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Serum Creatine Kinase, Lactate Dehydrogenase and Lipid Profile In Patients With Asthma

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Abstract:
Introduction: *Asthma is heterogenous disease with different phenotypes,triggered by multiple gene environment interactions.Majority of affected people have only occasional attacks of slight to moderate severity,which are managed with relative ease.The airway inflammation in asthma is associated with airway hyperresponsiveness correlated with variable airflow obstruction.Superimposed on this chronic inflammation state are acute episodes which corresponds to exacerbations of asthma.*
Aim: *To measure the levels of serum creatine kinase, lactate dehydrogenase and lipid profile in patients with stable asthma and exacerbating asthma and to predict the severity of asthma.*
Materials & Methods: *A case control study of 120 was conducted including 40 controls, 40 of Stable Asthma Group and 40 of Exacerbating Asthma patients.*
Results: *Showed significant increase of creatine kinase(p<0.01) lactate dehydrogenase (p<0.01) and lipid profile (p<0.01) in exacerbation of asthma when compared to controls.No statistical significance was observed in stable asthma when compared to controls.*
Conclusion: *Creatine kinase and lactate dehydrogenase levels increased significantly and lipid profile showed a decrease in exacerbating asthma when compared to stable asthma patients.To correlate these levels and predict the risk of severity of asthma and help the clinician in diagnosis and implementation of appropriate treatment and prevent the risk of fatal asthma.*
Keywords: *Asthma,Creatinekinase(CK),Lactate dehydrogenase(LDH)*

I. Introduction

Asthma is a syndrome characterized by airflow obstruction that varies markedly, both spontaneously and with treatment.Asthamatics harbor a special type of inflammation in the airways that makes them more responsive than non asthamatics to a wide range if triggers, leading to excessive narrowing with consequent reduced airflow and symptomatic wheezing and dyspnea.Narrowing of the airways is usually reversible,but in some patients with chronic asthma there may be an element of irreversible airflow obstruction.[1,2].Mastcells,eosinophils,activatedTlymphocytes,macrophagesandneutrophils have key role in the chronic inflammation of asthma.[3,4]

An elevated serum CK level is a sensitive indicator of direct tissue injury or a change in cellular permeability in these tissues.The major isoenzyme present is CK-MM suggesting muscular involvement..The specificity of an elevated serum CK value, can be enhanced by measuring the levels of CK isoenzymes and related cellular enzymes which aid in identifying the site of tissue origin.[5,6]

LDH is an intracellular cytoplasmic enzyme ubiquitous to all the major organ systemseg: heart, kidney, muscle, leukocytes and erythrocytes.Cytoplasmic cellular enzymes, like LDH in the extracellular space are of benefit because they serve as indicators suggestive of disturbance of cellular integrity induced by pathological conditions.In asthma LDH is raised ,the potential source is influx from the inflammatory cells due to increased vascular permeability or necrosis of epithelium.[3]

Lipids in the lower respiratory tract have vital role in the lung defense against external challenges.Surfactant ,the protein-lipid complex that reduces surface tension in the alveolar space has an enhancing effect on pulmonary immune response.[3,7].Previous study demonstrated that native lipoproteins such as very low density lipoproteins potentially stimulate surfactant lipid synthesis.[3,8].

Alteration of surfactant composition and function is being noted in various inflammatory disorders that effect the airways and lung parenchyma including asthma.[3,7].An elevated serum creatine kinase,lactate dehydrogenase appears to be a frequent finding in patients of exacerbating asthma.

II. Materials & Methods

The study was conducted in Department of Biochemistry,Osmania General Hospital.A case control study of 120 divided into three groups including 40 controls, 40 cases of Stable Asthma Group and 40 cases of Exacerbating Asthma group.Patients with history of respiratoy infection,pneumonia,chronic bronchitis,coronary heart disease,heart failure,neuromuscular disease,renal and hepatic dysfunction were excluded. 5ml of blood was taken in plain vaccutainer. Grossly hemolysed and lipemicsamples were excluded.

The data was analysed using Graph Pad Prism Demo and SPSS (Statistical package for social science) software version and the results were expressed as Mean and Standard deviation of various parameters in different groups.Multiple comparisons ANOVA was used to assess the significance of difference of mean values of different parameters in between the groups.The significance of difference of mean values of different groups and within the groups is represented by p values and p value < 0.05 is considered as significant.

Serum creatine kinase[9,10,11] and Lactate dehydrogenase[12,13,14]estimated by Spectrophotometric method.Total cholesterol[15,16],HDL[17,18] by cholesterol oxidase method.Triacylglycerol by End point assay.LDL by Friedwald's Equation and VLDL =TG/5

III. Results

In the present study, there was statistically significant increase ($p<0.01$) in the mean value of serum creatine kinase in asthma with exacerbation(281.50±20.641)comparedtothatofcontrol group (125.10±25.65).Nostatisticalsignificancewasobservedbetweenstableasthmapatients(115.53±18.759) and control group. There was statistically significant increase($p<0.01$) in the mean value of serum LDH in patients of asthma with exacerbations (480.98±18.41) compared to that of control (309.93±42.48) . No statistical significance was observed between stable asthma patients (289.40±53.3) and control group.

There was statistically significant decrease ($p<0.01$) in the mean value of serum cholesterol in patients of asthma with exacerbation (126.78±9.39) when compared to control(184.8±19.13),serum triglycerides (65.25±9.73) when compared to that of control (119.05±22.5),), serum LDL (59.9±14.96) with control (122.33±22.48), serum VLDL (12.95±1.86) with control (23.35±4.45).HDL showed an increase with (54.25±8.91) when compared to control (39.70±7.51)

No statistical significance was observed between stable asthma patients with serum cholesterol (179.5±12.92), serum TG (110.75±21.3), serum HDL (32.20±7.36), Serum LDL (119.50±59.60) and serum VLDL (23.43±16.77) compared to control group.(Table-1)

Table-1 Mean , Standard Deviation and Significance of various parameters in asthma patients

Parameters	Mean ± SD of Controls	Mean ± SD of stable asthma cases	Mean ± SD of exacerbating asthma cases
Creatine kinase	125.10 ±25.65	115.53±18.75	281.50±20.64*
Lactate dehydrogenase	309.93±42.48	289.40±53.35	480.98± 18.41*
Cholesterol	184.95± 19.13	179.55± 12.92	126.78± 9.39*
Triglycerides	119.05± 22.58	110.75± 21.36	65.25±9.73*
HDL	39.70 ±7.51	32.20± 7.36	54.25±8.91*
LDL	122.33±22.48	119.50±59.60	59.90±14.96*
VLDL	23.35±4.45	23.43 ±16.77	12.95± 1.86*

(*****$p< 0.01$)

IV. Discussion

Asthma is a chronic inflammatory disorder of the airways.The strongest identifiable predisposing factor for the development of asthma is atopy, but obesity is increasingly recognized as a risk factor.AirwayHyperresponsiveness is the characteristic physiological abnormality of asthma and describes the excessive bronchoconstriction response to multiple inhaled triggers that would have no effect on normal airways.Histopathological feature include inflammatory cell infiltration with eosinophils,neutrophils and lymphocytes.

An elevated serum CK levels appears to be a frequent finding in asthma.The vigorous and repeated muscle contractions which qualify strenuous activity is accompanied by a rise in the serum level of muscle associated enzymes due to loss of integrity of muscle cell membrane permitting the leakage of muscle cell constituents into the circulation.

The parameters were analysed into three groups,40 non asthmatic healthy controls,40 stable asthma cases and 40 exacerbating asthma cases.In the present study, there was statistically significant increase($p<0.01$) in the mean value of serum creatine kinase in asthma with exacerbation compared to that of control group.No statistical significance was observed between stable asthma patients and control group.The present study suggest that serum CK concentration in exacerbating asthma is higher than that of stable asthma patients.Burki and

Diamond etal[3,19] reported that creatine kinase activity was increased in asthmatic patients and found that CK during exacerbations of asthma is probably derived from increased respiratory muscle activity.

Cytoplasmic cellular enzymes like LDH in the extracellular space serve as an indicator of disturbance of cellular integrity.In the present study,there was statistically significant increase($p<0.01$) in the mean value of serum LDH in patients of asthma with exacerbations compared to that of control.No statistical significance was observed between stable asthma patients and control group.The present study suggested that serum LDH concentration in exacerbating asthma is higher than that of stable asthma patients.These findings were more associated with increased inflammation of airways with infiltration of neutrophils, mast cells,eosinophils[3,4].The present study suggested that serum LDH concentration in exacerbating asthma is higher than that of stable asthma patients.

There was statistically significant decrease ($p<0.01$) in the mean value of serum cholesterol, triglyceridesLDL,VLDL in patients of asthma with exacerbation compared to that of control group.No statistical significance was observed between stable asthma patients with serum cholesterol,serum Triglycerides,Serum LDL and serum VLDL when compared to the control group.

Myer and Zimmerman etal[3,20] reported that there was alteration in surfactant composition and function in various inflammatory disorders that affect the airways.Low chain fatty acids play an integral role in surfactant synthesis as substrate used in biosynthesis of phospholipids and activators of key enzymes involved in phosphatidyl choline synthesis.[7].Depending on the stage of lung development ,the major source of lung fatty acids used for these purposes may be derived either from plasma fatty acids or endogenous synthesis.[21].Also fatty acids derived from circulating triglyceride rich lipoproteins such as VLDL is involved in regulating surfactant metabolism.

Mallampall et al [3,7] demonstrated that VLDL stimulates surfactant synthesis through interactions with lipoprotein lipase and to a lesser degree with cell surface lipoprotein receptor.The inflammatory cells may subsequently influence oxidant/antioxidant balance that could affect VLDL synthesis.

Biomarkers of airway inflammation have the potential to indicate an individuals disease and thereby guide the clinicians in their decision regarding treatment.The evaluation of the above parameters could be of benefit in the prognosis and treatment of the disease.

V. Conclusion

Pathogenic mechanism of lung injury has focused on cellular and biochemical mediators to be considered as potential biological markers of lung injury.Creatine kinase is a cellular enzyme with wide tissue distribution in the body and its levels are raised in the serum whenever injury occurs to a muscle or nerve cell.In acute asthma,neutrophil infiltration is associated with increased levels of lactate dehydrogenase due to increased vascular permeability and necrosis of epithelium.Thus the present study suggested that existence of inflammation in the airways and hyperirritability of airway mucosa contributes to remission when exposed to allergens and reduce the success rate of treatment and recovery of the patient.

To conclude from the present study serum creatinekinase,serum lactate dehydrogenase, showed an increase in exacerbating asthma patients but not in stable asthma patients.Lipid profile showed a decrease in the exacerbating asthma patients.The increasing global prevalence of asthma, imposes a large burden on patients with high health care cost and aiding the clinicians for appropriate monitoring,diagnosis and treatment of the disease.

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