

Synergistic Effect of Ginger Extract in Pulmonary Tuberculosis Patients

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ABSTRACT

Introduction: Tuberculosis (TB), a ubiquitous, highly contagious chronic granulomatous bacterial infection, is still a leading killer of young adults worldwide. The study was designed to know the effect of ginger extract in case of pulmonary tuberculosis patients, and to establish whether *Ginger officinale* might be used as a supplement to anti-tubercular therapy and as a supportive therapy.

Material and Methods: The study group was supplemented to ginger extract (6-gingerol) daily for 1 month and placebo group was supplemented with starch capsule. Both groups were taking standard anti-tubercular treatment (ATT) during the study.

Results: Ginger supplementation significantly reduced the levels of acute phase protein mainly C-Reactive Protein (CRP) in ginger supplemented group in comparison to baseline due to its broad anti-inflammatory action.

Conclusion: Ginger and ATT have a synergistic effect on Pulmonary Tuberculosis (PTB) Patients. Since Ginger and its bioactive compound control the molecular mechanism of inflammation, it might be used to treat not only Pulmonary Tuberculosis (PTB) patients but also inflammation associated disorder.

Keywords: Anti Tubercular Treatment (ATT), Ginger Extract (6-gingerol), Synergistic Effect Anti-inflammatory, Insignificant Side Effect

between 20-58 yrs) who were clinically proved to be healthy and were not taking any medication, drug or therapy were taken as control. Anemic Patients were selected as per WHO criteria.⁵ The patients were enrolled in the study group after taking permission from the Ethical Committee of SAIMS Medical College, Indore, MP.

Dose: the study group was supplemented 250mg. of ginger extract⁶ orally twice daily after meals for 1 month and placebo group was supplemented with starch capsule. Participants of both groups were taking standard anti-tubercular treatment during the study.

Collection of Blood Sample and Applied Method

In the study group first blood samples were collected on day zero, before ginger supplementation and second blood sample was collected on thirtieth day of ginger supplementation. Serum was stored in the appendrof tube at -20°C. All the samples were analyzed for: hemoglobin, Serum C-reactive protein, Serum ferritin⁷, Serum iron⁸ and Serum Total Iron Binding Capacity (TIBC)⁹ and Serum Erythropoietin (EPO).¹⁰

STATISTICAL ANALYSIS

Paired and Unpaired t-test were used for statistical assessments with SPSS to evaluate mean levels of variables in study groups.

RESULTS

A highly significant rise ($p < 0.001$) was noted in serum levels of C-reactive proteins (CRP) and Ferritin (FRT) in study group as compared to control group. (Table 1) Pre (0 D) and Post (30th) analysis of Biochemical parameters in study groups suggests that ATT with ginger supplemented group were significantly improve (< 0.001) in biochemical parameter in comparison to only ATT treatment. Supplementation of ginger with ATT in Tuberculosis patients for 30 Days improve Hemoglobin (Hb) level and other Biochemical parameters towards normal. The cumulative effect of ATT with ginger supplementation for 30 days in TB patients increases serum iron and TIBC level by 11.86% and 53.98% respectively in comparison to only ATT which increases serum iron 4.81% and TIBC 43.85%. (Table

INTRODUCTION

Tuberculosis (TB), a ubiquitous, highly contagious chronic granulomatous bacterial infection, is still a leading killer of young adults worldwide. Disturbance in acute phase Proteins, in case of pulmonary tuberculosis causes reduction in appetite, altered metabolism and malabsorption in micronutrient which lead to secondary immunodeficiency that increases the host's susceptibility to infection. ATT is the only effective method for treatment of TB patients but having toxic to liver. Global trend in resistance to anti-tuberculosis drug was observed¹ so it is challenging for Scientific world to overcome TB in stipulated time to make RNTCP Program successful. Ginger is a well known herbal medicine since ancient time. Earlier report suggest that Ginger has been effective against the growth of both Gram-positive and Gram-negative bacteria.^{2,3} The aim of the present study was to know the therapeutic effects of ginger extract with ATT in newly diagnosed sputum AFB positive Pulmonary Tuberculosis (PTB) patients having significant anemia.

MATERIAL AND METHODS

The study group consisted of 76 newly diagnosed sputum AFB positive Pulmonary Tuberculosis patients having significant anemia, falling in DOTS (CAT I)⁴ were selected from the Out Patient Department (OPD) of Medicine in SAIMS Medical College, Manorma Raje Tuberculosis Hospital and from different DOTS Centers of Indore (M.P). 32 subjects (Age

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Parameters	Control (n =32)	PTB (n = 40)	t-value	p-value
Hb (g/dL)	14.11 ± 3.61	11.10 ± 3.53	10.23	<0.001**
CRP (µg/mL)	3.01 ± 1.78	34.78 ± 9.27	17.38	<0.001**
Ferritin (ng/mL)	155.21 ± 34.2	354.30 ± 67.4	15.81	< 0.001**
Serum Iron (µmol/l)	16.97 ± 3.56	6.15 ± 3.77	18.54	< 0.001**
TIBC (µg/dL)	299.14 ± 22.4	186.12 ± 34.05	11.34	< 0.001**
Erythropoietin (mU/mL)	29.77 ± 3.23	42.35 ± 23.17	10.21	<0.001**

Values are in Mean ± SD; **Highly Significant p < 0.001

Table-1: Comparison of Biochemical Parameters between Control and Study group On Days Zero

Parameters	Pre (0 Days)	Post (30th Days)	t-value	p-value
Hb (g/dL)	11.10 ± 3.53	12.88 ± 1.21	13.04	< 0.001**
CRP (µg/mL)	34.78 ± 9.27	9.67 ± 5.15	16.86	< 0.001**
Ferritin (ng/mL)	354.30 ± 67.4	301.63 ± 70.13	8.59	< 0.001**
Serum Iron (µmol/l)	6.15 ± 3.77	6.88 ± 2.43	14.73	< 0.001**
TIBC (µg/dL)	192.19 ± 46.05	295.94 ± 51.85	16.10	< 0.001**
Erythropoietin (mU/mL)	40.44 ± 11.88	29.13 ± 10.09	9.68	< 0.001**

Values are in Mean ± SD; **Highly Significant p < 0.001; DF = 39

Table-2: Pre (0 D) and Post (30th D) analysis of Biochemical Parameter in Study group (PTB, n = 40) With Ginger Supplements

Parameters	pre (0 Days)	Post (30th Days)	t-value	p-value
Hb (g/dL)	11.03 ± 1.06	11.65 ± 6.52	12.45	<0.001**
CRP (µg/mL)	37.36 ± 5.73	22.23 ± 5.67	21.31	<0.001**
Ferritin (ng/mL)	367.34 ± 73.34	336 ± 21.15	3.47	< 0.001**
Serum Iron (µmol/l)	6.23 ± 2.54	6.53 ± 3.32	9.35	< 0.001**
TIBC (µg/dL)	180.12 ± 34.05	259.12 ± 22.3	11.23	< 0.001**
Erythropoietin (mU/mL)	36.28 ± 7.19	32.8 ± 11.23	8.61	<0.001**

Values are in Mean ± SD; **highly Significant p < 0.001; DF = 35

Table-3: (0 D) and Post (30th D) analysis of biochemical parameter in study group (PTB, n = 36) without ginger supplements

Parameter	ATT With Ginger Difference of 0 days and 30D	ATT Without Ginger Difference of 0 days and 30D	Percentage difference (ATT with Ginger- ATT without Ginger) on 30th Day
CRP (µg/mL)	72.19% decreased	40.49% decreased	31.70%
Ferritin (ng/mL)	14.86% decreased	8.53% decreased	6.33%
Hb (g/dL)	16.03% increased	5.62% increased	10.41%

Table-4: Efficacy of Ginger supplements in level of Biochemical Parameters in study group (with and without ginger)

Parameter	ATT With Ginger	ATT Without Ginger	Percentage difference
% Wt. gain	Maximum (20%)	Minimum (10%)	10%
Recovery Time	Less	More	NA
Appetite induction	++++	++	NA
Iron supplementation	Not required	Required	NA

NB - NA – Not applicable, ++++ appetite (More in less time)

Table-5: Results of Weight gain and others parameters during Treatment in ATT with Ginger and ATT without Ginger Supplemented Group on 30th Day

2 and 3). This finding suggest that increase level of Serum iron and TIBC might be due to decreased in acute phase response (mainly CRP). ATT with ginger Supplementation for 30 days in TB patients improves clinical symptom and produces higher cure rate than ATT alone (Table 3 and 4). We observed that in both of the study groups (ATT With Ginger Supplements and Only ATT) there was improvement in weight during the treatment but the result was more significant in case of ginger supplemented group, this indicates that ginger acts synergistically role to compensate underling disturbance and acts as stimulant of digestion and antispasmodic action in TB Patients (Table 2,3, 5).

DISCUSSION

Earlier study focused that ginger extract play broad spectrum roles (antimicrobial¹¹, anti-inflammatory¹², antioxidant¹³, immunomodulatory action¹⁴ and increases antioxidant enzymes.¹⁵ Inflammation is part of the body's immune response in Tuberculosis patients. On the basis of alteration observed in biochemical parameter in study group (TB Patients) in comparison to control subject, it is clear that inflammation and acute phase response interact with iron metabolism. Raised level of CRP is marker of inflammation which causes blunted erythropoietin resistance in TB patients, resulting anemia. The results of present study strongly suggest that zinger play more

significant role in restore mechanism of Cachexia and nutritional status in Pulmonary Tuberculosis Patients as comparison to only conventional therapy (ATT). Ginger is an alternative, safe herbal drug through its anti-inflammatory action it reduces the level of proinflammatory marker and blunted EPO response which in turn restore iron homeostasis and correct underlying disturbance.¹⁶ Present study Strongly suggest that ginger supplementation along with Anti-tubercular Treatment not only reduce the load of drug in TB patients but also helpful to prevent relapse of the disease if, taken ginger for a long period of time. It emphasize that synergistic effect of ginger with ATT.

CONCLUSION

The result of the present study conclude that ginger not only reduces the level of pro inflammatory cytokine in TB Patients, but also act on the body by regulating and balancing its vital process, so it might be safely be included in the standard anti tubercular treatment.

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