 31)				Buffaloes (No.= 35)			
Causes of recumbency	No.	Reprod. status+	Treated	Died/ slaughtered	No	Reprod. status	Treated	Died/ slaughtered
Non parturient Hypocalcaemia	3	Pregnant (7-9 M)	3	- -	10	Pregnant (8-10M)	8	2
Parturient paresis	8	2-4 days pp.	8	- -	9	1-7 days pp.	9	- -
Hypomagnesaemia	6	1-3 M pp	4	2	-	-	-	-
Abomasal Ulcer	3	20-30 days pp.	-	3	-	-	-	-
Post abortion toxaemia	4	abortion* since 7 days	3	1	7	Abortion * since 7-15 days	5	2
Traumatic fracture	3	2 Preg. (4-8 M) 1 pp.	-	3	4	Pregnant (8-10 M)	-	4
Pericarditis	4	Preg. (7-8 M)	-	4	5	Pregnant (8-9 M)	-	5

+ : Pregnancy diagnosis was done on the basis of rectal palpation. M: months pp.: Postparturient
*- Abortion occurred in late stage of pregnancy (8-9 months in cattle and in 9-10 months in buffaloes).

Table 2 :Clinical signs and treatments used in the different groups of recumbent cattle and buffalo-cows.

Groups	Clinical signs	Treatment
Non parturient Hypo-calcaemia	Recumbency for 7-10 days, severe emaciation, weakness and inappetance, poor body condition score, paresis with mental depression. affected animals were in the late stage of pregnancy, sluggished ruminal motility, weak pulse, subnormal to normal body temperature. Respond to treatment except 2 buffaloes were slaughtered	Cal-D-Mag (pfizer): 1-1.5 L / slow I.V., dextrose 5 % : 2- 2.5 L / I.V. and molasses 4-5 L orally for 2 successive days. ADEVIT-C (ADWIA): 20 ml / I.M. Mumcophos (Mineral mix)
Parturient Paresis	Sternal recumbancy after parturition by 1-7 days, the animal were unable to stand, consciousness, depression, lateral deviation of head and neck. dry muzzle, cold skin and extremities, relaxation of the anus, dilated pupil and eyes were dry and starring. Weak heart beats, weak pulse and some animals showed subnormal temperature. Ruminal stasis, constipation and forced expiratory grunt. Body condition score moderate to good. Rapid respond to calcium therapy.	
Hypoma-gnesaemia	Recumbent cows showed excitement, tetany and hyperaethesia, twitching of the eyelid, convulsion, increase cardiac and respiratory rates and intensity. 4 cases respond to treatment and 2 showed severe signs, not respond to treatment and died.	Mg. sulphate 50 %: 80-150 ml s/c., Cal-D-Mag (pfizer): 0.5-1.0 L. slow I.V., dextrose 5%, 2-3 L / I.V & molasses 4-5 L orally, for 2 successive days; ADEVIT-C (ADWIA): 20 ml,.I.M.; Adenoplex Fort (ATP, carboxylase, vit. B12 & nicotinamide) and Mumcophos (Mineral mix)
Abomasal Ulcer	Haemorrhagic anaemia, pale mucous membranes, abdominal pain, complete loss of appetite, Feces was scant, black and tarry, very weak ruminal motility, some cases showed blackish diarrhoea, dehydration, sunken eyes. 2 cows were died and the 3rd cow was slaughtered.	No treatment trials
Post abortion toxaemia	The cows and buffaloes were found recumbent and showed anorexia , weakness depression, and severe emaciation. Late abortion followed by retention of the placenta, presence of cupious amounts of foul smelling , dark yellowish brown vaginal discharges containing small parts of the placenta. Elevated internal body temperature and reaches up to 41 C, and elevated heart, pulse and respiratory rates. Rectal examination revealed that the uterus was large and still in the abdomenal cavity.	Gentamicin sulphate, 20 mg/kg BW daily for 5-7 successive days. Teramycine tab. (oxytetracyclin, 2 gm intravaginal). Dextrose 5%, 3 L & Saline, 3 L daily for 3 successive days Cal-D-Mag (pfizer): 0.5 L i.v, ADEVIT-C (ADWIA) 20ml I.M , Oxytocin : 20 IU t.b.d
Traumatic fracture	Swelling around the fractured pelvis and hip joint, severe pain and cripitation at the area of the fractured bone and prolonged recumbency up to one month. Fracture in pelvic & femur bones and fore limbs were recognized after slaughtering. Body condition scores were poor - good.	No treatment trials
Peri-carditis	Pain especially after percussion or deep palpation over the cardiac area . Auscultation of the pericardial frictional sound. In some cases there were a muffling of the heart sounds, increased weak pulse, some cases had elevated body temperature (39.5-41). There were a decreased palpability of the apex beat and increase in the area of cardiac dullness. Pulsation and distention of the jugular vein (true jugular pulsation).	No treatment trials

Table 3: Mean and standard deviation values of blood serum levels of Ca, P, Mg, Na, K, Cu, Fe, Zn and Mn in downer cows as well as healthy control ones.

Groups / Parameter	Clinically healthy (No. = 6)	Non parturient Hypocalcaemia (No. = 3)	Parturient paresis (No. = 8)	Hypo-magnesaemia (No. = 6)	Abomasal ulcer (No. = 3)	Post abortion toxaemia (No. = 4)	Traumatic fracture (No. = 3)	Traumatic pericarditis (No. = 4)
Ca (mg/dl)	9.9 ± 1.2	5.2 ± 0.4**	3.39 ± 0.42***	6.31 ±1.02*	6.65 ± 0.45*	6.4 ± 0.99*	5.95 ± 0.66	5.98 ± 0.51
P (mg/dl)	5.5 ± 0.99	3.1 ± 0.2*	3.0 ± 0.85*	3.0 ± 0.4*	4.2 ± 1.78*	5.4 ± 0.47	4.75 ± 2.91	5.33 ± 0.74
Mg (mg/dl)	2.9 ± 0.42	2.27 ± 0.4	2.8 ± 1.2	1.07 ± 0.2**	3.27 ± 0.79	2.32 ± 0.85	2.81 ± 1.03	3.11 ± 0.94
Na (mmol/l)	136 ± 7.1	138 ± 6.4	137 ± 4.6	135 ± 4.3	132 ± 3.8	135 ± 3.4	136 ± 5.9	141 ± 3.7
K (mmol/l)	4.9 ± 0.95	3.03 ± 0.21**	3.4 ± 0.46*	3.47 ± 0.51*	3.67 ± 1.04*	3.93 ± 0.88	4.25 ± 0.9	4.91 ± .88
Cu (ug/dl)	117.9 ± 54	94.0 ± 16.8	96.2 ± 39.7	98.9 ± 32.9	89.3 ± 13.9	125.3 ± 33.4	122.5 ± 14.5	90.9 ± 34.1
Fe (ug/dl)	168.8 ± 34.3	84.67 ± 20.6**	95.0 ± 10.0**	84.5 ± 15.4**	131.5 ± 48.7*	148.8 ± 71.2	131.0 ± 45.3*	151 ± 56.6
Zn (ug/dl)	106.3 ± 49.1	71.67 ± 25.2*	129.3 ± 58.9	111.3 ± 44.2*	99.7 ± 23.2	129.5 ± 36.2	80.0 ± 18.7*	75.0 ± 11.4
Mn (ug/dl)	24.2 ± 7.7	18.83 ± 6.3	23.7 ± 5.13	15.5 ± 6.95	19.8 ± 8.7	27.6 ± 6.7	20.3 ± 4.03	24.0 ± 8.4

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)

Table 4: Mean and standard deviation values of blood serum levels of Ca, P, Mg, Na, K, Cu, Fe, Zn and Mn in downer buffalo-cows as well as healthy control ones.

Groups Parameter.	(No. = 6)	Non parturient Hypocalcaemia (No. = 10)	Parturient paresis (No. = 9)	Post abortion toxaemia (No. = 7)	Traumatic fracture (No. = 4)	Traumatic pericarditis (No. = 5)
Ca (mg/dl)	9.6 ± 1.4	6.1± 0.92**	3.7 ± 0.64***	6.4 ± 1.03*	5.7 ± 1.27*	6.7 ± 0.45*
P (mg/dl)	4.7 ± 0.88	3.9 ± 0.43*	3.8 ± 0.80*	4.3 ± 1.51	4.3 ± 0.80	4.5 ± 1.47
Mg (mg/dl)	2.7 ± 0.68	2.6 ± 0.42	2.8 ± 0.41	3.6 ± 0.82	2.6 ± 0.50	2.5 ± 0.76
Na (mmol/l)	136 ± 6.1	141 ± 5.48	138 ± 2.39	142 ± 8.14	129 ± 3.21	140 ± 2.05
K (mmol/l)	4.9 ± 1.1	3.7 ± 0.69**	3.2 ± 0.78**	4.3 ± 0.79	3.3 ± 0.86*	4.7± 0.71
Cu (ug/dl)	158.0 ± 32.1	105.6 ± 23.82*	117 ± 39.91*	109.6 ± 24.4*	130.6 ± 11.02*	92.1 ± 18.1**
Fe (ug/dl)	164.1 ± 26.9	138.8 ± 7.84*	121.1 ± 8.55*	160.2 ± 39.7	93.7 ± 8.08*	138.3 ± 68.3*
Zn (ug/dl)	120.3 ± 41.09	131.0 ± 49.48	117.8 ± 27.32*	127.6 ± 40.46	85.3 ± 13.8*	108.7 ± 35.2*
Mn (ug/dl)	25.6 ± 10.1	25.6 ± 6.59	28.8 ± 5.33	24.8 ± 7.55	19.7 ± 4.73	30.0 ± 18.03

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)

Table 5: Mean and standard deviation values of blood serum AST, ALT, Gamma GT, CPK, Total protein, Albumin, globulin, A/G ratio and glucose in downer cows as well as healthy control ones.

groups / Parameter	Control healthy (No. = 6)	Hypocalcaemia (No. = 3)	Parturient paresis (No. = 8)	Hypo magnesaemia (No. = 6)	Abomasa ulcer (No. = 3)	Post abortion toxaemia (No. = 4)	Traumatic fracture (No. = 3)	Traumatic pericarditis (No. = 4)
AST (U/l)	34 ± 9.8	103 ± 41**	88 ± 26**	92 ± 7.7**	191± 59**	63 ± 16**	82 ± 13**	151 ± 82**
ALT (U/l)	26.00 ± 6.32	30.67 ± 16.92	32.0 ± 19.98	36.0 ± 24.51	21.5± 7.01	29.75 ± 16.45	14.13 ± 3.01	25.5 ± 17.52
GGT (U/l)	16.9 ±4.61	19.67 ± 1.53	18.8 ± 8.94	37.59 ± 22.0	23.19 ± 6.58	17.74 ± 7.55	20.88 ± 3.78	23.0 ± 12.99
CPK (U/l)	19.5 ± 8.09	941 ± 198.2**	372 ± 55.8**	290 ± 63.96**	853 ± 321.2**	366 ± 121**	853 ± 321**	390 ± 111**
T.prot. (g/l)	87.0 ± 10.8	58.3 ± 4.6*	75.97 ± 8.7*	73.23 ± 10.2*	66.2 ± 18.7*	73. ± 12.2*	65.15± 4.4*	64.5 ± 6.7*
Albumin (g/l)	42.0 ± 2.0	31.0 ± 3.6*	30.4 ± 6.8*	34.48± 2.5*	32.93± 3.99*	23.48 ± 4.5*	31.75 ± 1.7*	24.8 ± 4.58*
Glob. (g/l)	45.0 ± 11.1	27.33 ± 5.1*	45.57 ± 14.2	38.75± 8.1	33.27 ± 17.3*	50.13 ± 9.52	33.40 ± 4.1*	39.65 ± 6.75
A/G ratio	0.98 ± 0.23	1.15 ± 0.26*	0.67 ± 0.16	0.91 ± 0.14	0.99 ± 0.42	0.48 ± 0. 03	0.96 ± 0.13	0.81 ± 0.62
Glucose (mg/dl)	47.7 ± 17.66	30.3 ± 7.1*	42.4 ± 6.5*	31.63±13.1*	24.17 ± 5.2*	42.75 ± 4.8*	29.58 ± 12.8*	38.5 ± 7.6*

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)

Table 6: Mean and standard deviation values of blood serum AST, ALT, Gamma GT, CPK, Total protein, Albumin, globulin, A/G ratio and glucose in downer buffalo-cows as well as healthy control ones.

groups Parameter	Control healthy (No. = 6)	Hypocalcaemia (No. = 10)	Parturient paresis (No. = 9)	Post abortion toxaemia (No. = 7)	Traumatic fracture (No. = 4)	Traumatic pericarditis (No. = 5)
AST (U/l)	45 ± 12	174 ± 51**	74 ± 15**	77 ± 41**	87 ± 13**	138 ± 19**
ALT (U/l)	25.1 ± 17.8	26.9 ± 15.85	21.89 ± 2.09	15.54 ± 5.02	17.33 ± 2.08	30.67 ± 19.01
GGT (U/l)	13.9 ± 3.3	22.1 ± 4.33	14.14 ± 2.68	19.94 ± 6.45	22.0 ± 2.65	27.28 ± 3.95
CPK (U/l)	33 ± 20	594 ± 108**	365 ± 107**	595 ± 116**	386 ± 157**	303 ± 54**
T.prot. (g/l)	81.1 ± 11	67.1 ± 10*	72.9 ± 6*	64.4 ±14*	64.7 ± 5.1*	69.9 ± 5*
Albumin (g/l)	44.9± 8.7	28.4 ± 5*	29.1 ± 9*	22.5 ± 4*	26.7 ± 6*	30.3 ± 8*
Glob. (g/l)	36.2 ± 5	38.7 ± 13	43.8 ± 10	41.9 ± 13	38.0 ± 4	39.5 ± 6
A/G ratio	1.3 ± 0.48*	0.97 ± 0.39*	0.59 ± 0.19*	0.59 ± 0.18*	0.79 ± 0.23*	1.1 ± 0.39*
Glucose (mg/dl)	64.0 ± 15.1	32.9 ± 12.3*	49.8 ± 8.1*	32.0 ± 14.3*	54.0 ± 7.2*	38.0 ± 2.7*

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)

Table 7: Mean and standard deviation values of RBCs, Hb, PCV, MCV, MCH, MCHC, WBCs and Platlets count in downer cows as well as healthy control ones

groups Parameter	Control healthy (No. = 6)	Hypocalcaemia (No. =3)	Parturient paresis (No. =8)	Hypo-magnesaemia (No. =6)	Abomasal ulcer (No. =3)	Post abortion toxaemia (No. = 4)	Traumatic fracture (No. =3)	Traumatic pericarditis (No. =4)
RBCs (T/l)	6.6 ± 2.17	4.57± 1.31*	4.70 ± 0.45*	4.45 ± 0.44*	2.61 ± 0.95***	5.59± 2.39	5.22 ± 0.98	6.31 ± 0.54
Hb (g/l)	120.0 ± 19.22	91.7± 20.2*	96.7 ±11.5*	89.0 ± 15.3*	66.7± 24.8***	94.3± 14.1*	95.8 ± 13.7*	140.2± 17.9
PCV (%)	31.30± 3.15	26.0 ± 7.0	24.27 ± 2.1*	24.5 ± 1.73*	15.17± 5.04**	22.77 ± 6.5*	25.10 ± 3.1	32.25± 3.86
MCV (fl)	49.1 ± 9.85	47.7 ± 18.52	51.9 ± 6.66	55.2 ± 3.55	60.6 ± 14.5	45.6 ± 10.98	48.4 ± 3.32	51.6 ± 8.68
MCH (pg)	18.7 ± 3.45	20.32± 1.42	20.5± 1.62	19.89 ± 1.60	25.43± 3.59	19.88± 6.70	18.52 ± 2.6	21.9 ± .3.38
MCHC (g/dl)	38.6 ± 5.88	35.67 ± 4.89	39.83 ± 3.14	33.88 ± 7.99	43.32 ± 8.29	42.58 ± 5.56	38.29 ± 4.85	43.35 ± 0.47
WBCs (G/l)	7.1 ± 1.8	9.5 ± 1.5	6.2 ± 1.96	7.3 ± 1.1	11.3± 4.4*	16.6 ± 4.9**	13.5 ± 1.5**	13.6 ± 5.1**
Platlets (G/l)	245.33 ± 62.97	247.33± 66.04	263.33 ± 51.32	232.5 ± 95.70	257.83 ± 58.58	209.05 ± 32.49	224.25± 102.6	241.25 ± 90.75

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)

Table 8: Mean and standard deviation values of RBCs, Hb, PCV, MCV, MCH, MCHC, WBCs and Platlets count in downer buffalo-cows as well as healthy control ones.

groups Parameter	Control healthy (No. = 6)	Hypocalcaemia (No. = 10)	Parturient paresis (No. = 9)	Post abortion toxaemia (No. = 7)	Traumatic fracture (No. = 4)	Traumatic pericarditis (No. = 5)
RBCs (T/l)	7.16 ± 1.25	5.36± 0.58**	4.89 ± 0.54**	4.53 ± 0.92**	6.00 ± 0.96	6.04± 0.10
Hb (g/l)	145.6 ± 18.4	101.2 ± 14.6**	104.56 ± 17.3**	101.3 ± 15.7**	110.0 ± 20*	147.0± 14.7
PCV (%)	38.6 ± 4.2	24.4 ± 4.97**	28.97 ± 5.8**	23.43± 6.47**	32.00± 7.55	36.33 ± 1.53
MCV (fl)	54.40 ± 4.1	46.24 ± 6.78*	58.92± 6.42	49.78± 6.15*	52.95 ± 5.76	60.03 ± 1.7
MCH (pg)	20.5 ± 1.2	19.31± 2.78	21.44 ± 1.51	21.91 ± 1.77	18.25± 1.75	24.43± 2.1*
MCHC (g/dl)	37.8 ± 1.03	41.92 ± 4.91	36.45 ± 1.59	44.70 ± 5.32	35.17± 7.85	40.73 ± 4.58
WBCs (G/l)	6.70 ± 1.67	7.94 ± 2.32	7.34 ± 3.48	13.01± 5.0*	8.7± 3.97*	10.63 ± 3.41*
Platelets (G/l)	153.2 ± 25.5	152.60± 40.57	145.22 ± 22.43	163.1± 33.84	179.0 ± 51.22	146.33 ± 28.38

*: Significant ($P < 0.05$) **: Significant ($P < 0.01$) ***: Significant ($P < 0.001$)