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RESEARCH ARTICLE

ASSESSMENT OF MAGNESIUM AND PHOSPHORUS IN SUDANESE ALCOHOLISM IN KHARTOUM STATE.

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Abstract

Alcoholism is a major issue globally. It is estimated to be the fifth leading risk factor for global disability-adjusted life years**.** Commonly chronic alcoholic patients develop a variety of acid base and electrolyte disturbances, which play a significant role in their morbidity and mortality. Physicians should recognize these abnormalities and the underlying interrelated patho-physiological mechanisms for their prompt diagnosis and appropriate management.

This study was carried out to measure serum levels of the magnesium and Phosphorus in Sudanese alcoholism. A total of one hundred and twenty subjects were enrolled in this study, divided into two groups sixty alcoholism and sixty normal individual serve as control were collected from period between May to June 2017, chosen randomly from Khartoum state , to assess the blood levels of magnesium and phosphorus. Serum magnesium and Phosphorus were measured by using full automated chemical analyzer BS 380 and results were analyzed using statistical of package social science (SPSS), computer program.

The study showed that, alcoholism had significantly decreased the means of serum magnesium and phosphorus (3..91±0.39mg/dl) vs. (5.34±0.68 mg/dL) P<0.05, (2.48±0.71 mg/dl) vs (4.32±0.66 mg/dl) p value <0.05 respectively . There were significantly weak negative correlation between serum magnesium, phosphorus levels and duration of alcoholism (r=-0.264 , p value=0.041), (r = − 0.034 , P, value = 0.008 **)** respectively and there was insignificant weak positive correlation between serum magnesium in alcoholism and age (r = 0.214 and P, value= 0.089) while there was insignificant weak negative correlation between serum phosphorus in alcoholism and age (r = − 0.097 and P = 0.460). The study concluded that, the level of magnesium and phosphorus were significantly decreased in alcoholism.

Introduction:-

Alcohol can be categorized as a central nervous system depressant agent. When consumed, about 20% is absorbed in stomach and 80% in the small intestines like other depressant drugs, it slows the pace of brain, approximately 90% of ingested alcohol is metabolized in the liver, the test is excreted via breath and urine. [(1)] In chemistry an

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alcohol is any organic compound in which the hydroxyl functional group (-OH) is bound to a saturated carbon atom. The term alcohol originally referred to the primary alcohol ethanol (ethyl alcohol), the predominant alcohol in alcoholic beverages. [2] Alcoholism, also known as alcohol use disorder (AUD), is a broad term for any drinking of alcohol that results in problems. [3] It was previously divided into two types: alcohol abuse and alcohol dependence. [4].

Magnesium is a chemical element with symbol Mg and atomic number 12. [5] low level of magnesium in the blood called Hypomagnesmia ,and high level of magnesium in the blood called Hypermagnesemia[6].

Phosphorus **i**s a chemical element with symbol P and atomic number 15. As an element, phosphorus exists in two major forms– white and red phosphorus. [7] abnormally low level of phosphate in the blood called Hypophosphatemia [8] and abnormally elevated level of phosphate in the blood called Hyperphosphatemia. [9]

In long term alcoholics hypomagnesaemia is the most common electrolyte abnormality observed. It is the result of various pathophysiologic mechanisms [10] which include increased renal losses of Mg caused by coexistent metabolic acidosis. This action could be the result of transient hypoparathyroidism reported during alcohol intoxication ,decrease magnesium intake, which may play a significant role in the pathogenesis of hypomagnesium in poorly nourished alcoholics. [11] An increased magnesium entry into the cells mainly due to the coexistent respiratory alkalosis. Furthermore, an excessive catecholamine release caused by alcohol withdrawal syndrome may also result in the transfer of magnesium into the cells. Also increased gastrointestinal magnesium losses due to diarrhea or steatorrhea may play a role in the development of hypomagnesaemia in some patients. [12]

Hypophosphatemia is the second common electrolyte abnormality observed in alcoholism, they commonly consume a phosphate-deficient diet which may play a role in the pathogenesis of hypophosphatemia. [13] In addition, ethanol per induce proximal tubular dysfunction associated with decreased phosphate reabsorption and inappropriate phosphaturia . Also increased phosphate entry into the cells, due to the coexistent respiratory alkalosis and increased gastrointestinal phosphate losses cause hypophosphatemia [14]

Materials and Methods:-

Study Population: The study was carried out at College of Medical laboratory Sciences, and the subjects were recruited from Omdurman , in Khartoum(Sudan) from May to June 2016. A total of 120 subjects were enrolled in this study ; divided into two groups 60 alcoholism and 60 normal individual. They study was approved by Alneelin university committee. Informed consent was obtained from all participants before blood sampling.

Inclusion criteria:-Sudanese alcoholism without disease affects the levels of magnesium and phosphorus and healthy individuals serve as control and age-matched with the cases were included in this study.

Exclusion criteria alcoholism with congestive heart failure, Diabetes mellitus, kidney disease , any individual refused to participates in the study were excluded from the study.

Blood sample and Analysis:-

About 2ml of venous blood was collected from the antecubital vein by taking aseptic precautions. Care was taken to prevent venous stasis during the sample collection. The blood was allowed to clot and the serum was separated by centrifugation. The estimation of the parameters was carried out within 4-6 hrs. The samples were analyzed for serum magnesium and phosphorus by full automated chemical analyzer BS 380[15] The internal control sera of two different levels were used to calibrate the instruments.

Data was analyzed using SPSS computer program, the mean and standard deviation were obtained and the independent T test used for comparison (p value of ≤ 0.05) was considered significant and person correlation was used for correlation.

Results:-

In comparison with the controls, Sudanese alcoholism had significantly lowered the means of serum magnesium and phosphorus (3. 91±0.39 mg/dl) vs.(5.34±0.68mg/dl) (2.48±0.71mg/dL) vs. (4.32±0.66 mg/dL) $P<0.05$ respectively as in table (1).

Table 1:- Comparison between mean concentration of magnesium and phosphorous levels in alcoholism and control group.

Variable	Case (Mean ±SD) n=60	Control (Mean ±SD) n=60	*P-value*
Magnesium	3.91±0.39	5.34±0.68	0.000
Phosphorous	2.48±0.71	4.32±0.66	0.000

There were significantly weak negative correlation between serum magnesium, phosphorus levels and duration of alcoholism (r= - 0.264 , p value=0.041), (r = − 0.034 , P, value = 0.008 **)** respectively as in figure (1,2).

There was insignificantly weak positive correlation between magnesium level and age of alcoholism (r=0.214, p, value= 0.089), while there was in significantly weak negative correlation between phosphorus level and age of alcoholism (r= − 0.097 and P = 0.460) as in figure(3,4).

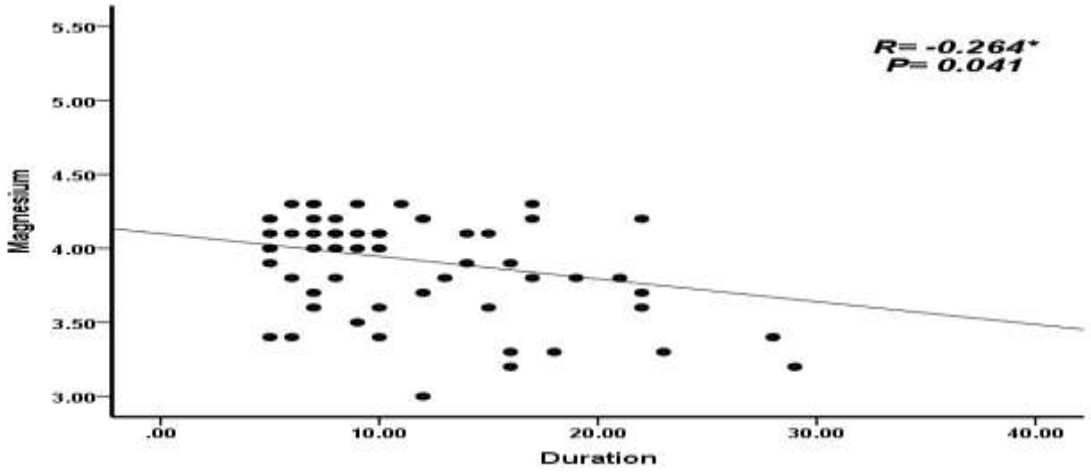

Figure (1):- correlation between Magnesium level and duration of alcoholism

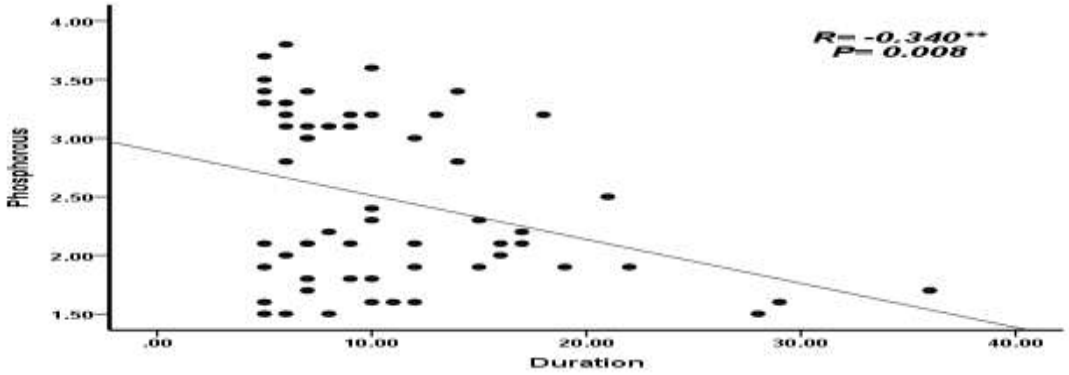

Figure (2):- correlation between phosphorus level and duration of alcoholism

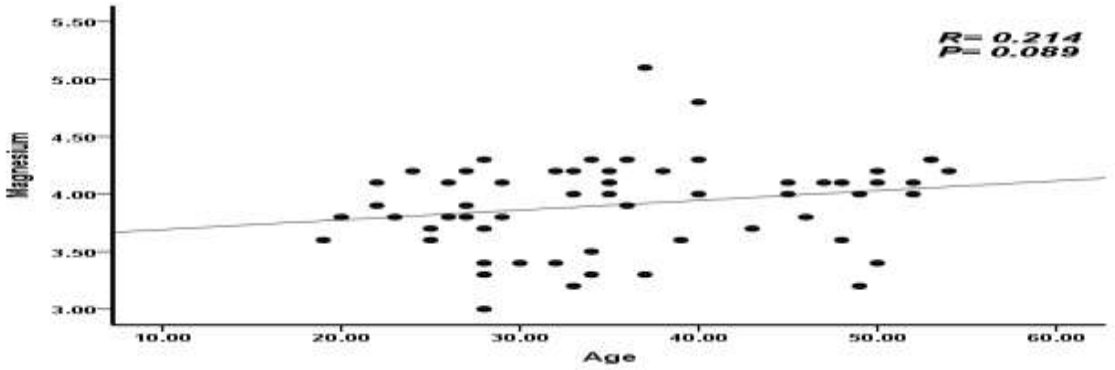

Figure (3):- correlation between magnesium level and age of alcoholism

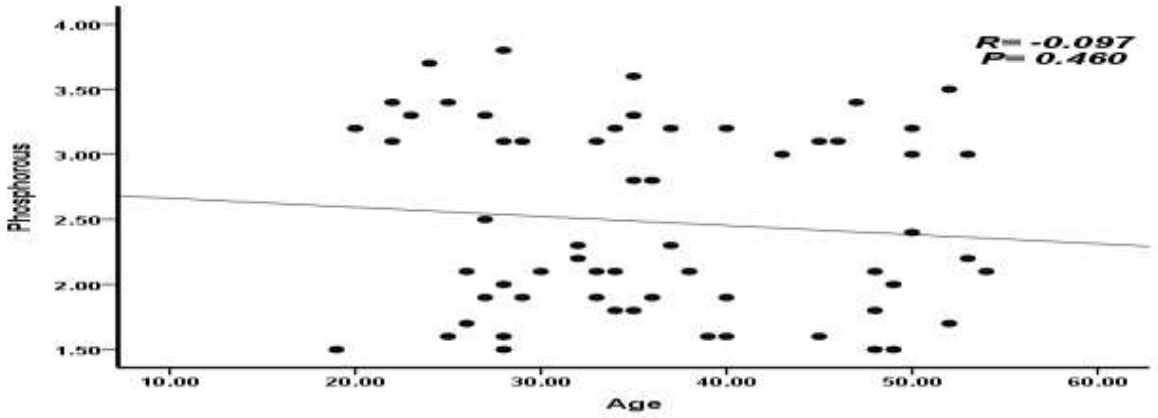

Figure (4):- correlation between Phosphorous level and age of alcoholism

Discussion:-

Alcoholism is estimated to be the fifth leading risk factor for global disability-adjusted life years. Alcoholic patients commonly develop a variety of acid-base and electrolyte disturbances, which play a significant role in their morbidity and mortality. [16]

From the finding of this study it appears that ,serum levels of magnesium and phosphorus were significantly decreased in alcoholism group compared to control group (p, value=0.000). This result agreed with study carried by many authors [17, 18] which showed that; In long-term alcoholics, hypomagnesaemia is the most common electrolyte abnormality observed. It is the result of various pathophysiologic mechanisms. Also the result agreed with another result which showed; Increased renal losses of Mg^{2+} caused by coexistent metabolic acidosis, hypophosphatemia as well as by a direct magnesiuric effect of acute alcohol consumption. Furthermore, magnesiuria could be the result of transient hypoparathyroidism reported during alcohol intoxication. This decline in the secretion of parathyroid hormone might enhance renal magnesium excretion concordantly with a deterioration of the coexistent hypocalcaemia [19]. Additionally ,reversible ethanol-induced defects in renal tubular function were suggested as responsible for the enhanced urinary magnesium and other electrolytes excretion [20].The result in agreement with another result which showed ; Decreased magnesium intake, which may play a significant role in the pathogenesis of hypomagnesaemia in poorly nourished alcoholics. Also increased magnesium entry into the cells mainly due to the coexistent respiratory alkalosis, and excessive catecholamine release caused by alcohol withdrawal syndrome may also result in the transfer of magnesium into the cells and cause hypomagnesaemia [21]. Also result of this study similar to another result which found; Increased gastrointestinal magnesium losses due to diarrhea or steatorrhea may also play a role in the development of hypomagnesaemia in some patients [22]. The result in agreement with another result carried by Yi j [23] which found; Hypophosphatemia is the second common electrolyte abnormality observed in alcoholic patients. Patients with chronic alcoholism, commonly consume a phosphate-deficient diet which may play a role in the pathogenesis of hypophosphatemia . In addition, ethanol per se induces proximal tubular dysfunction associated with decreased phosphate reabsorption and inappropriate phosphaturia. Also the result agreed with another result which showed, serum phosphate level was significantly

decreased in alcoholic patients compared to healthy nonalcoholic controls. Hypophosphatemia could be due to the increased oxidative stress and might be a risk factor in the progression of fatty liver to steatohepatitis.[24]

This study found that, there were significantly weak negative correlation between serum magnesium, phosphorus levels and duration of alcoholism (r=-0.264 , p value=0.041), ($r = -0.034$, P, value = 0.008 **)** respectively. Also result of this study showed, there was insignificantly weak positive correlation between magnesium level and age of alcoholism (r=0.214, p, value= 0.089), while there was insignificantly weak negative correlation between phosphorus level and age of alcoholism ($r = -0.097$ and $P = 0.460$) .

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