Introduction

Hematological tests have been widely used for the diagnosis of various animal diseases. The information gained from the blood parameters would substantiate the physical examination and coupled with medical history provide excellent basis for medical judgment. In addition, it would help determine the nature of the disease, the extent of tissue and organ damage, the response of the defense mechanism of the patient, and aid in diagnosing the type of possible anemia. It would also prove useful in evaluating patients before commencing any surgical intervention and selecting appropriate treatment (Schalm *et al.*,1975). A quantifiable variation was reported in blood parameters due to altitude, management, feeding level, age, sex, breed, health status, method of blood collection, hematological techniques used, diurnal and seasonal variation, ambient temperature, and physiological status (excitement, muscular exercise, pregnancy, estrus, parturition, time of sampling, water balance and transportation). (Schalm ,1975) ; Dacie ,(1991) and Sherman , (1994).

The haematological values can be utilized for the diagnosis of the disease and prognosis of various pathological condition) Hassan , 1967) : Amin , 1993).

Blood parameters change in relation to the physiological status of an animal. The haematological examination is among the methods which may contribute to the detection of some changes in health and physiological status, which may not be apparent during physical examination but which affect the fitness of the animal (Bamishaiye *et al.*, 2009). Haematological analysis involves the determination of different blood parameters such as packed cell volume, Red Blood Cell count among others.

Pregnancy and lactation are physiological status considered to modify metabolism in animals and induce stress (Iriadam, 2007) and (Tanritanir *et al.*,2009). The per parturient period is important in terms of its influence on the health and the subsequent performance of dairy cows, since cows develop serious

metabolic and physiological changes during these periods (Tanaka *et al*., 2011). In fact, it is well known that during the pregnancy all the metabolic pathways are involved in sustaining the fetus growth (Bell, 2000). The period of transition between late pregnancy and early lactation presents a huge metabolic challenge to the high-yielding dairy cow and the haematochemical profiles are important in evaluating the health status of animals during this transition (Hagawane *et al*., 2009)and (Bell, 2000). Immediately after the calving, high rates of body condition score losses are associated with a severe negative energy balance status, indicated by alterations in blood metabolite and hormone profiles (Wathes *et al*., 2009).

The objective of this study is:-

-To investigate the effects of the physiological status on some haematological and biochemical parameters.

Chapter One

Literature and Review

.1 Animal Wealth in the Sudan :

The livestock population in the Sudan was estimated around 140.909 million heads, including 41.563 heads of cattle, 51.555million head of sheep, 43.270 million head of goats and 4.52 million camels (Ministry of Animal Resources and Fisheries , 2009).

2. Importance of Goats:

The goat is one of the main contributors of dairy and meat products for rural people, more than any other mammalian farm animal, particularly in developing country. One of the prominent aspects of demand of goat milk is its home consumption. This demand is increasing because of the growing populations of people. The second important aspect of demand for goat milk is the connoisseur interest in goat milk products especially, cheeses and yoghurt in several developed and developing countries. This demand is growing because of the increasing levels of per capita incomes. (FAO, 2009).

The importance of goats as providers of essential meat and dairy products is reflected in the largest increase in animal numbers during the past 20 years (FAO, 2001) and the largest increase in goat-milk production compared with other mammalian farm animals. The milk of small ruminants, particularly from goats, is of growing economic importance in developing countries and has become a key food resource to tackle the problems of malnutrition (Haenlein, 2004).

3. Goats in the Sudan:

3.1 Sudan Nubian goats :

This breed was developed along the river Nile valley of Southern Egypt and Northern Sudan north 12^{th} latitude . This breed a dairy type goat characterized by fairly proportioned body size with small to medium size head ,convex facial profile and large dropping ears usually turned out at the lower tips.

Both sexes carry medium size lateral or backward – sweeping horns , which are simple in females . The neck is of moderate length , the chest is deep and the withers are prominent. The back is long and straight , the legs are long , strong and well proportioned , the udder is large and well shaped (Manson, 1951) : (Elnaim ,1979) and (AOAD , 1999).

The colour is commonly black (Manson , 1951), but brown pure white and different shadows between them are found . Also multicoluration of black and white are found (Elnaim , 1979) and (AOAD ,1999).

3.2 Sudan Mountain goats :

These type of goats are found in South Kordofan Nubba mountain and Jabil Mara as well as Angassana hill . It comprise about 4.5% of the whole population of goats in Sudan. They are small body sized goats with short legs and neck .

Both sexes are horned ,the hair is short and variable in the colour , but black colour predominates , sometimes light brown color may present (Ibrahim , 2000).

3.3 **Desert goats**:

These goats are indigenous to aried and semi- aried of Northern and savannah regions of western Sudan (Darfur and Kordofan) , Eretria and west ward in Chad . They comprise 27% of the goat population of country. Males have a mane , the neck is short , the wither is height range from 69-83 cm in males and about 65cm in females.

The goat colour varies from white to black and grey colour is the most common (FAO, 1999).

1.4 Gestation period

Pregnancy is the most important event in the life of any female organism to reproduce its progeny. It is a very coordinated process among the mammalian species involving reproductive organs and hormones. The endocrine changes in the profile of estrogens and progesterone in the ewe (female sheep) during the estrous cycle, pregnancy and parturition dramatically affect the structure of the endometrial as well as the uterine

immune system. (Hunter, 1980) : (Pineda, 1989) : (Liggins and Thorburn ,1994), and (Lye ,1996) have significant contribution in the sheep reproductive endocrinology. It is to be mentioned here that the hormonal profiles in the ewe varies those from the cow, the buffalo cow and the doe (female goat). Hormonal changes in the uterus might also regulate the immune cells and immunity of the uterus.

During early development the embryo is not attached to the epithelium lining the female reproductive tract. During this period , embryo obtain their nourishment from fluid and nutrients secreted by glands in the walls of the uterus (endometrial gland in the wall of the uterus). Progesterone stimulates secretion by these glands and blood levels of progesterone are relatively high during this period , as it is being secreted from ovarian corpus luteum .

The maternal recognition of pregnancy is detection of a developing embryo which prevents regression of the progesterone secreting corpora general the mechanism involve secreting products from the developing embryo , these products (proteins or steroid) act locally within the reproductive tract (Frandson *et al*.,2009) .

In most cases the embryonic secreting products inhibit the uterine secretion of prostaglandin ($PGF_2\alpha$), after that the embryo develop to the blastula stage still enclosed in zona pellucid. The zona is shed prior to attachment of the embryo to uterine wall for placentation .

The placentation is attachment of a blastula to the uterine epithelium and penetration of the epithelium by embryonic tissue . Placentation in domestic animals is considered to be noninvasive and primarily the result of formation of cell- to – cell junctions between embryonic tissue and the uterine epithelium . These junction involve binding of membrane protein in embryonic tissue to receptors on maternal epithelium . after fertilization , attachment occurs in the doe about 16 days . (Frandson *et al*.,2009).

In late of gestation and to facilitate delivery of the fetus , muscles and ligaments of the birth canal relax shortly before parturition . The valve swells , and mucous discharge may be present , muscles on both sides of the tail head may relax and appear lowered or depressed . Mammary glands enlarge and may secrete a milky material for a few days prior to parturition .As the time of parturition becomes , animals become restless , seek section , and increase the frequency of attempts to urinate . (Frandson *et al*.,2009).

An important endocrine change during late gestation in most species is in the ratio of estrogen to progesterone . Progesterone is high relative to estrogen during most of gestation , but this ratio change during late gestation , with estrogen increasing relative to progesterone . Estrogen promotes the development of contractile proteins in the smooth muscle cell of the uterus and gap junction between these cells . These uterine increase the force that the uterus can generate for delivery (Frandson *et al*.,(2009).

1.5 Nutrients requirement during pregnancy period :-

In the early stage the doe requires very little additional nutrients above those which she needs for lactation, maintaining body weight, different levels of activity, and growth . In the late stage, most fetal and mammary gland growth takes place, elevating the nutrient requirements of the doe considerably .

In the late stage the requirement for glucose and glucose precursors is high in late gestation primarily for support of fetal development demands and in early lactation to allow the metabolism of fatty acids being mobilized from adipose tissues in support of milk synthesis. for the pregnant doe during the last 2 months of gestation it is recommended that daily allowances of crude protein (CP) should be at least 10 or 11% (as fed basis) and should meet or be no more than 10 to 20% above the energy. In order for mobilization of adequate bone calcium (Ca) to support milk production in early lactation and maintain adequate blood (Ca) . And also

must be added iodine, phosphorus and vitamin A in the ratio because Although iodine and calcium deficiencies have been observed to cause fetal deaths, a vitamin A deficiency is most likely to cause fetal deaths. Especially during or after a dry summer when grass and hay usually lack adequate amounts of vitamin A, specific care is required to meet the animal's requirements. A phosphorus (P) deficiency is more likely than a Ca deficiency in grazing goats because of the relatively low phosphorus concentration in forages. It is important to be aware of possible soil mineral deficiencies in the area where your animals are grazing or where your hay is produced, since this will influence the specific content of that nutrient in the forage . (Sahlu and Dawson , 1995).

1.6 parturition :

Parturition is the physiological process by which the pregnant uterus delivers the fetus and placenta from the mother. The onset of parturition is associated with a switch from a progesterone-dominated state to an estrogen-dominated state (Liggins and Thorburn, 1994). Parturition is triggered by the fetus and is completed by a complex interaction of endocrine, neural, and mechanical factors (Jainudeen and Hafez, 2000) in which both the fetal and maternal mechanisms play essential roles. In the ewe, the fetal endocrine system plays a major role. During the final stage of gestation, the production and secretion of cortisol by the fetal adrenal gland (Bazer and First,1983) and (Thorburn, 1991) induces a fall in the maternal progesterone concentration, which initiates parturition. This cortisol induces the placental 17a-hydroxylase to catalyze the conversion of progesterone to estrogen (Liggins and Thorburn, 1994) resulting in increased estrogen.

Progesterone ratios, which play an important role in the increased synthesis and release of prostaglandins, activation of the myometrium and ripening of the cervix (Challis and Lye, 1994).

Prostaglandins, particularly PGF, play a central role in myometrium contraction, which begins 6-18 hours before delivery (Lye, 1996). Along with relaxin, estrogen causes a relaxation of the birth canal, especially the cervix and the vagina (McDonald, 1989), and helps to facilitate the birth of the fetus. Oxytocin is not a pre-requisite for the parturition in the ewe (Liggins and Thorburn, 1994) but it facilitates the delivery of the fetus and placenta by inducing forceful uterine contractions (Glatz *et al.*, 1981).

1.7 Postpartum period:

The postpartum period is characterized by involution of the uterus and re-establishment of ovarian function, with the main purpose being to prepare the animal for a new pregnancy. Uterine involution results from three overlapping processes: contraction, loss of tissue and tissue repair (Yavas and Walton, 2000).

The post-partum (PP) period is comprised of a series of integrated anatomic and physiologic re-adjustments of both the uterus and endocrine system, and is a crucial factor for the resumption of reproductive capacity and regular cycling of a breeding goat. Morphological changes or their delay in the PP uterus and ovaries of farm animals exert a limitation on reproductive performance following parturition (GreylIng, 2000).

Completion of uterine involution and resumption of sexual activity following parturition in ruminants normally depend on several factors, such as nutrition, nursing of offspring and season of parturition (Yavas and Walton, 2000).

1.8 Lactation period :

Whether you are raising dairy goats or meat goat, milk production by does is critically important to flock's productivity. The udder production within a few days after parturition. Colostrums is critically important to newborn kids, and you should make sure that kids suckle and receive colostrums within the first 24 hours after parturition, preferably the first two to four hour. (Wilde *et al.*,1986).

Colostrum is high in immunoglobulin's, or antibodies. Colostrum provides kids with a temporary immune system that will protect kids against disease until their own immune system is capable of making antibodies. Vaccinating does 30days before kidding will boost the production of antibodies in the colostrums and other protect kids against disease (Wilde *et al.*,1986).

1.9 General composition and function of the blood:

Blood is essential for transporting nutrients and wastes, thermoregulation, immunity, and acid-base balance. The heart and blood vessels help deliver the blood throughout the body (Reece , 1993).

. Variations in blood parameters of animals may due to several factors such as altitude, feeding level, age, sex, breed, diurnal and seasonal variation, temperature and physiological status of animals (Mbassa and Poulsen ,2003).

1.91Blood functions :

1.9.1.1.Transportation

Blood transports O2 and CO2 between the lungs and the tissues. In addition, blood transports absorbed nutrients from the gastrointestinal tract to the liver and other cells; hormones from endocrine glands to target cells; waste products from cells to excretory sites including the liver, kidneys, and skin; and heat throughout the body (Reece ,1993).

1.9.1.2 Regulation

Blood serves a major role in maintaining homeostasis. Blood helps regulate pH via buffers, body temperature by either carrying excess heat to the skin for dissipation or by vasoconstriction to conserve heat, and osmotic pressure by maintaining blood protein and electrolyte levels (Reece ,1993).

1.9.1.3 Protection

Blood plays many roles in immunity. Some blood cells are phagocytic; others produce antibodies. Blood proteins such as complement and interferon are important in immunity. In addition, blood helps maintain homeostasis by clotting to prevent blood loss (Reece , 1993).

1.10 Haematological parameters:

The haematological test serve as an information base for animals health assistance . It has reported that regardless of age , sex and climate , goats reared under traditional husbandry system have low haematological values compared with those reared under modern husbandry (Schalm *et al.*,1975) and (Coles , 1980).

1.10.1 Erythrocytic series :

The erythrocytic series include the erythrocyte count (RBC) , packed cell volume (PCV) and hemoglobin (Hb) concentration . It also comprises mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) mean corpuscular hemoglobin concentration (MCHC) and erythrocyte sedimentation rate (ESR).

In mammals erythrocytes are non nucleated, circular, biconcave discs (Kelly ,1984). The diameter of red blood cell in domestic ruminants ranges between 2.5 and 8.0 µm. The goat erythrocyte has a diameter of 2.5- 3.9 µm (Jain , 1986).

1.10.1.1 Factors effect of erythrocytic series :-

1.10.1.1.1 Sex :

Females need an increased energy reserve in reproduction period when .their feed intake decrease and they are under more physiological pressure (Egbe *et al* ., 2000) . Observed that haematological data are influence by sex and age and these was a fluctuation in haematological values. This fluctuation may be due to several factors such as undefined infection , weather extremities and poor management.

(Egbe *et al* ., 2000) they recorded higher RBC , Hb and PCV values in the males than in the females , while the opposite was true for the MCV and MCH values.

1.10.1.1.2 Season :

Seasonal variation in blood composition of sheep associated with nutrition have been reported in particular PCV and, Hb concentration which decrease during late winter , however , it is difficult to dissociate the effect of nutrition from environment (Withock , 1963).

Merino sheep have higher plasma volume during summer than during winter . Seasonal fluctuation in environmental temperature and relation humidity constitute an important factor that influence blood composition in animals . Maximum mean values of erythrocyte count and Hb concentration of goats were reported during wet summer and these values dropped during dry summer (Deb, 1959).

1.10.1.1.3 Breed :

A great variation in the haematological parameter was observed among the different breeds of goats (Azab and Abdel- Maksoud , 1999) and (Tambuwal *et al*., 2002).

(Daramola *et al*., 2005) showed that PCV was higher in West African Dwarf goat than obtained by (Tambuwal et al., 2002) in Sokoto goats , (also Azab

and Abdel- Maksoud 1999) reported higher PCV values in Baladi goats than in Red Sokoto goats (Tambuwal et al., 2002) .

(Mbassa and Poulsen , 2005) compared cross- bred , (East African goats , Norwegian dairy goat) with Dwarf African and Dan landrace goats , they found that hemoglobin concentration , PCV,RBC were lowest in Norwegian goats.

1.10.1.1.4 Physiological status:

Several investigators have studies the variation in the concentration of clinical chemical parameters in goats in relation to physiological condition (Mbassa and Poulsen, 2005), such as in pregnancy and lactation. It was observed that during pregnancy and lactation material metabolic activities are strained due to fetal and offspring growth requirement which pose extra demand for water and nutrient (Maltz and Shkolink, 1984).

In fact lactation and pregnancy are physiological stages considered to include metabolic stress . In does there is great variation in the haematological and biochemical parameters during the different physiological stages (Iriadam , 2006).

1.10.2 RBC Count :

The test help in diagnosed anemia, and other condition affecting red blood cell (Gernsten, 2009) and (Bunn , 2011).

The amount of oxygen tissue receive depends on the amount and function of RBCs and hemoglobin.

The increased number of RBCs may be due to congenital heart diseases , dehydration , low blood oxygen levels (hypoxia) . (Gernsten, 2009) and (Bunn ,2011) . The decreased number of RBCs may be due to anemia, bone marrow failure , erythropoietin deficiency (secondary to kidney disease) , haemolysis (RBCs destruction , due to blood vessel injury or other cases) , hemorrhage (bleeding) , malnutrition , nutritional deficiencies of ion ,

copper ,vitamin B_{12} , vitamin B_6 , pregnancy . (Gernsten, 2009) and (Bunn, 2011).

1.10.3 Packed cell Volume (PCV) :-

The PCV or haematocrit (HCT) or Erythrocyte Volume Fraction (EVF) is the percentage (%) of red blood cell in blood .(Purves *et al*., 2004).

The PCV can be determine by centrifuging heparinzed blood in capillary tube at 12,000 RPM for 5 minutes . DeMoranville and (Best , 2013). The PCV decreased in variety of common condition including : liver and kidney diseases, malnutrition , vitamin B_{12} and folic acid deficiencies , iron deficiency and pregnancy. (DeMoranville and Best, 2013).

1.10.4 Hemoglobin:

Hb is the pigment of erythrocytes and represent approximately 95 % of erythrocyte protein , and 35 % of erythrocyte mass, and the factors that affect RBCs number hemoglobin and other blood constituent include : age , sex , breed , exercise , nutritional status , stage of estrous , pregnancy , lactation , environment temperature . (Reece, 2005).

Haemoglobin in blood carries oxygen from the respiratory organs (lungs) to the rest of the body where it release the oxygen to burn nutrients to provide energy to power the function of the organism and collects the resultant carbon dioxide to bring it back to the respiratory organs to be dispensed from organism (Weed *et al*.,1963).

1.10.5 Erythrocytes indices:

1.10.5.1 Mean Corpuscular Volume (MCV) :

The MCV was calculated from the PCV and RBC count as follows:-

$$\text{MCV (fl)} = \frac{PCV}{RBC} \times 10 \frac{PCV}{RBC} \times 10$$

1.10.5.2 Mean Corpuscular Hemoglobin (MCH):

The MCH was calculated from the RBC and Hb as follows; -

$$\text{MCH (pg)} = \frac{Hb}{RBC} \times 10$$

1.10.5.3 Mean Corpuscular hemoglobin concentration (MCHC):

The MCHC was calculated from the PCV and Hb as follows :-

$$\text{MCHC g/dl} = \frac{Hb}{PCV} \times 100$$

1.10.6 Erythrocyte Sedimentation Rate (ESR) :

The ESR is a test performed on blood to help determine the health status of an animal. The ESR is usually determined in standard tubes placed in a vertical position. It is measured as the distance in millimeters through which the uppermost layers of erythrocytes pass in a certain length of time. An anticoagulant such as heparin or EDTA is used to keep the cell volume constant (Reece, 2005).

The ESR in horse blood settle quickly , whereas those from ruminants settle very slowly. The ESR increased in anemia and changed in the viscosity of plasma , or plasma proteins , acute general infection , inflammatory condition , in hypothyroidism ,and also in pregnancy (Reece ,2005).

1.10.7 Leukocytic Series :-

The Leukocytic series comprise the total leukocyte count and different leukocyte count . Leukocytes are much less numerous than erythrocytes in the blood of animals where there are approximately 13000 erythrocyte to every leukocyte in blood stream of goats (Reece ,1993) .

1.10.7.1 Factors effect of Leukocytic series :-

1.10.7.1.1Breed :-

(Daramola *et al*., 2005) showed the TWBC was higher in WAD goats than the values obtained for Red Sokoto goats (Tambuwal *et al*., 2002).

1.10.7.1.2 Seasonal :-

(Deb, 1959) showed that season did not affect TWBC in goats , also (Vailya *et al*., 1970) , reported that seasonal variation in TWBC of goats were not significant. The TWBC was not effect by seasonal changes. The seasonal changes in the ratio of neutrophils, lymphocyte and eosinophils

were not significant . The Monocyte ratio was significantly higher during wet summer, compared to winter value (Abdellatif *et al.*, 2009).

1.10.7.1.3 Sex :-

The WBC , lymphocyte and eosinophils were significantly higher in males than females , conversely , neutrophils were significantly higher in males than females (Tibbo *et al.*, 2004). The males WAD goats have increased lymphocyte values compared to the females which had increased neutrophils values compared to the male animals (Daramola ,2003).

1.10.8 Total Leukocyte Count (TLC):

Leukocytes are much less numerous than the erythrocytes in circulating blood , and carry out their function predominantly in the tissue (Reece., 2005). Leukocytes may be found in the circulating blood adhered to (margination) or passing slowly along the endothelial lining of capillaries and small vessel (Reece ,2005). In the healthy animals , leukocytes are constantly passing from the marginal pool to the tissue to remove antigenic substances ,which are harmful to the animals (Reece ,2005).

1.10.9 Differential leukocyte count(DLC) :

1.10.9.1 Neutrophils :

Comparatively are numerous in blood of most animals. They originate in the bone marrow from extra vascular neutrophilic myeloplastic , have cytoplasm granules which stain with neutral dyes (Reece ,2005). Neutrophils are also called polymorph nuclear leukocytes because the nucleus is formed of two to five lobes . The cell is the most important cell in the cellular defense of the body against infection . The neutrophils must reach the site of infection **(** chemotaxis) ; they must ingest the foreign organism (phagocytosis) and they must kill or inhibit the multiplication of the microorganism (microbial killing). (Sukkar*et al.* , 2000).

1.10.9.2 Eosinophils :

The eosinophils normally constitute about 2 percent of all the blood leukocytes. Eosinophils are weak phagocytes, and they exhibit chemotaxis, but in comparison with the neutrophils, it is doubtful that the eosinophils are significant in protecting against the usual types of infection. Eosinophils, however, are often produced in large numbers in people with parasitic infections, and they migrate in large numbers into tissues diseased by parasites **(**Guyton *et al* ., 2006**)**. Although most parasites are too large to be phagocytized by eosinophils or any other phagocytic cells, eosinophils attach themselves to the parasites by way of special surface molecules and release substances that kill many of the parasites. For instance, one of the most widespread infections is schistosomiasis, parasitic infection found in as many as one third of the population of some Third World countries; the parasite can invade any part of the body. Eosinophils attach themselves to the juvenile forms of the parasite and kill many of them.(Guyton *et al* . , 2006).

1.10.9.3 Basophile :

The basophile in the circulating blood are similar to the large tissue mast cells located immediately outside many of the capillaries in the body **(**Guyton *et al.*,2006) .Both mast cells and basophile liberate heparin into the blood, a substance that can prevent blood coagulation. The mast cells and basophile also release histamine, as well as smaller quantities of bradykinin and serotonin. Indeed, it is mainly the mast cells in inflammed tissues that release these substances during inflammation **(**Guyton *et al.*, 2006**)**. The mast cells and basophile play an exceedingly important role in some types of allergic reactions because the type of antibody that causes allergic reactions, the immunoglobulin E (IgE) type , has a special propensity to become attached to mast cells and basophile. Then, when the specific antigen for the specific IgE antibody subsequently reacts with the antibody, the resulting attachment of antigen to antibody causes the mast cell or basophile to rupture and release exceedingly

large quantities of histamine, bradykinin, serotonin, heparin, slow-reacting substance of anaphylaxis, and a number of liposomal enzymes. These cause local vascular and tissue reactions that cause many, if not most, of the allergic manifestation. .(Guyton *et al.,* 2006).

1.10.9.4 Lymphocyte :

Lymphocyte are relatively numerous in the blood stream of most species of domestic animals , they are formed in lymphoid tissue – lymph nodes , payers patches, spleen , tonsil , and thymus (Reece ,2005). These cells are play important role in immune system , and functionally are divided to T and B lymphocyte .They are actively motile and show amoeboid activity Reece , (2005). They may increase in acute infection like brucellosis ,hepatitis A and B, and decrease due to corticosteroid use ,malnutrition or immunosuppressive drug (Faguet ,1975) and(Weiss *et al* .,1975).

1.10.9.5 Monocyte:

These are relatively are large with single nucleus, they are motile, phagocytic , and have enzyme systems that degrade engulfed tissue debris from chronic inflammatory reaction (Reece , 2005) . Monocytes can leave the blood stream to tissue by chemokines and lymphokines **(**Reece, 2005). The mature Monocyte reaches the bloodstream , where it stays for a few hours to 6 days . Then it leaves the circulation for the tissue , where it undergoes transformation to the larger and more effective phagocyte - tissue macrophage (tissue scavengers) . (Sukkar *et al.,* 2000).

1.11 Blood Chemistry :

1.11.1 Blood glucose :

Blood glucose is the major source of energy for maintenance of life and for different reproductive processes. It is the only sugar which is found in the body . Glucose level is used as an evident reflection of weight changes (Coles ,1986) .The normal blood glucose level in goats ranged between 50-75 mg /dL (Dhanotiya ,2004).

Blood glucose concentration in mature ruminants are substantially lower than those in non ruminants , maintenance of blood glucose concentration involves a finely regulated mechanism in which the liver, extra hepatic tissue ,and several hormones including insulin , glucagon , epinephrine , glucocorticoid ,and thyroid hormone play a major regulator role (Reece , 2005). The increase glucose levels (Hyperglycemia) occur due to : glucocorticoids , parenteral nutrition , stress, (Kerr , 2002). The decrease in glucose levels (Hypoglycemia) can be due to : over dose of insulin , fasting (Kerr, 2002).

1.11.2 Total Protein :

The three major classes of plasma proteins have been identified albumin : α_1 – α_2 – β_1 – β_2 and γ globulins , and fibrinogen . The γ globulins produced by lymphocytes and plasma cell contain antibodies commonly called immunoglobulin's (Ig).The plasma proteins , formed chiefly by hepatic cells , may also be broken down into amino acid and made available for formation of cellular protein , especially when the amino acid supply from the digestive processes is not adequate. The function of plasma proteins are in state of equilibrium , when the amino acid concentration in tissue cells decreases below that plasma , amino acid enter the cells and are used for synthesis of essential plasma and tissue proteins. Also the plasma proteins help to maintain the colloidal somatic pressure of blood . (Reece , 2005).

1.11. 3 Albumin :

The albumin is synthesized by liver and makes up about 60% of the plasma proteins . Albumin is important in the formation and absorption of tissue fluid and in preserving a fluid balance between blood and tissue. When the albumin fall to levels called hypoalbuminemia , the fluid leave the circulation readily and a cumulate in excessive amounts in the interstitial compartment leading to Edema .

The common cause lead to hypoalbuminemia is : liver disease – decreased intake of protein . (Sukkar *et al.* , 2000).

1.11.4 Globulin :

The globulins are subdivided into : $\alpha_1 - \alpha_2 - \beta_1 - \beta_2$ and γ globulins . Alpha and beta globulins are synthesized in the liver and γ globulins in the reticuloendothelial system by plasma cells. Alpha globulins transport lipoproteins , lipids , hormones , bilirubin in plasma .

The beta globulins transport lipoprotein , lipids , cholesterol , iron , copper, vitamin A, D and K and some hormones .

Gamma globulins (IgG , IgM , IgD , IgE) are used to give active immunity against a variety of diseases. Solution of γ globulins are used therapeutically to give passive immunity(Sukkar *et al.* , 2000).

1.11.5 Urea :

Monitoring of blood urea levels can used for measuring protein status in cattle from different feeding regimes (Hammond ,2006) . In ruminant a decrease in blood urea concentration is relation to low dietary intake of protein due to the recycling of urea from blood back to the rumen when dietary protein intake is slow (Oulum ,2005).

High blood urea levels could indicate a high protein intake or the excessive mobilization of muscle (Chimayo *et al* ., 2000). Urea production occurs almost exclusively in the liver and liver failure is frequently associated with a decrease in urea . Some situation like dehydration or renal failure may increase of serum urea (Carlson , 2002).

1.11.6 Creatinine :

Creatinine levels in the blood that are too high can indicate that the kidneys aren't working properly. The kidneys filter and excrete creatinine; if they're not functioning properly, creatinine can build up in the bloodstream. Both dehydration and muscle damage can also raise creatinine level **.** **(** Yamini *et al.* ,2012).

1.12 Liver Enzymes :

1.12.1 Alanine aminotransferase (ALT) :

The ALT enzyme was found in serum and organ tissue, especially liver. ALT is elevated in serum under conditions of significant cellular necrosis and is used as a measure of liver function (Evans, 2009).

1.12.2 Asparatate aminotransferase (AST) :

The AST enzymes were found in all tissues except bone, with highest levels in liver and skeletal muscle. Concentration of AST is elevated after trauma, necrosis, infection, neoplasia of liver or muscle (Eugester *et al*., 1966).

Chapter Two

2- Materials and Methods

2.1 Study area:

This study was performed at farm of Faculty of Veterinary Science, University of Nyala. Nyala- South Darfur state , it is located between latitudes 8° 30 and 13º 30 North and longitudes 22° and 28° East , in the year 2013.

2.2 Experimental Animals:

Fifteen healthy sexually mature female goats , cyclic, aged between 2 to 3 years, with an average body weight 30± 2.1kg, the animals were divided into two groups, (group A consist of ten pregnant does) and (group B consist of five none pregnant does) and one desert buck. All the animals were apparently healthy on clinical examination, and were dosed against internal parasite by (Ivomec®) one ml injected subcutaneously.

2.3 Animals Housing:

The animals were housed in semi closed pens at the Farm of the Faculty of Veterinary Science, University of Nyala. Group A had kept with a male before conception and were separated after pregnancy.

2.4 Animals feeding regime:

The feeding regime based on grazing natural pasture and supplemented with concentrates (sorghum grain, groundnut cake, wheat bran) .

2.5 Pregnancy Occurrence:

Group A does were synchronized for estrous following (Arthur *et al.*, 1989) by: Prostaglandin (Estrumate®) 1ml dose intramuscular (IM) and the dose was repeated after 11 days. The animals were served naturally by healthy an active desert buck.

Non return to estrous was considered as an indication for conception. Ten does that became pregnant were group A , while five animals remained as non pregnant were group B.

2.6 Blood sampling :

Five ml of blood was collected by using disposable syringes 22G×1$\frac{1}{4}$″ sterile needles, from the jugular vein following aseptic techniques. Blood samples were divided into (2.5 ml) in plastic tube contain EDTA, for hematological tests that is count of Red blood cell(RBCs) in 10^6cell/µL , Hemoglobin concentration (Hb) in g/dl , packed cell volume (PCV) in % , Total white blood cell (WBCs) in 10^3cell/µl , Differential leukocyte count (DLC) in % (Jain ,1986) .

(2.5 ml) in plastic tube, for serum biochemical tests (glucose assessment and albumin, urea, total protein , creatinine and liver function test). The samples were taken every two weeks during the gestation period at the day of parturition and every week during the postpartum period for 5 weeks.

2.6.1 Haematological parameters:

2.6.1.1 Red Blood Cell count (RBCs):

Red blood cells were counted using an improved Neubaur-hemacytometer (Neubaur improve – Germany) , hayem solution was used as a diluent. A total count of five squares was multiplied by 10000 and expressed in 10^6 cell/µl (Jain, 1993).

2.6.1.2 Packed Cell Volume (PCV):

The packed cell volume of erythrocytes was determined by a micro-haematocrit- centrifuge method using a special centrifuge(Hetich Germany). The capillary tubes (75mm×1.0 mm) were filled by capillary from a well mixed blood sample up to ⅔ length of the tube. The outside of the tube was cleaned with absorbent gauze and the opposite end was sealed with special clay (cristaseal). The filled tube was centrifuged at 12000 rpm for 5 min. The PCV was measured as percentage of whole blood using the micro-haematocrit reader (Jain ,1993).

2.6.1.3 Hemoglobin concentration (Hb):

The blood Hb was estimated using a digital colorimeter LAB-TECH INDIA) and (SPINREACT)® reagents .according to the method described by (Kelly , 1984**).**

2.6.1.3.1 Principle of the method:

Hemoglobin is oxidized by potassium ferricyanide into methaemoglobin, which is converted into cyanomethaemoglobin, by potassium cyanide.

2.6.1.3.2 Reagents:

- Potassium ferricyanide 0.60 mmol/L
- Potassium cyanide 77 mmol /L
- Dihydrogen potassium phosphate 2 mmol/L

2.6.1.3.3 Preparation:

Working reagent (WR) :

Was attended by mixing 245ml of distilled water with1 vial (5ml) of reagent.

2.6.1.3.4 Procedure:

From the working reagent 2.5ml was added to each test tube , 10µml of the sample and the standard were pipette into test tubes, Mixed and incubated for 3 min. at room temperature. The absorbance of sample and standard were read at wave length of 540 nm against blank.

2.6.1.3.5 Calculation :-

$$\frac{(A)\ sample}{(A)\ standard} \times (standard\ conc) = \text{g/dL hemoglobin in the sample.}$$

2.6.1.4 Erythrocytes indices:

The erythrocytes indices were calculated according to (Jain , 1993).

2.6.1.4.1 Mean Corpuscular Volume (MCV) :

The MCV was calculated from the PCV and RBC count as follows:-

$$\text{MCV (fl)} = \frac{PCV}{RBC} \times 10$$

2.6.1.4.2 Mean Corpuscular Hemoglobin (MCH):

The MCH was calculated from the RBC and Hb as follows:-

$$\text{MCH (pg)} = \frac{Hb}{RBC} \times 10$$

2.6.1.4.3 Mean Corpuscular hemoglobin concentration (MCHC):

The MCHC was calculated from the PCV and Hb as follows

$$\text{MCHC g/dl} = \frac{Hb}{PCV} \times 100$$

2.6.1.5 Erythrocyte sedimentation Rate (ESR) :

Usually is determined by sedimentation level of the red blood cells in the wastigern tubes when was placed in a vertical position and the reading was taken after hours of testing (Reece , 2005).

2.6.2 White blood cell count (WBCs) :

The total white blood cells were counted by Nebular haemocytometer using Turkey's solution as diluting fluid . A total count of four squares was multiplied by 1000 and expressed in 10^3cell /µl (Jain ,1993)

2.6.3 Differential leukocyte count (DLC) :

2..6.3.1 Preparation of blood film and staining :-

The blood smear was prepared immediately after the collection of blood by placing a drop of blood in the centre line at the end of a clean slide, then the blood was spread using spreader slide. The smear was dried at room temperature and fixed by placing it in absolute methyl alcohol for 5 min **(**Jain, 1993).

Smear was stained with diluted Giemsa stain for 15 min; the smear was rinsed well with distilled water and dried **(**Jain, 1993).

The percentages of Neutrophils , Lymocytes , Monocyte , Eosinophils , and Basophils were determined microscopically from account of 100 leukocytes in thin may –Grunewald-Giemsa stained blood smear by using straight marginal method (Jain ,1993).

2.6.3.2 Counting leukocytes :

The blood film was examined by the microscope (Olympus : Japan) using the oil immersion lens (x100). Battlement method was used for the examination of the blood film to give representative sampling of all parts of the film **(**Jain ,1993).

2.7 Biochemical tests :

2.7.1 Glucose :-

The glucose was estimated using a digital colorimeter (LAB-TECH INDIA) and (SPINREACT)®. according to method described by (Barhan and Trinder , 1972).

2.7.1.1 Principle of the method :-

Glucose oxidase (GOD) catalyase the oxidation of glucose to gluconic acid. The formed hydrogen peroxidase (H_2O_2) is detected by achromogenic oxygen acceptor, phenol, 4 – aminophenazone (4AP) in the presence of peroxidase (POD).

$$\beta\text{-D-Glucose} + O_2 + H_2O \xrightarrow{GOD} \text{gluconic acid} + H_2O$$

$$H_2O_2 + \text{phenol} + 4AP \xrightarrow{POD} \text{Quinine} + H_2O$$

The intensity of the color formed is proportional to the glucose concentration in the sample.

2.7.1.2 Reagents :-

- TRIS ph 7.4 92 mmol/ L
- Phenol 0.3 mmol/L
- Glucose oxidase 15000 U /L
- Peroxidase 1000 U/L
- 4 – Aminophenazone 2.6mmol/L

2.7.1.3 Procedure :-

One ml of working reagent was added to each test tubes , 10 µml of the samples and the standard were pipetted into test tubes ,mixed and incubated for 10 min at room temperature. The absorbance of sample and standard were read at wavelength of 490 nm against blank using digital colorimeter.

2.7.1.4 Calculation :-

$$\frac{A\ sample}{A\ standard} \times (standard\ conc) \quad = \text{mg / dL}$$

2.7.2. Total protein :-

The total protein was estimated using a digital colorimeter (LAB-TECH INDIA) and (Bios stem react)®. According to the method described by (Henry ,1964).

2.7.2.1 Principle:-

Protein in the sample reacts with copper (II) ion in alkaline medium forming colored complex that can be measured by colorimeter.

2.7.2.2 Composition :-

Reagent : copper (II) acetate 6mmol/L , potassium iodine 12 mmol /L , sodium hydroxidase 1.15 mmol/L .

2.7.2.3 Procedure :-

One ml of working reagent was added to each test tubes , 20 µml of the samples and the standard were pipetted into test tubes ,mixed and incubated for 10 min at room temperature. The absorbance of sample and standard were read at wavelength of 545 nm against blank using digital colorimeter.

2.7.2.4 calculation :-

The protein concentration in the sample is calculated using the following general formula :-

$$\frac{A\ sample}{A\ standard} \times (\ standard\ conc\ ) = \text{C sample g/dL.}$$

2.7.3 Albumin :-

The serum Albumin was estimated using a digital colorimeter (LAB-TECH INDIA) and (SPINREACT)® according to the method described by, (Doumas ,1971).

2.7.3.1 Principle of the method :-

Albumin in the presence of bromcresol green at a slightly acid pH , produces a color change of the indicator from yellow-green to green tube. The intensity of the color formed is proportional to the albumin concentration in the sample.

2.7.3.2 Reagents;-

- Bromcresol green pH 4.2 0.12mmol/L
- Albumin aqueous primary standard 5 g/dL

2.7.3.3 Procedure :-

One ml of working reagent was added to each test tube, 5 µml of the samples and the standard were pipetted into test tubes, mixed and incubated for 10 min at room temperature. The absorbance of sample and standard were read at wavelength of 600 nm against blank using digital colorimeter (LAB-TECH INDIA).

2.7.3.4 Calculation :-

$$\frac{A\ sample}{A\ standard} \times (\ standard\ conc\ ) = \text{g/dL}$$

2.7.4 Serum globulin :

The serum globulin was calculated by subtracting the measured albumin from the measured the total protein according to (Jain , 1993).

Globulin = Total protein – Albumin

2.7.5 Urea :

The blood urea was estimated using a digital colorimeter (LAB-TECH INDIA) and (SPINREACT)® according to the method described by **(**Barbara and Thomus ,1998).

2.7.5.1 Principle of the method :-

Urea in the sample is hydrolyzed enzymatically into ammonia ($NH_4)^+$ and corbondioxide (CO_2). Ammonia ions formed reacts with salicylate and hypo chloride (NaCIO) , in presence of catalyst nitroprusside, to form green indophenols:

$$\text{Urea} + H_2o \xrightarrow{\text{urease}} (NH_4)_2 + Co_2 .$$

$$NH_4^+ + \text{salycilate} + \text{NaCIO} \xrightarrow{\text{Nitroprusside}} \text{Indophenol} .$$

2.7.5.2 Reagent:-

R_1 buffer	Phosphate pH 6.7	50mmol/L
	EDTA	2mmol/L
	Sodium salicylate	400mmol/L
	Sodium nitroprusside	10 mmol/L
R_2 NaCIO	Sodium hypochloride	140mmol/L
	Sodium hydroxide	150mmol/L
R_3 enzymes	Urease	
UREA CaL	Urea aqueous primary standard 50mg/dL.	

2.7.5.3 Preparation :-

The working reagent (WR) was attended by mixing R_3 (enzymes) with R_1 (buffer) in one bottle and R_2 was ready to use.

2.7.5.4 Procedure :-

1 ml of R_1 was added to each test tubes , 10 µml of the samples and the standard were pipetted into test tubes ,mixed and incubated for 10 min at room temperature. After that 1 ml of R_2 was added to each test tube, mixed and incubated for 10 min. The absorbance of sample and standard were read at wavelength of 580 nm against blank using digital colorimeter (reagents).

2.6.2.5.5 calculation :-

$$\frac{A\ sample}{A\ standard} \times (\ standard\ conc\ ) = \text{mg /dL.}$$

2.7.6 Creatinine :-

The serum Creatinine was estimated using digital colorimeter (LAB-TECH INDIA) according to the method described by, (Faulkner and King ,1976).

2.7.6.1 Principle of the method :-

Creatinine reacts with alkaline picrate forming a red complex. The time interval chosen for measurements avoid interferences from other serum constituents the intensity of the color formed is proportional to the creatinine concentration in the sample.

2.7.6.2 Reagents :-

- Picric acid 17.5mmol/L .
- Sodium hydroxide 0.29 mol/L.

2.7.6.3 .Preparation:-

- Working reagent (WR) was attended by mix equal volume of R_1 with R_2 .

2.7.6.4 Procedure:-

One ml of working reagent was added to each test tubes , 100 µml of the samples and the standard were pipetted into test tubes , the absorbance A_1 was read after 30 second and after 90 seconds read A_2 of sample . The absorbance of sample and standard were read at wavelength of 490 nm against blank using digital colorimeter (reagents).

- Calculate $\Delta A = A_2 - A_1$.

2.7.6.5 Calculation;-

$$\frac{\Delta A\ sample\ - \Delta A\ blank}{\Delta A\ standard - \Delta A\ blank} \times (\ standard\ conc\ ) = \text{mg / dL.}$$

2.7.7 Liver Enzymes :-

Determination of serum Asparatate Aminotransferase (AST) and serum Alanine Aminotransferase (ALT) activities were determined by spectrophotometer method using (Spectrophotometer – BioSystems, BTS – 302) and (SPINREACT)® . According to the method described by (Bergermeyer *et al.*, 1986) .

2.7.7.1 Alanine Aminotransferase (ALT) :

Alanine aminotransferase (ALT) or Glutamate pyruvate transaminase (GPT) catalyses the reversible transfer of amino group from Alanine to α – ketoglutarate forming glutamate and pyruvate. The pyruvate produced is reduced to lactate by lactate dehydrogenase (LDH) and NADH using (Spectrophotometer – BioSystems, BTS – 302) and (SPINREACT)®. (Bergermeyer *et al.*, 1986).

L- Alanine + α ketoglutarate $\xrightarrow{\text{ALT}}$ Glutamate + pyruvate

Pyruvate + NADH+H $\xrightarrow{\text{LDH}}$ lactate + NAD^+

The rate of decrease in concentration of NADH ,measured photo metrically, is proportional to the catalytic concentration of ALT in the sample.

2.6.2.7.1.1 Reagents :-

- TRIS pH 7.8 100 mmol/ L.
- Lactate dehydrogenases (LDH) 1200 U/L.
- L- Alanine 500mmol/L.
- NADH 0.18 mmol/L.
- α-ketoglutarate 15 mmol/L.

2.6.2.7.1.2 working reagent preparation :-

Mix R_1 (buffer) with R_2 (substrate).

2.6.2.7.1.3 Procedure :-

One ml of working reagent was added to each test tubes , 100 µml of the samples were pipetted into test tubes , the absorbance A_1 was read after 1 minutes and after 3 minutes read A_2. The absorbance of samples were read at wavelength of 340 nm against blank using spectrophotometer.

2.6.2.7.1.4 Calculation :-

$\Delta A/ \text{min} \times 1750 = U/ L \text{ of ALT}$.

2.7.7.2 Asparatate aminotransferase (AST) :-

Asparatate aminotransferase (AST) or Glutamate oxalacetate transaminase (GPT) catalyses the reversible transfer of amino group from Asparatate to α – ketoglutarate forming glutamate and oxalacetate. The oxalacetate produced is reduced to malate by malate dehydrogenase (MDH) and NADH using (Spectrophotometer – BioSystems, BTS – 302) and (SPINREACT)®. (Bergermeyer *et al*., 1986).

L- Asparatate + α ketoglutarate $\xrightarrow{\text{AST}}$ Glutamate + oxalacetate.

oxalacetate + NADH+H $\xrightarrow{\text{MDH}}$ malate + NAD^+.

The rate of decrease in concentration of NADH ,measured photo metrically, is proportional to the catalytic concentration of AST in the sample.

2.7.7.2.1 Reagents :-

- TRIS pH 7.8 80 mmol/ L.
- Lactate dehydrogenases (LDH) 800 U/L.
- Malate dehydrogenase (MDH) 600 U/L.
- L- Asparatate 200mmol/L.
- NADH 0.18 mmol/L.
- α-ketoglutarate 12 mmol/L.

2.7.7.2.2 working reagent preparation :-

Mix R_1 (buffer) with R_2 (substrate).

2.6.2.7.2.3 Procedure :-

One ml of working reagent was added to each test tubes , 100 µml of the samples were pipetted into test tubes , the absorbance A_1 was read after 1 minutes and after 3 minutes read A_2. The absorbance of samples were read at wavelength of 340 nm against blank using spectrophotometer (reagents).

2.7.7.2.4 Calculation :-

$\Delta A/ \text{min} \times 1750 = U/ L \text{ of ALT}$.

2.8 Statistical analysis :-

The data obtained were subjected to one way analysis of variance to examine the effect of the physiological status on the studied parameters. Significant differences among the physiological status were determined using Least Significant Differences (LSD) test according to Gomez and Gomez, (1984). The Statistical Package for Social Sciences Program (SPSS) was used for the analysis.

Chapter Three

3-Results :

3.1 Effect of physiological status on : -

3.1.1 The Erythrocytic series :-

The effect of physiological status on erythrocytic series were presented in table (1) , the TRBCs was significantly higher ($P<0.05$) in the control group and postpartum than the other. No significant observed between the early stage , late stage and the day of parturition .

The PCV was significantly higher ($P<0.05$) at the control group, followed by the postpartum. The lower value was showed at the early stage. No significant difference ($P>0.05$) between the mean of the late stage and the day of parturition.

The result of Hb was showed significantly higher ($P<0.05$) at the control group, followed by the late stage of pregnancy. There was no statistical difference ($P>0.05$) between the mean values of the early stage , day of parturition and postpartum period.

A significant higher ESR value was found in the day of parturition , followed by early stage than late stage . No significant were found between the postpartum period and control group.

The result of MCV was showed significantly higher ($P<0.05$) at the control group and followed by the late stage of pregnancy. But the value obtained at the early stage was significantly lower ($P<0.05$) than other stages. No significant variation ($P>0.05$) occurred between the day of parturition and postpartum period.

The MCH value was significantly higher ($P<0.05$) in the control group, followed by the late stage and the day of parturition. But no significant variation were observed between the postpartum period and the early stage of pregnancy.

The result of MCHC was significantly higher ($P<0.05$) at the early stage . But the lower value occurred at the postpartum period. No significantly difference between the late stage , day of parturition and control group.

3.1.2 The Leukocytic series :-

Table (2) shows a significantly higher TWBCs count at ($P<0.05$) in day of parturition . But the lower value observed at the postpartum period. No variation between the early stage , late stage and control group.

The leukocyte differential count was presented in table (2), the neutrophils percentage was significantly higher ($P<0.05$) in the day of parturition. No significant ($P>0.05$) difference between the other stages in DLC.

The result of the eosinophils, basophiles, lymphocyte and Monocyte were no significant observed between the physiological statuses.

3.1.3 biochemical parameters and enzymes:-

Result of some biochemical and enzymes are shown in table (3).

Glucose : The highest value was observed in the day of parturition followed by the late stage of pregnancy ones. The lowest value was observed in the postpartum period.

Total protein : During the late stage observed the lowest value than the other periods. No variation was occurred between the other physiological statues.

Albumin : There were not significant variation between the different physiological stages.

Globulin : The lowest value observed at the late stage . No variation between the other physiological statues.

Urea : The day of parturition showed a significantly higher value ($P<0.05$) than the other stages . But the late stage showed a significantly lower value ($P<0.05$) than the other stages . No significant between the early stage , postpartum and the control group.

Creatinine : The late stage of pregnancy showed significantly higher at ($P<0.05$) value than the other stages. No variation were observed between the other stages .

ALT : The highest ($P<0.05$) value was observed in the day of parturition followed by late stage of pregnancy and early stage ones . No significant difference between the postpartum period and the control group.

AST : The highest values ($P<0.05$) were found in day of parturition followed by late stage of pregnancy ones. The lowest value was observed in the postpartum period . No variation observed between the control group and the early stage of pregnancy.

Table 1

Mean (M) Erythrocytic series at the different physiological status.

Physiological status	Early stage of pregnancy	Late stage of pregnancy	Parturition	Postpartum period	Non pregnant Non lactating	Standard Error (SE)	Significance Level
Parameters							
TRBC 10^6cell/µl	12.50^{b}	12.20^{b}	12.76^{b}	13.07^{a}	13.56^{a}	0.11	*
PCV %	24.55^{c}	25.50^{b}	25.40^{b}	26.56^{ab}	29.90^{a}	0.29	*
Hb g/dl	8.70^{c}	9.0^{b}	8.98^{c}	8.82^{c}	10.47^{a}	0.12	*
MCV (Fl)	19.15^{b}	20.58^{ab}	19.60^{b}	19.94^{b}	21.45^{a}	0.14	*
MCH (pg)	6.90^{b}	7.32^{a}	7.10^{a}	6.72^{b}	7.37^{a}	0.05	*
MCHC g/dl	35.08^{a}	34.93^{b}	34.80^{b}	32.80^{c}	34.70^{b}	0.10	*
ESR ml /H	1.08^{b}	1.08^{b}	2.40^{a}	0.94^{c}	0.10^{c}	0.06	*

a, b ,c within the same row followed by different superscript are significantly different .

* = significant at $P < 0.05$.

NS = No significant at $P < 0.05$.

Table 2

Mean (M) Leukocytic series at the different physiological status .

Physiological status	Early stage of pregnancy	Late stage of pregnancy	Parturition	Postpartum period	Non pregnant Non lactating	Standard Error (SE)	Significance Level
Parameters							
TWBC 10^3cell/µl	9.25^b	9.40^b	10.20^a	8.94^c	9.40^b	0.10	*
Neutrophils %	43.05^b	41.55^b	49.40^a	44.06^b	40.45^b	0.56	*
Eosinophils %	2.88	2.95	2.90	2.78	2.55	0.11	NS
Basophils %	0.0	0.0	0.0	0.0	0.0	0.0	NS
Lymphocyte %	53.60^a	55.35^a	49.60^b	52.96^a	56.60^a	0.55	NS
Monocyte %	1.63	1.10	1.30	1.06	1.40	0.09	NS

a, b ,c mean within the same row followed by different superscript are significantly different .

* = significant at $P < 0.05$.

NS = No significant at $P < 0.05$

Table 3

Mean (M) of biochemical parameters at the physiological status

Physiological status	Early stage of pregnancy	Late stage of pregnancy	Parturition	Postpartum period	Non pregnant Non lactating	Standard Error (SE)	Significance Level
Parameters							
Glucose mg/dL	50.95[b]	60.76[ab]	75.37[a]	48.29[c]	50.61[b]	1.00	*
Total protein g/dL	7.50[a]	5.09[b]	7.04[a]	7.76[a]	7.92[a]	0.15	*
Albumin g/dL	3.90	3.80	3.59	3.97	3.92	0.08	NS
Globulin g/dL	3.61[a]	1.29[b]	3.45[a]	3.61[a]	3.99[a]	0.15	*
Urea mg/dL	33.43[b]	29.91[c]	45.76[a]	33.33[b]	30.89[cb]	0.62	*
Creatinine mg/dL	0.64[b]	2.09[a]	0.60[b]	0.61[b]	0.53[b]	0.07	*
ALT IU/L	28.08[b]	32.58[ab]	36.60[a]	24.30[c]	25.50[c]	0.58	*
AST IU/L	82.58[b]	87.70[ab]	95.10[a]	77.54[c]	80.70[b]	1.31	*

a, b ,c within the same row followed by different superscript are significantly different .

* = significant at $P < 0.05$.

NS = No significant at $P < 0.05$.

Chapter Four

4-Disscusion

In the present study the level of the erythrocytic series varied significantly with the physiological status of the animals.

The data showed that TRBC, PCV , Hb , MCV and MCH were higher in the control group compared with the other periods, while ESR and MCHC were higher in the pregnant animals, this is in agreement with (Calvo *et at*.,1989) due to dilution of blood which occur as a consequence of an increased plasma volume increase .The increase in MCHC during gestation was to prevent a marked decreased in total oxygen carrying capacity of the circulating blood (Azab and Abdel –Maksoud , 1999).

There were significantly lower in PCV, TRBC , Hb and MCV during the day of parturition compared with the control group , and significantly higher ESR value this accords with the study of (Elsharif and Assad , 2001), who attributed the reduction in the mentioned parameters to loss of RBC during parturition .

The postpartum period showed a significant decrease in PCV , Hb , MCV and MCHC in the test group compared with the control group . No variation between this stage and other stages , this is due to hemodilution resulting from increasing water mobilization to mammary gland through the vascular system (Roy *et al*., 1965) .

(Vihan and Rai , 1987) found in the day of parturition significantly higher TWBC count and neutrophils.This finding support the results of the current work. The later authors attributed this due to an increased plasma cortisol .

The present study showed that glucose concentration was affected by the physiological stages of the animals. The highest level of glucose was in the day of parturition, followed by the late stage of pregnancy, the lowest was in the postpartum period. The increase in glucose during the late stage of

pregnancy and day of parturition is due to an increase in the secretion of several hormones as cortisol and estrogen (Herd *et al*., 2000) . Parturition occurred in the winter season and the rise in glucose level is in agreement with those obtained by (Alharbi, 2012) ,who reported , during winter season goats registered higher glucose values in comparison with the other seasons .They attributed this seasonal effect to environmental variation and to the type of feed available during winter .

. During the postpartum period the level of glucose was lower in test group compared with control group , this is on line with the finding of (Pamlu – Gollah et.al.2000**)** in ewes , this decrease was suggested to be due to an increased utilization of glucose for milk lactose synthesis.

The total protein was highest in the control group and early stage of pregnancy, and no variation between the day of parturition and postpartum . The lowest value was in the late stage of pregnancy this is in agreement with that found by (Davson and Segal, 1980), and they attributed this to the production of globulin rich colostrums.

The urea level showed the highest level during the day of parturition, and the lowest level during the late stage of pregnancy. No variation between the other stages. This result is in agreement with that found by (Silanikove *et al*., 2000), and they explained this finding to be due to an increased cortisol level that increased the catabolism of protein in the body.

In this study the creatinine showed the higher level during the late stage of pregnancy, and no variation between the other stages this also due to effect of cortisol on body protein.

The present study showed that ALT and AST were affected by the physiological status. The highest level of ALT and AST were in the day of parturition followed by the late stage of pregnancy , the lowest were in the postpartum period and control group, this is due to the effect of glucocorticoids (Allen *et al*., 1977).

Conclusion: -

- During the gestation period the erythrocytic series were decreased except ESR and MCHC.
- The TWBCs was increased during the day of parturition and the neutrophils percentage was also increased.
- The glucose, Urea, ALT and AST were increased during the day of parturition.
- During the late stage of gestation the total protein and globulin were decreased.
- The Creatinine was increased during the late stage of gestation.

Recommendations

- The pregnant animals should be managed and fed according to their physiological status.

-When approaching the time of the parturition the pregnant animals should be separated from the non pregnant animals in a quiet place .

- Estrous cycle synchronization should be used to reduce the period between the parturition in desert goats, which may be long.

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Appendix : -

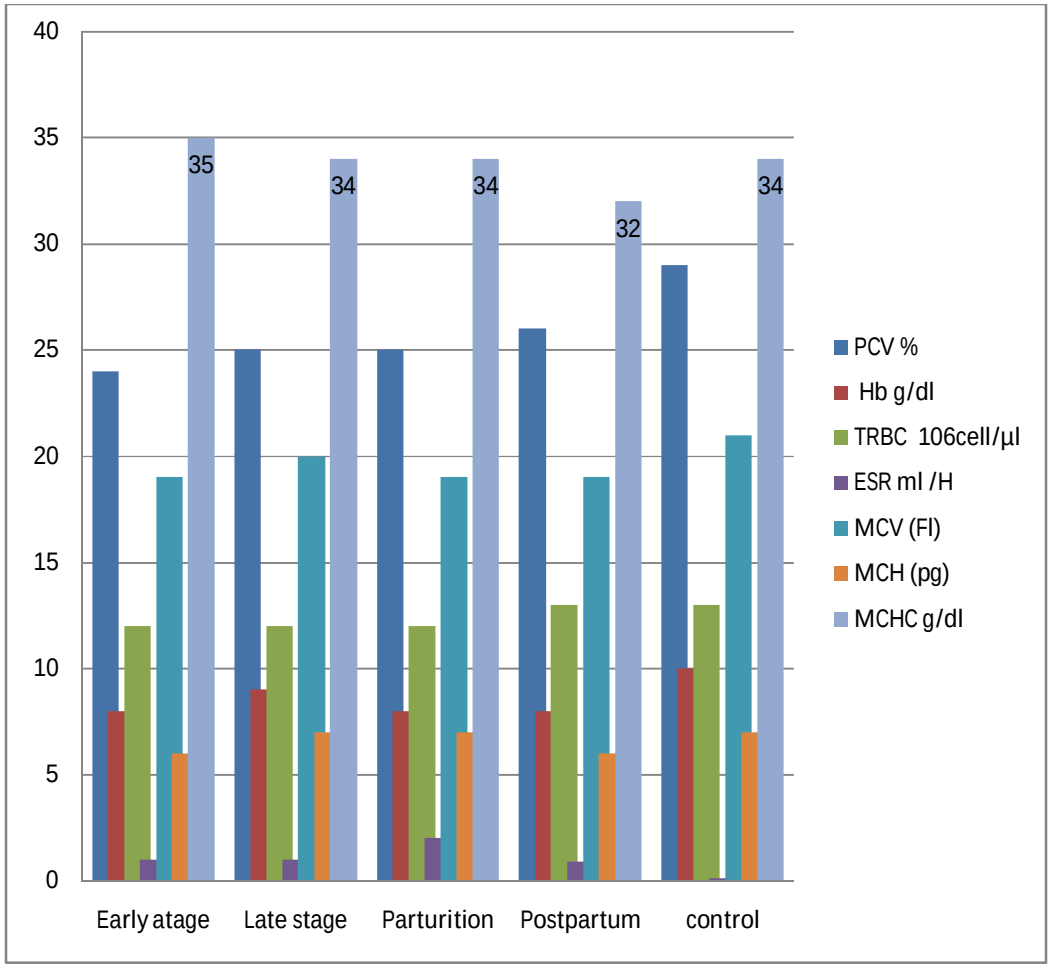


Fig (1) Erythrocytic series:-

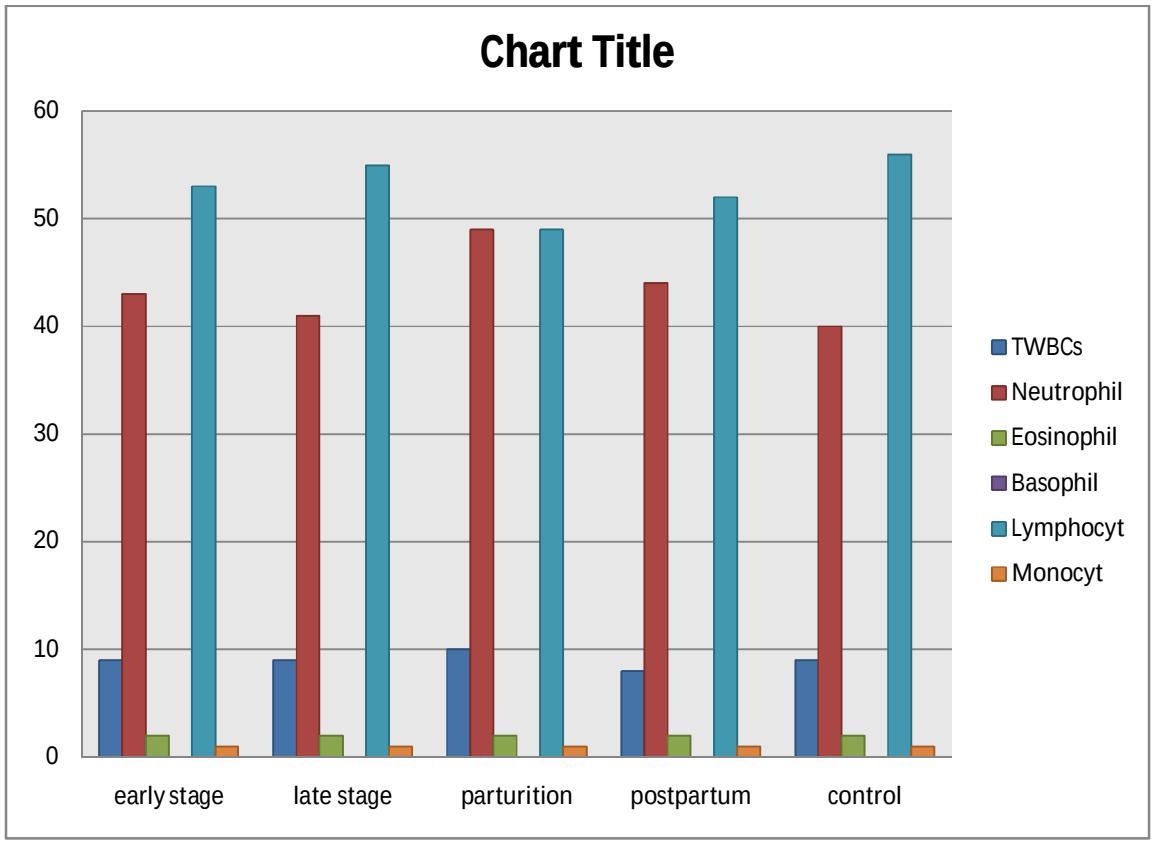


Fig (2) Leukocytic series:-

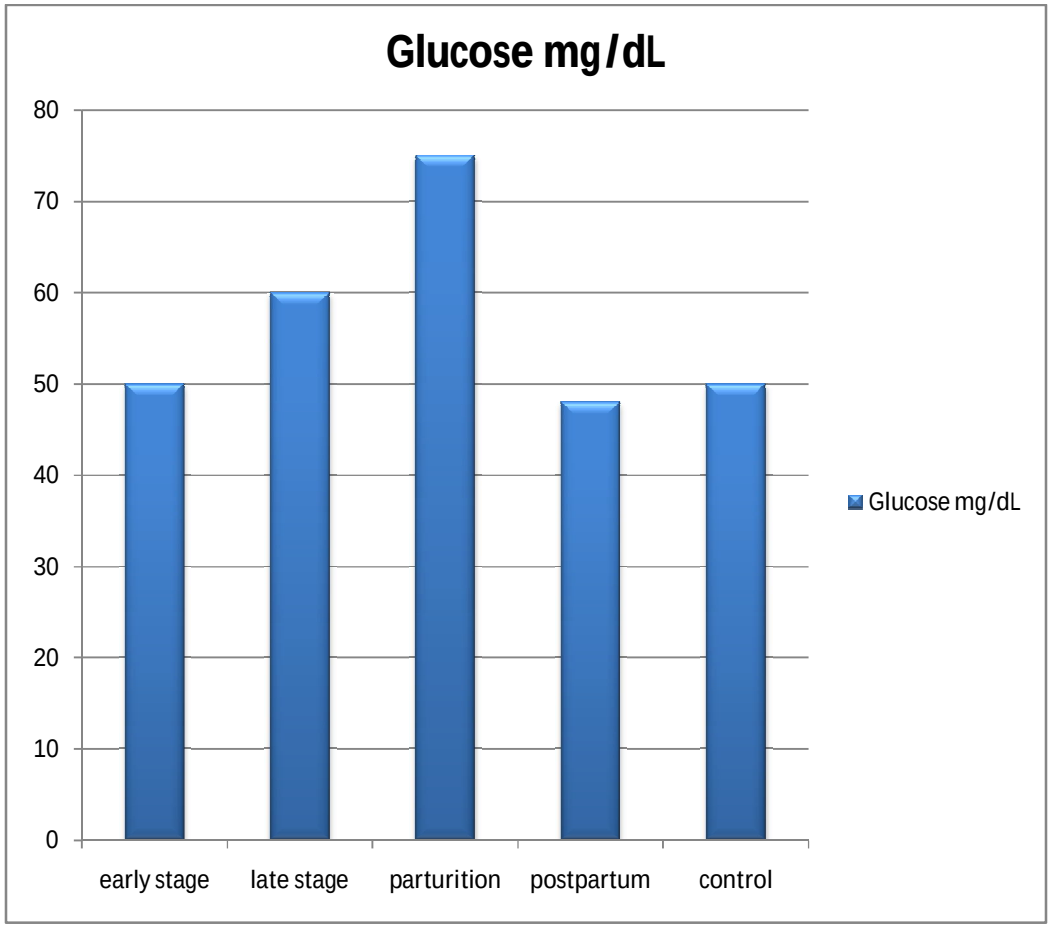


Fig (3) glucose level :-

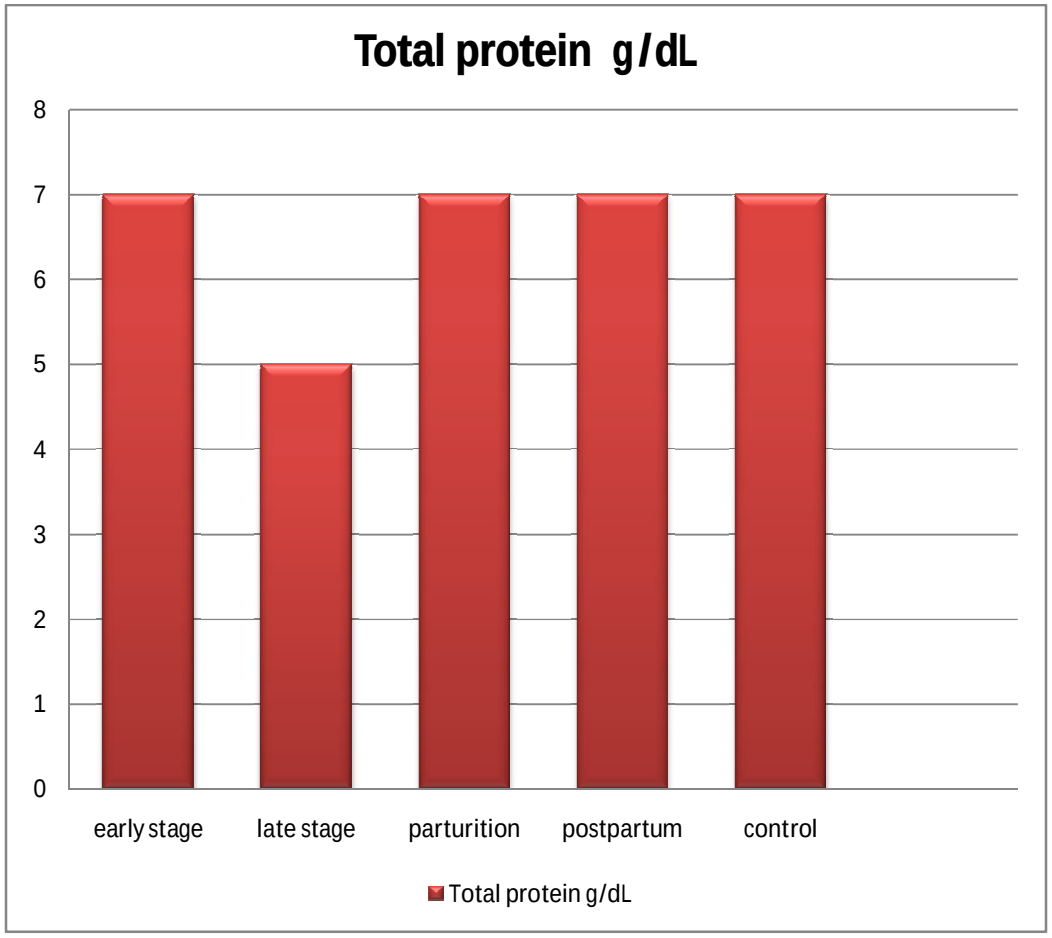
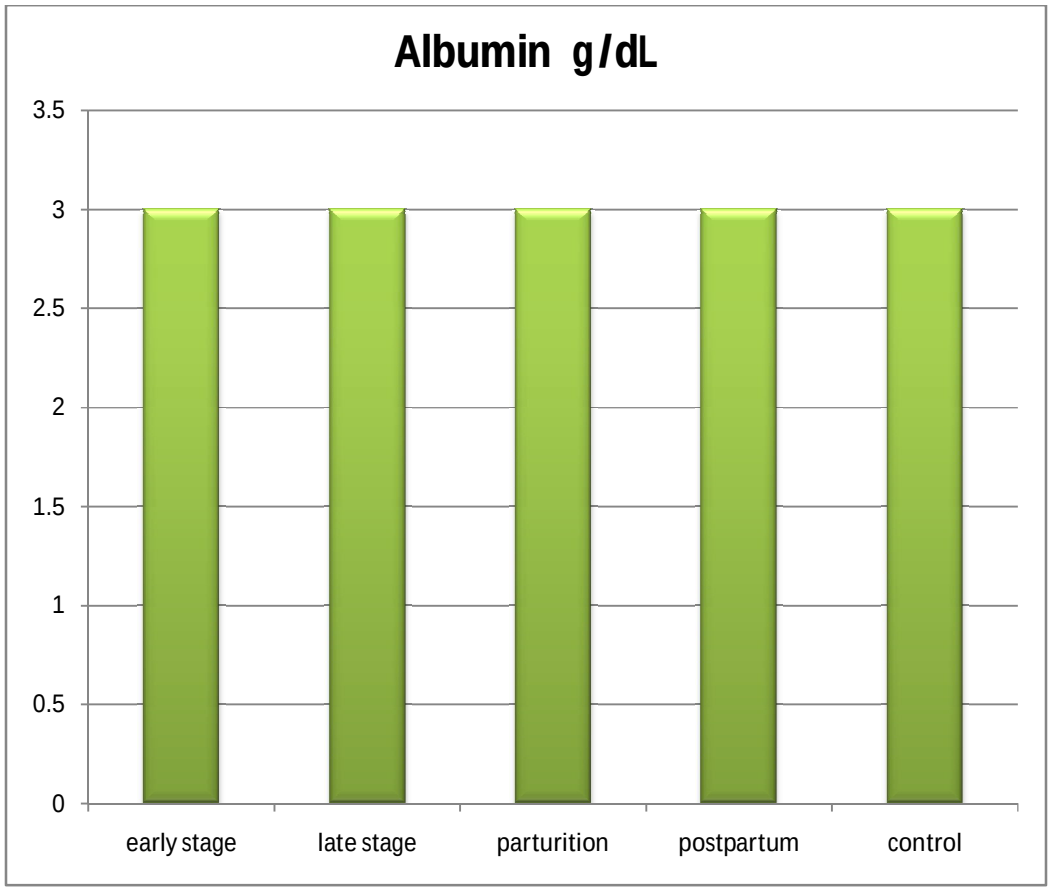


Fig (4) total protein level :-



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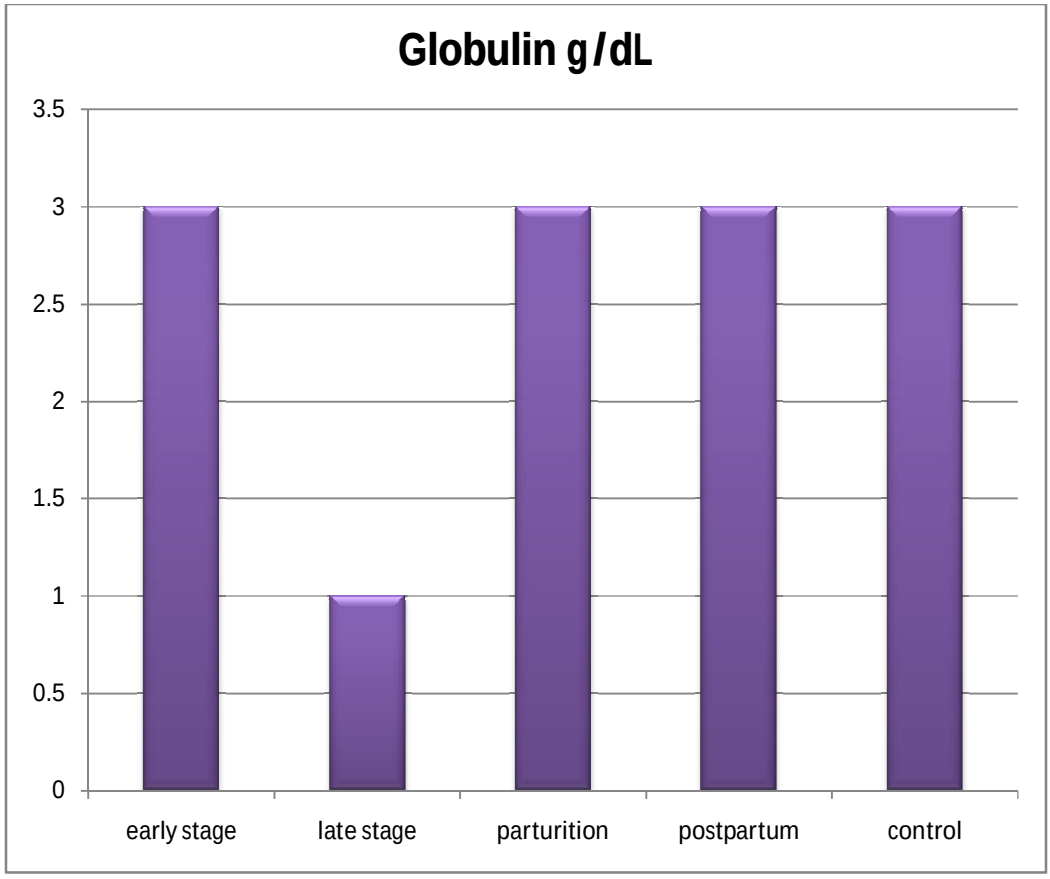

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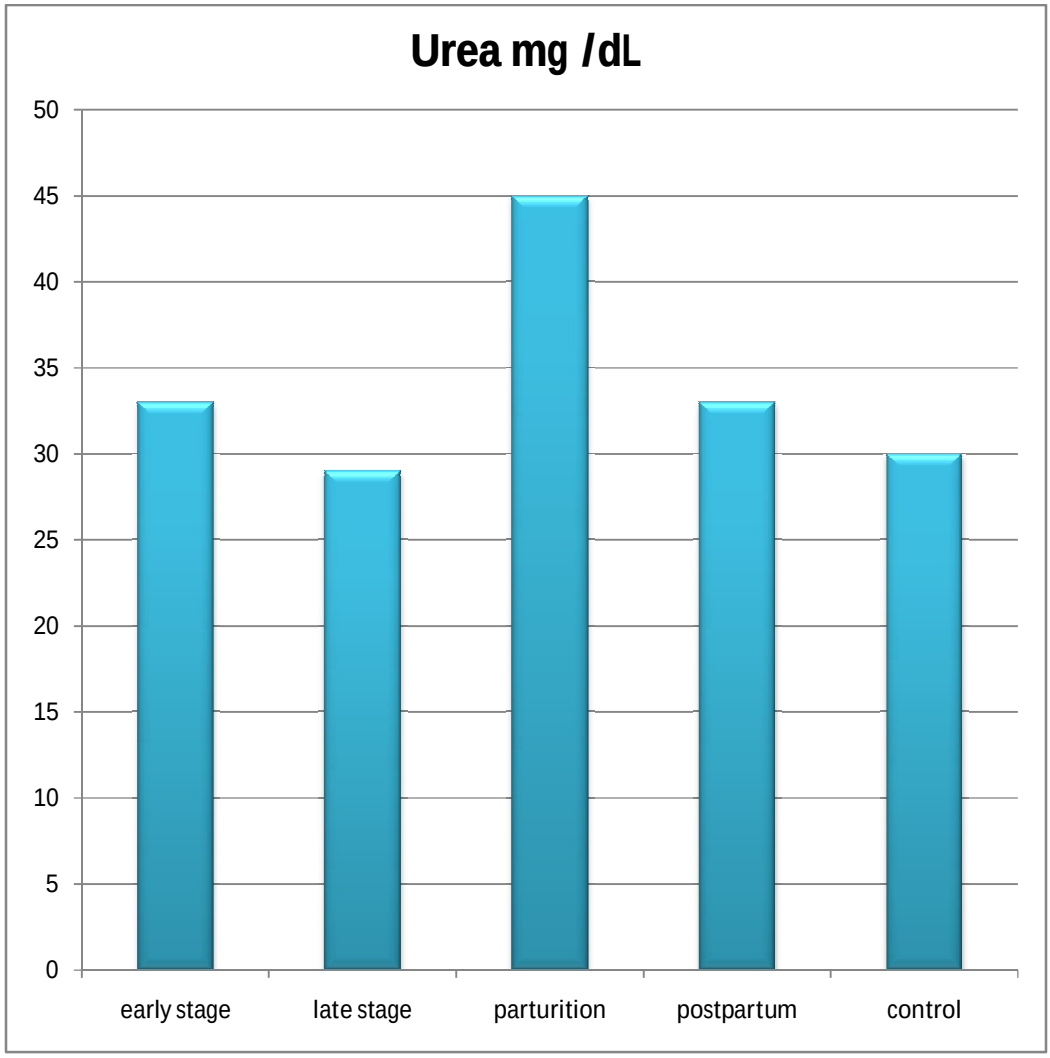
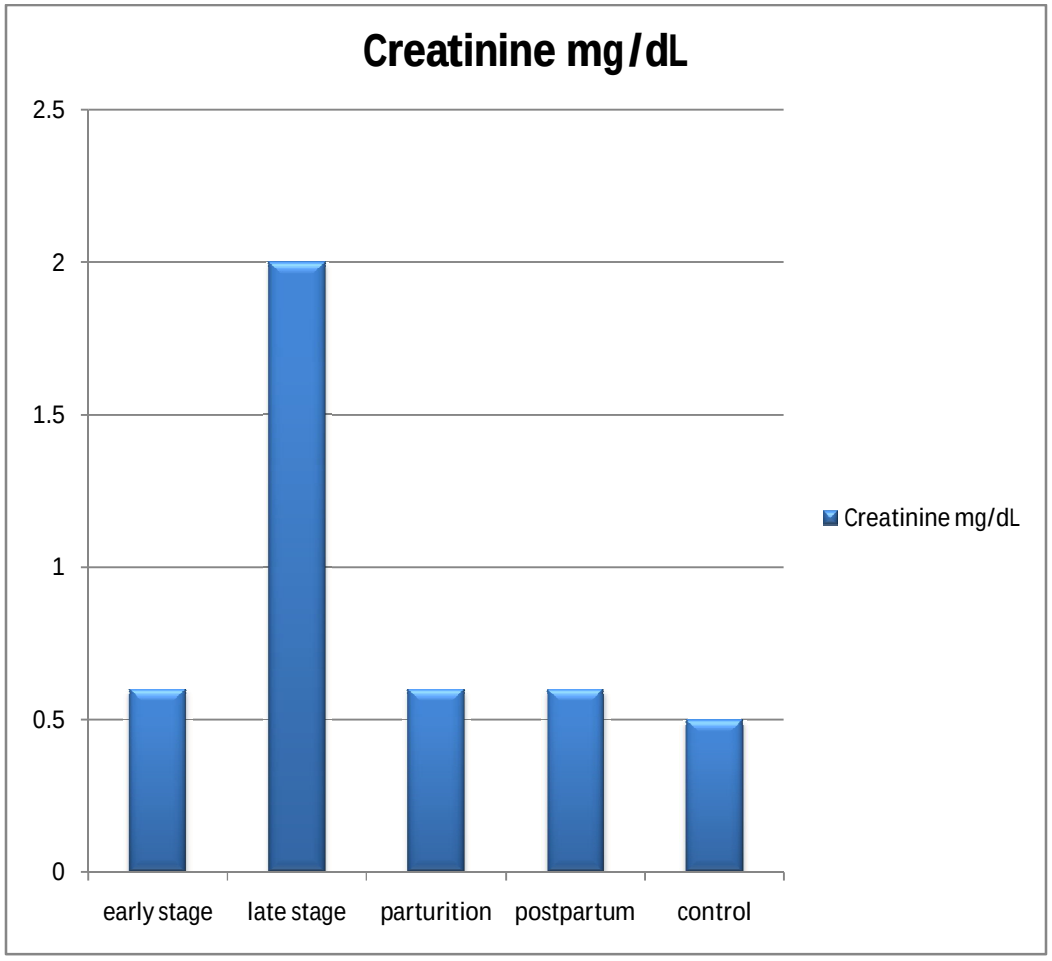


Fig (7) urea level :-



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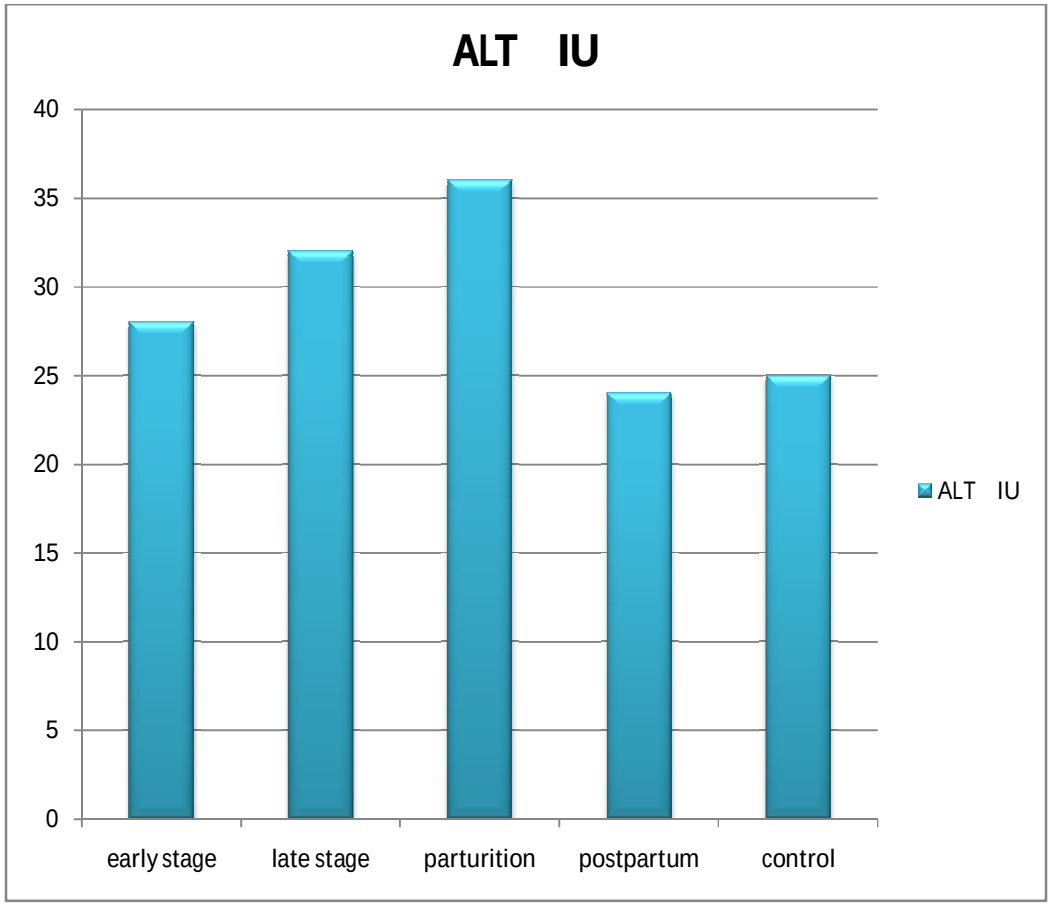

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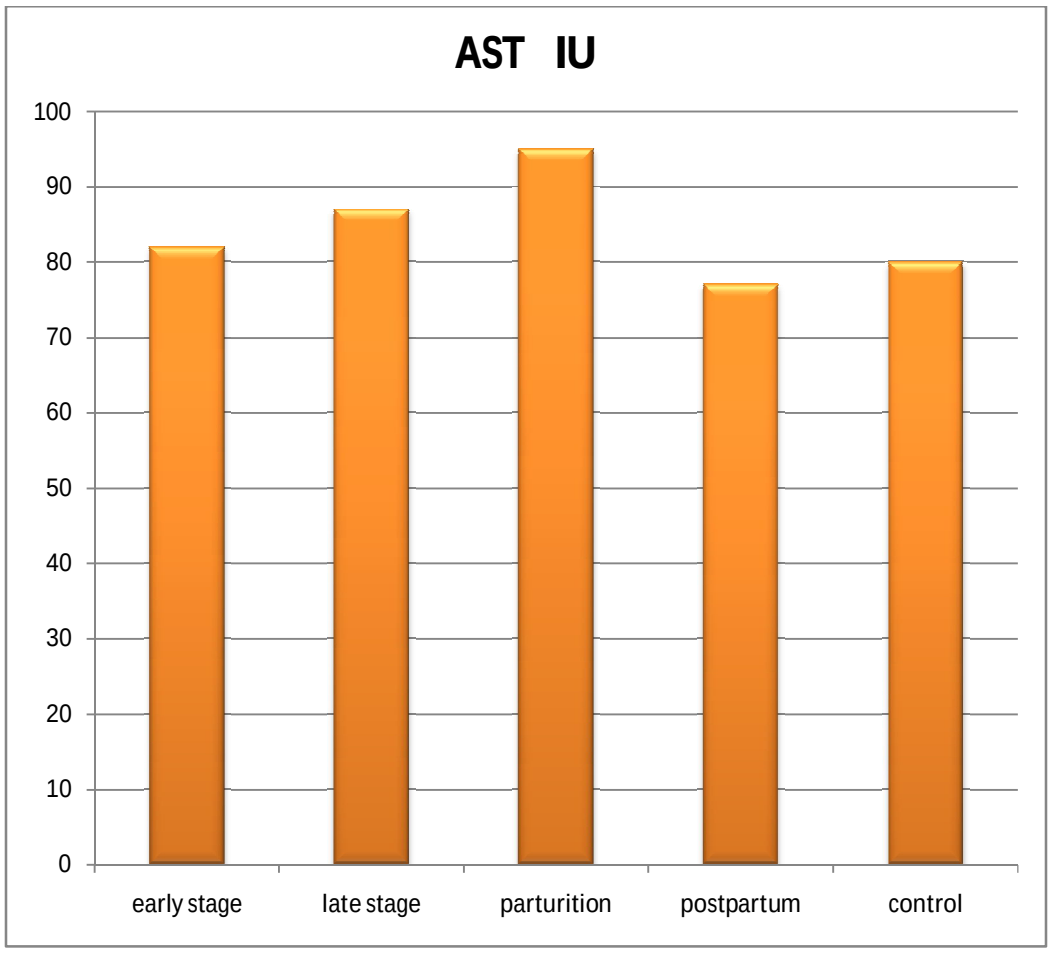

Fig (10) AST level :-

Fig (11) Blood samples collected from jugular vein

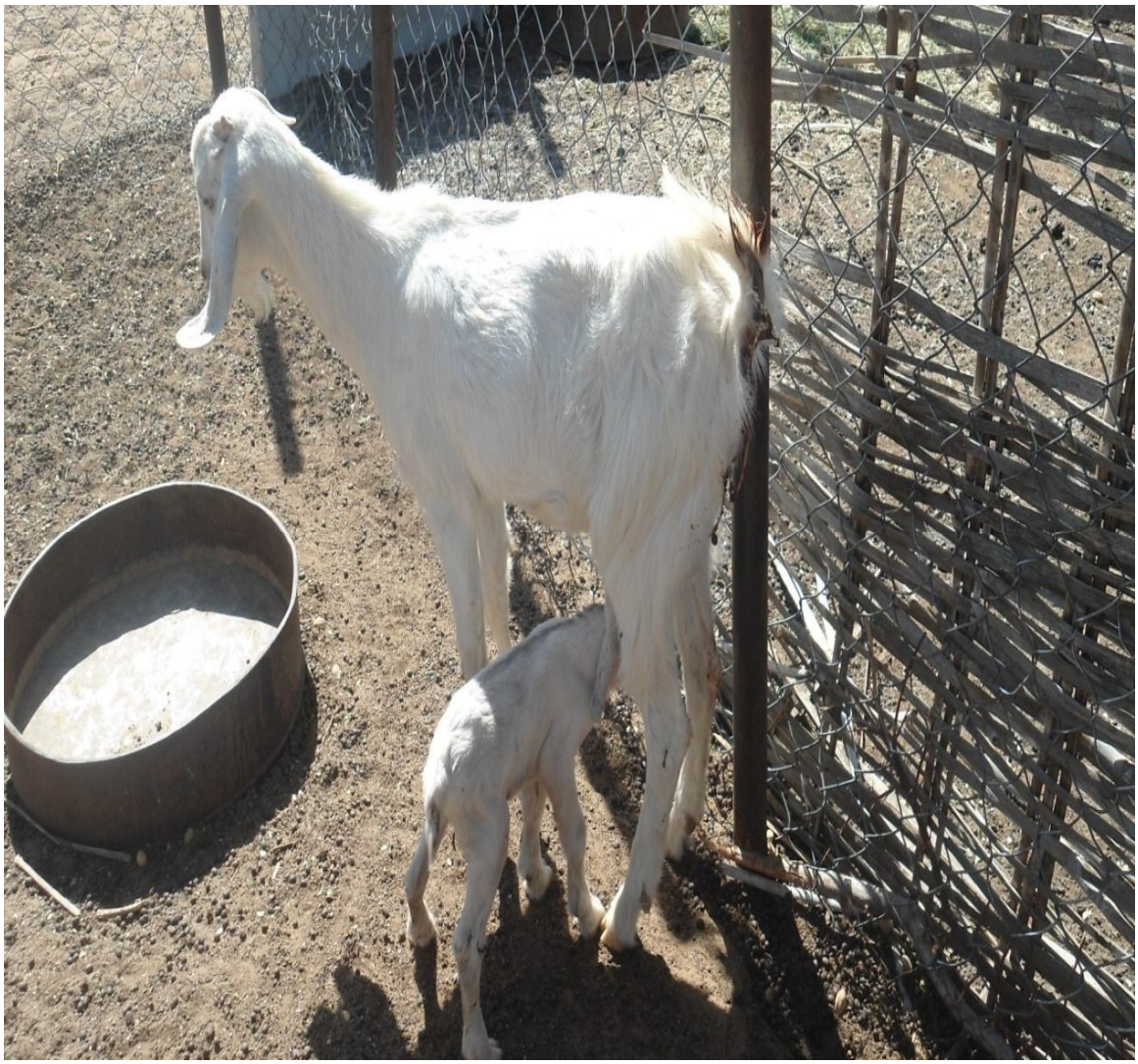

Fig (12) Day of parturition

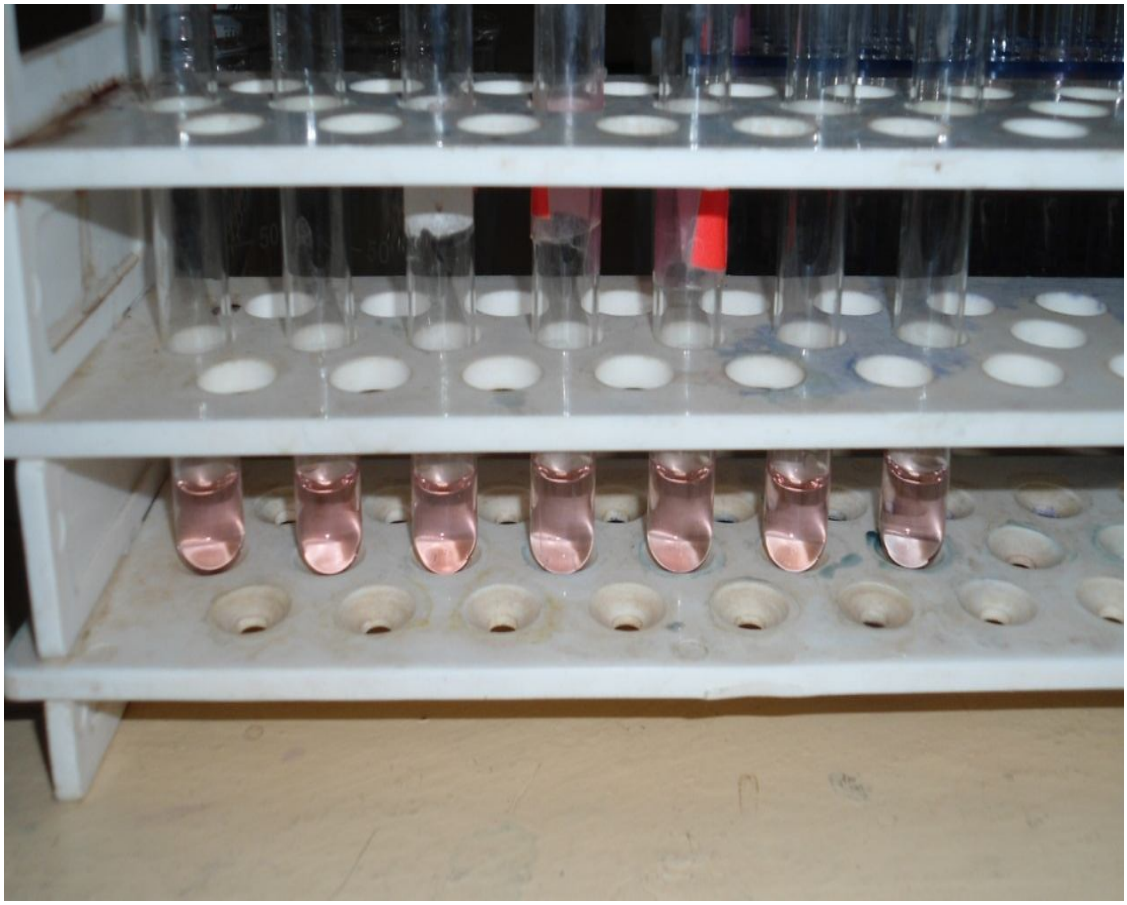

Fig (13) serum glucose test

Fig (14) Urea test

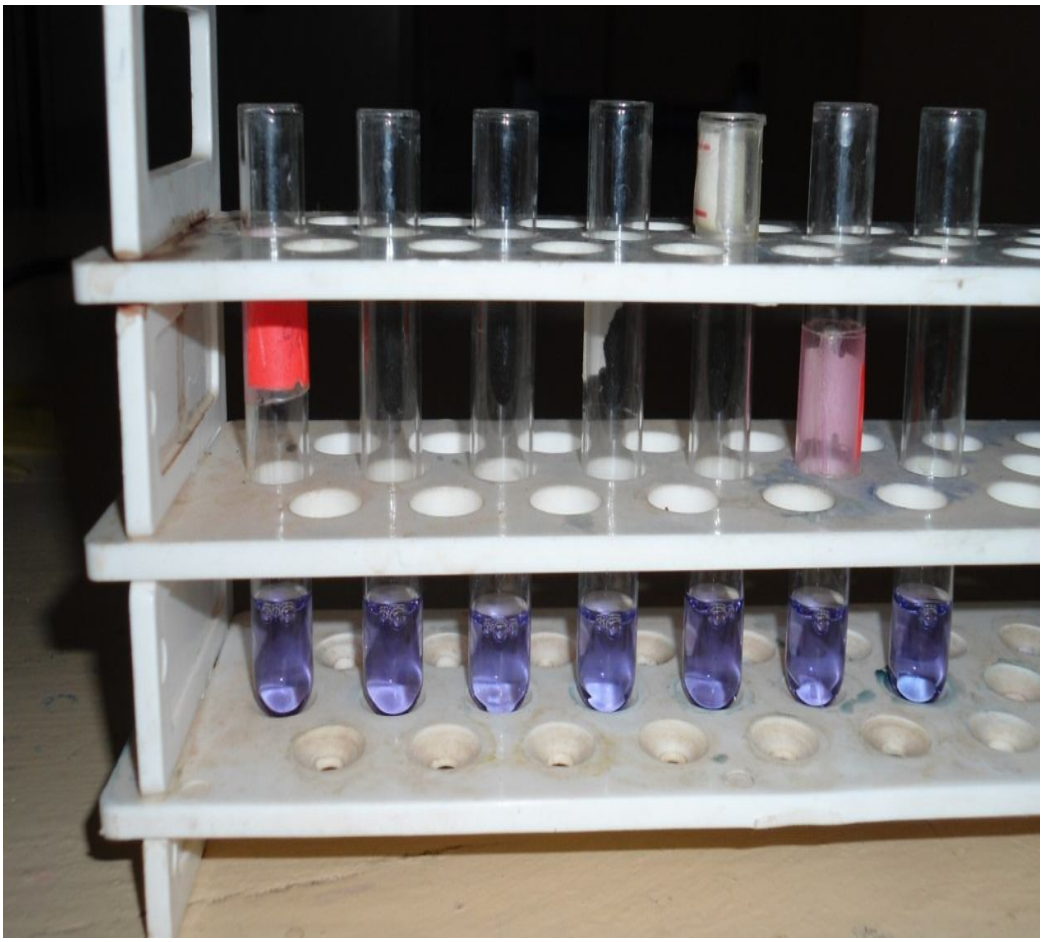

Fig (15) Total protein test

Fig (16) Albumin test

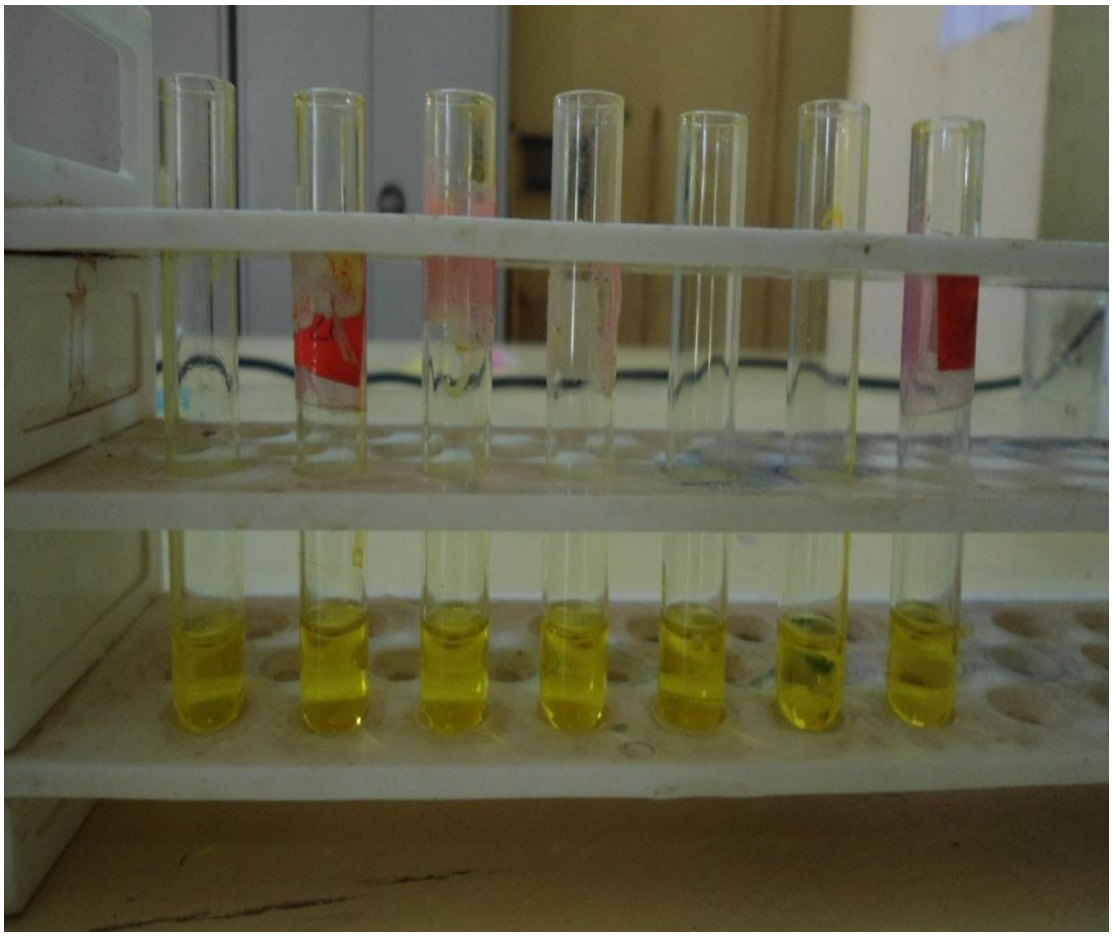

Fig (17) Creatinine test

Output of the Experimental.