Original Research Article

Effect of glutathione in lipid profile in isoprenaline induced myocardial infarction in male albino rats

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Abstract

Background: There is a growing body of evidence for the role of free radicals in mediating myocardial injury during myocardial ischemia and in particular during the phase of myocardial reoxygenation. Associated with the myocardial ischemia, reperfusion is the generation of oxygen-derived free radicals from a variety of sources that include the mitochondrial electron transport chain; the biosynthesis of prostaglandins; the enzyme Xanthine oxidase; and circulating elements in the blood, with polymorphonuclear neutrophil assuming a primary focus of attention. **Aim of The Study:** To study the effect of glutathione in lipid profile in isoprenaline induced myocardial infarction in male albino rats. **Materials and Methods:** All Wistar strain male albino rats weighing 150 – 200g were selected for the study. The animals were allowed a standard diet and water ad libitum and rered in Central Animal House, RMMC, Annamalai University was included in the study. of all the Wistar strain male albino rats, rats weighing 150-200gm and fulfilling all the inclusion criteria, 24 rats were randomly selected for the study and they were divided into 4 groups. **Results:** The mean value of serum cholesterol in control group was 85.83±4.36 as compared to isoproterenol treated group of value 93.00 ± 4.52, isoproterenol + glutathione treated group of value 87.17±4.02 which was significant at P<0.05 and 0.001.The mean value of TGL in control group of the rat was 96.17 ± 3.06 as compared to glutathione treated group of rat of value 94.33± 4.13, isoproterenol +glutathione treated a group of rat of value 91.17±3.60 which was significant at P<0.020 and 0.040. The mean value of isoproterenol treated group of was 97.00±4.00 as compared to isoproterenol +glutathione treated group of rat of value 91.17±3.60 which was significant at P<0.02. **Conclusion:** The main action of glutathione is that of protecting cells from oxidative stress and damage, mainly via its antioxidant properties. The magic of glutathione lies in its sulfur compounds, lipid-lowering effect. Researchers report that people who have lower levels of glutathione have an increased risk of cardiovascular disease.

Key Words: Cardiovascular Disease, Isoproterenol, Glutathione, Taurine, Lipid Profile.

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INTRODUCTION

Coronary heart disease (CHD) mortality is greater in south India while stroke is more common in the eastern Indian states. CHD prevalence is higher in urban Indian populations while stroke mortality is similar in urban and rural regions.[1] Case-control studies in India have identified that the common major risk factors account for more than 90% of incident myocardial infarctions and stroke. There is a growing body of evidence for the role of free radicals in mediating myocardial injury during myocardial ischemia and in particular during the phase of myocardial reoxygenation.[2] Associated with the myocardial ischemia, reperfusion is the generation of oxygen-derived free radicals from a variety of sources

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that include the mitochondrial electron transport chain; the biosynthesis of prostaglandins; the enzyme Xanthine oxidase; and circulating elements in the blood, with polymorphonuclear neutrophil assuming a primary focus of attention.[3] Events associated with myocardial ischemia suggests that within ischemic myocardial region or area at risk, there is a population of cells that are reversibly injured and that reperfusion within a specified period (less than 3 hours) of time is capable of restoring the majority of demise of a fraction of the cells because of the cytotoxic effects of reactive species of oxygen-derived from one or more of the sources indicated above. The efforts to minimize the amount of tissue that undergoes cell death as a result of myocardial ischemia demand that early reperfusion is established.[4] Recent advances in thrombolytic therapy and balloon angioplasty have resulted in reperfusion therapy as a logical maneuver in the treatment of evolving myocardial infarction. Microvascular damage may play an important role in the pathogenesis of this phenomenon. Reperfusionenhances the infiltration of activated neutrophils into the ischemic bed, and neutrophil plugging of capillary lumen in association with extensive disruption of endothelial cells results in a progressive decrease in blood flow (the no-reflow phenomenon).[5] Activated neutrophils may potentiate the inflammatory response, produce cellular damage, and reduce capillary blood flow by producing chemoattractants, proteolytic enzymes, reactive oxygen species, and arachidonate products respectively. Therapeutic strategies that modify the interaction between neutrophils and endothelium helps in preparation for reperfusion. Thus suppression of neutrophil activation, especially chemotaxis might be the ideal step to reduce the component (adenosine and perfluorochemical) from the inflammatory response in the ischemic myocardium after reperfusion.[7]

MATERIALS AND METHODS

All Wistar strain male albino rats weighing 150 – 200g were selected for the study. The animals were allowed a standard diet and water ad libitum and rered in Central Animal House, RMMC, Annamalai University was included in the study. but of all the Wistar strain male albino rats, rats weighing 150-200gm and fulfilling all the inclusion criteria, 24 rats were randomly selected for the study and they were divided into 4 groups. G1, G2, G3, and G4 with each group consisting of 6 animals each. Experimental protocol (Glutathione treated group) N=24Animals were divided into 4 groups comprising of 6 rats each. Group- 1 (Control) N=6 Rats received a standard diet for a period of 30 days. Group- 2 (Glutathione treated) N=6 Rats were orally administered with glutathione 200mg/kg body weight dissolved in water by intragastric intubation for 30 days. Group- 3 (Isoproterenol treated) N=6.Rats were injected with Isoproterenol 100mg/kg body weight /day subcutaneously for 2 consecutive days at an interval of 24 hrs for induction of Myocardial Infarction on 31st and 32nd day. Group 4 (Isoproterenol +glutathione) N=6 Rats were pretreated with glutathione 200mg /kg body weight orally for 30 days and Myocardial Infarction was induced with Isoproterenol at a dose of 100 mg/kg body weight at an interval of 24 hrs on 31st and 32nd day. Inclusion Criteria:1) Healthy animals Wistar strain male albino rats.2) Weight of animals 150-200g.Exclusion Criteria:1) Wistar strain female albino rats.2) Wistar strain male albino rats weighing below 150 and above 200g.3) Diseased animals.

RESULTS

Table 1: Comparison of serum cholesterol mg/dl in control and glutathione treated group of rats

Groups	Control Group (N=6)	Experimental Group (N=6)	Student t- test	
			t-Value	P-Value
ISO	85.83 ± 4.36	93.00 ± 4.52[a]	2.158	0.05 (S) *
Glutathione	85.83 ± 4.36	88.83 ± 4.45[b]	0.883	0.417 (NS)
ISO+G	85.83 ± 4.36	87.17 ± 4.02[c]	0.415	0.695 (NS)

Groups	N	Mean	SD	t-Value	P-Value
ISO	6	93.00	4.52	8.296	0.001 (S) ***
ISO+G	6	87.17	4.02		

Table 1 compares the level of serum cholesterol in control and glutathione treated group of rats. Values expressed as mean ± SD. S-Significant NS- not significant. The mean value of serum cholesterol in control group was 85.83±4.36 as compared to isoproterenol treated group of value 93.00 ± 4.52, isoproterenol + glutathione treated group of value 87.17±4.02 which was significant at P<0.05 and 0.001.

Table 2: Comparison of serum tgl in mg/dl in control and glutathione treate1d group of rats

Groups	Control Group (N=6)	Experimental Group (N=6)	Student t- test t-Value	P-Value
ISO	96.17 ± 3.06	97.00 ± 4.00[a]	1.387	0.224 (NS)
Glutathione	96.17 ± 3.06	94.33 ± 4.13[b]	3.379	0.020 (S) *
ISO+G	96.17 ± 3.06	91.17 ± 3.60[c]	2.766	0.040 (S) *

Groups	N	Mean	SD	t-Value	P-Value
ISO	6	97.00	4.00	2.584	0.02 (S) *
ISO+G	6	91.17	3.60		

Table 2 compares the level of serum TGL in control and glutathione treated a group of rats. Values expressed as mean ± SD. S –Significant NS – Not significant. The mean value of TGL in control group of the rat was 96.17 ± 3.06 as compared to glutathione treated group of rat of value 94.33± 4.13, isoproterenol +glutathione treated a group of rat of value 91.17±3.60 which was significant at P<0.020 and 0.040.The mean value of isoproterenol treated group of was 97.00±4.00 as compared to isoproterenol +glutathione treated group of rat of value 91.17±3.60 which was significant at P<0.02.

Table 3: Comparison of serum ldl in mg/dl in control and glutathione treated group of rats

Groups	Control group (n=6)	Experimental group (n=6)	Student t-test T-value	P-value
Iso	36.50 ± 2.88	36.33 ± 3.98[a]	0.112	0.915 (ns)
Glutathione	36.50 ± 2.88	34.33 ± 3.56[b]	1.857	0.122 (ns)
Iso+g	36.50 ± 2.88	30.50 ± 3.39[c]	4.108	0.009 (s) **

Groups	N	Mean	Sd	T-value	P-value
Iso	6	36.33	3.98	3.693	0.014 (s) **
Iso+g	6	30.50	3.39		

Table 3 compares the level of LDL in mg/dl in control and glutathione treated group of rats. Values expressed as mean ±SD. S – Significant NS – Not significant. The mean value of LDL in the control group of the rat was 36.50±2.88 as compared to isoproterenol + glutathione treated group of rats of value 30.50 ± 3.39 which was significant at P<0.009. The mean value of LDL in isoproterenol treated group of the rat was 3.33 ± 3.98

Table 4: comparison of serum hdl in mg/dl in control and glutathione treated group of rats

Groups	Control group (n=6)	Experimental group (n=6)	Student t- test T-value	P-value
Iso	31.17 ± 3.19	31.33 ± 3.33[a]	0.237	0.822 (s)
Glutathione	31.17 ± 3.19	36.00 ± 2.90[b]	6.874	0.001 (s) ***
Iso+g	31.17 ± 3.19	32.50 ± 3.27[c]	2.000	0.102 (ns)

Groups	N	Mean	SD	t-Value	P-Value
ISO	6	31.33	3.33	1.025	0.352 (NS)
ISO+G	6	32.50	3.27		

Table 4 compares the level of HDL in mg/dl in control and glutathione group of rats. Values expressed as mean ± SD. S –Significant NS – Not significant. The mean value of the control group of the rat was 31.17±3.19 as compared to glutathione treated group of rat of value 36.00 ± 2.90 which was significant at P<0.001.

DISCUSSION

Glutathione is used to treat blood disorders, detoxify the liver of heavy metals, toxins, and alcohol. It has a long history of being used by those exposed to radiation and chemotherapy during cancer therapies. It has anti-aging effects, promote longevity and reduce chronic diseases.[8] In addition glutathione bolsters the structure of body proteins and assists in the transport of amino acid across cell membranes. [9] When comparing the level of serum cholesterol in control and glutathione treated group of rats. The mean value of serum cholesterol in control group was 85.83±4.36 as compared to isoproterenol treated group of value 93.00±4.52, isoproterenol + glutathione treated group of value 87.17±4.02 which was significant at a P value of 0.05 and 0.001.There was an increase in the level of serum cholesterol in isoproterenol treated group of rats as compared to control group and glutathione pre-treatment preserved the level to near normal.[10] The level of serum TGL in control and

glutathione treated a group of rats. The mean value of TGL in control group of the rat was 96.17 ± 3.06 as compared to glutathione treated group of rat of value 94.33±4.13, isoproterenol + glutathione treated a group of rat of value 91.17±3.60 which was significant at a P value of 0.020 and 0.040.The mean value TGL of isoproterenol treated group of was 97.00±4.00 as compared to isoproterenol + glutathione treated group of rat of value 91.17±3.60 which was significant at a P-value of 0.02.There was a significant increase in the level of TGL in isoproterenol treated group of rats as compared to control group and glutathione pre-treatment preserved the level to near normal.[11] The level of LDL in mg/dl in control and glutathione treated a group of rats. The mean value of LDL in the control group of the rat was 36.50±2.88 as compared to isoproterenol + glutathione treated group of rats of value 30.50±3.39 which was significant at a P-value of 0.009.The mean value of LDL in isoproterenol treated group of the rat was 33.3 ± 3.98 as compared to isoproterenol + glutathione treated group of rats of value 30.50 ± 3.39 which was significant at a P-value of 0.014.There was a significant increase in the level of LDL in isoproterenol treated group of rats as compared to a control group of rats and glutathione pre-treatment preserved the level to near normal. compares the level of HDL in mg/dl in control and glutathione group of rats.[12] The mean value of the control group of the rat was 31.17±3.19 as compared to glutathione treated group of rat of value 36.00 ± 2.90 which was significant at P< 0.001 level. There was a decrease in the level of serum triglycerides, cholesterol, LDL and an increase in the level of HDL in GIV rats as compared to GIII rats.[13]

CONCLUSION

The main action of glutathione is that of protecting cells from oxidative stress and damage, mainly via its antioxidant properties. The magic of glutathione lies in its sulfur compounds, lipid-lowering effect. Researchers report that people who have lower levels of glutathione have an increased risk of cardiovascular disease. It is best to supplement with glutathione precursors to increase glutathione levels in the body. Regular exercise also stimulates glutathione production. Thus, this action of glutathione could be an important mechanism for providing benefits to the cardiovascular system during different pathophysiological conditions.

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