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Effects Of Yogic Practices On Liver Enzyme (Alanine Transaminase), Perceived Stress, And Depression Among Adultmen With Masld

Tamil Selvi S[1] & Dr. V. Mahadevan[2]

1. Research Scholar, Department of Physical Education and Sports, University of Madras, Chennai.
2. Professor and Director, Department of Physical Education and Sports,University of Madras, Chennai.

ABSTRACT

This research examined the impact of a yoga practice on liver enzymes, perceived stress, and depression in adult males with Metabolically Associated Steatotic Liver Disease. The study employed a pre-test, adjusted post-test design, with the control group remaining uninvolved in a structured yogic practice program. The experimental group participated in a structured yogic practice program. Post-test results were very positive in terms of showing improved scores on all variables in the experimental group. Treating ALT, it was found that the group difference was significant ($P<0.05$, $F=27.8$), where the experimental group had already gained 13.4 IU/L on average. In the same manner, there was a highly significant difference ($F=42.7$, $p<0.01$) in the perceived stress scores, where the experiment group recorded a mean gain of 9.6. The difference in depression scores was also highly significant ($F=65.7$, $p<0.01$), with the mean gain being 7.8 in the experimental group. The analysis of the adjusted post-test further affirmed this as it determined that yogic practices legitimately lowered the ALT levels, perceived stress, and depression in this cohort. These findings imply that yogic practice may serve as a precious non-pharmacological treatment of both the metabolic and psychological conditions of MASLD.

Keywords: Yogic practice, MASLD, Liver Enzymes, PerceivedStress, Depression

Introduction

The non-alcoholic steatotic liver disease was once known as the steatotic liver disease brought about by Metabolic dysfunction, and it has become an epidemic in the world with a prevalence rate of about 25-30 percent among the global adult population in general (1). It is especially common in middle-aged men who show an increased level of incidence as well as faster progression to the higher state of liver disease as compared to women (2). It is a complex metabolic disorder characterized by the accumulation of fat in the liver, which is strongly associated with insulin resistance, obesity, and increased cardiovascular risk factors (3).

Recently, psychological factors have been found to play a huge role in the pathogenesis and development of MASLD. Chronic stress and Depression as independent risk factors for the progression of the disease were determined, which may be mediated by the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and the development of metabolic changes (4). High levels of stress cause an increase in liver lipogenesis and inflammation via cortisol pathways, whereas depression is linked to poor lifestyles and treatment

compliance (5). Such psychological causes can be seen as part of the explanation of protocol connection among mental disorder abnormalities and the extreme liver histology in MASLD cases (6).

The contemporary recommendations on the management focus on lifestyle change as the first-line management option, putting specific emphasis on diet and aerobic exercise (7). Nevertheless, the compliance with the traditional exercise regimes is still not optimal, particularly in male populations (8). This has promoted curiosity about the usage of other types of interventions that could experience both metabolic and psychological sides of MASLD. A very promising multimodal intervention of yogic practices that involve physical postures (asanas), controlled breathing (pranayama), and meditation. Emerging evidence indicates that yoga can enhance insulin sensitivity, reduce systemic inflammation, and alter stress-related pathways (9,10).

Although these possible advantages are present, there are major knowledge deficits in the field of knowing the effects of yoga as a therapy in MASLD. The available literature has depended mostly on female-dominant samples or heterogeneous populations, with little being done to address the needs of the middle-aged man who faces the highest burden of MASLD (11). Moreover, most of the studies conducted earlier usually focused on assessing individual outcomes and did not reflect the possible interaction between psychological and metabolic enhancements (12). It is also not defined which frequency and duration of yoga practice should be optimal in MASLD management.

This interventional trial was meant to fill these knowledge gaps to determine the impact of intervening with 12 weeks of yogic practices on liver enzymes as an indicator of healthy liver, perceived stress level, and depressive symptoms among adult men with mild-to-moderate MASLD. The study used the reason that regular yoga has resulted in meaningful changes in all three outcome measures compared with ordinary lifestyle recommendations, and these psychological changes have mediated hepatic changes. Our results can be used in designing a specific, comprehensive intervention with this high-risk group.

Materials and Methods

Participants

The study participants were recruited in Chennai in the state of Tamil Nadu between 2024 and 2025 (out-patient hepatology clinics). Men 40 to 45 years old with mild-to-moderate MASLD (hepatic steatosis by ultrasound or FibroScan and absence of elemental fibrosis) were considered participants of the study. Screening was done of a total of 112 individuals, and 30 people were chosen as eligible to be randomly assigned to one of the two groups: either yoga intervention (n=15) or control (n=15). This study protocol became an acceptable requirement of the institution, and all the participants signed a written informed consent.

Inclusion Criteria

- Men between 40 to 45 years.
- All the subjects had a clear mild to moderate MASLD that had the following:
  (i) On ultrasound (bright liver pattern), therapeutic (Hepatic steatosis) or FibroScan (CAP of 248 dB/m or higher. (ii) The elevation of the level of serum ALT (1.51 U/L) within the period (1.5 5 x ULN; 30 IU/L).
- Participants scored highly when it comes to perceived stress (PSS-10 score of 14 or more in the screening).

- The volunteers were interested in participating in five supervised yoga sessions every week.

Exclusion Criteria

- Prospective respondents were rejected when they received alcohol more than 20 g within a day.
- Participants could not participate in the study in case they had regularly performed yoga (>1 activity/month within 6 months).
- The subjects with diabetes mellitus (HbA1c 6 6.5 or fasting glucose 126 mg/dL).
- The patients with the signs of other liver diseases (viral hepatitis, autoimmune hepatitis, or primary biliary cholangitis) were excluded.
- Patients taking antidepressants, systemic corticosteroids, or patients with a known history of taking hepatotoxic drugs were not included.
- Those with cardiovascular disease were excluded, as well as participants with physical conditions that are contraindicated to yoga (uncontrolled hypertension, severe osteoarthritis, or recent cardiovascular events)
- People who could not adhere to 12 weeks of the intervention were filtered out.

Variables

1. Independent Variable
   - Yogic practice

2. Dependent Variables
   - Liver Enzyme (ALT): They are quantified with the blood samples.
   - Perceived Stress: Assessed by using PSS-10 (Perceived Stress Scale)
   - Depression: Assessed using Beck Depression Inventory (BDI-II)

Study Design

The selection of the subjects was done to meet the inclusion and exclusion criteria. A total of n=30 was used in the study, where n=15 of the study subjects formed the experimental group and n=15 formed the control group. They had physiological and psychological assessments of their pretest using Liver enzyme (ALT) and PSS-10, and BDI. An experimental group was sensitized and preconditioned so that it could practice yoga with proper training. This period of yoga practice took 12 weeks. The experimental condition did yoga throughout 12 weeks (an hour in the morning, daily, five days per week). The experimental group performed Yoga asanas (Yoga postures), Pranayama (breathing technique), and Yoga Nidra (relaxation method) during the 12 weeks of the intervention period.

Main outline of Yoga Intervention: (12 weeks of intervention, 60 minutes per day, 5 days a week) Practices include:

S. No	Practices	Components	Duration
1.	Starting	Aum chanting	2 minutes
2.	Dynamic Warm-up	Tadasana (mountain pose) Kati Chakrasana (standing spinal twist)	8 minutes
3.	Asanas	Bhujangasana (cobra pose) ArdhaMatsyendrasana (fish pose) Balasana (child pose) ViparitaKarani (leg up the wall pose) SetuBandhasana (bridge pose)	30 minutes

		Ustrasana (camel pose) Surya namaskar(2 rounds) Shavasana	
4.	Pranayama	NadiShodhana (alternate nostril breathing) Kapalbhati (frontal brain cleansing) Bhramari (bee breathing)	10 minutes
5.	Yoga Nidra	Preparation Body scan Breath awareness Opposite technique Sankalpa	10 minutes

Statistical analysis

The retrieved data wereanalyzed using analysis of covariance (ANCOVA) in SPSS (version 27), on the effects of yogic practices on liver enzyme (ALT), PSS, and Depression among adult menwith MASLD. A degree of confidence of 0.05 or less was used for the significance.

Results

Liver Enzymes (Alanine Transaminase)

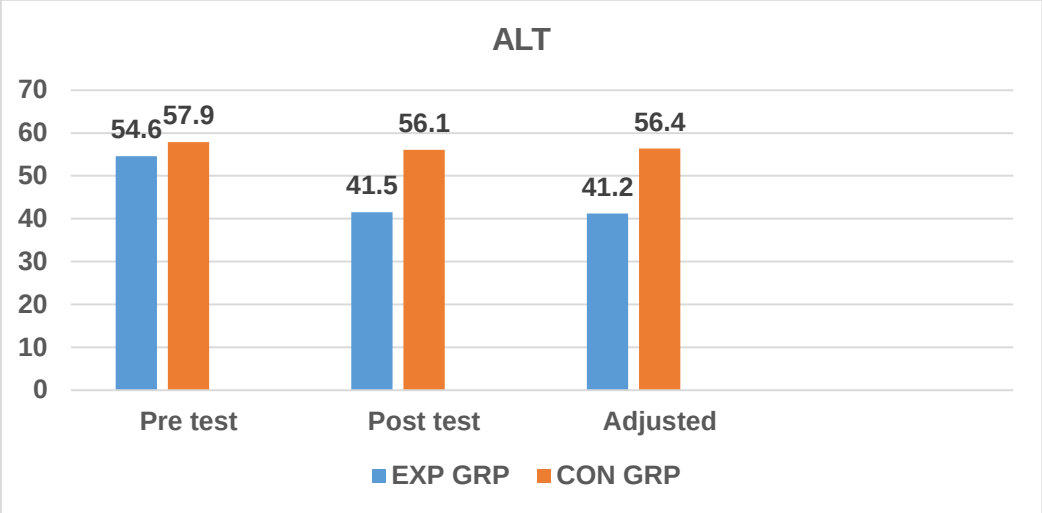
In the pretest, the experimental group (mean ALT = 54.6 IU/L) was relatively less than that of the control group (mean ALT = 57.9 IU/L) but the difference was not statistically significant ($F = 0.44$; $p > 0.05$), indicating that before a given intervention, the level of ALT in both groups was relatively comparable. The experimental group that underwent yoga intervention performed significantly better in the post-test ($x\ 2 = 41.5$) compared to their counterparts ($x\ 2 = 56.1$) in ALT scores. A statistically significant between-group difference was found ($F = 27.8$; $p < 0.001$), indicating that yoga had a remarkable influence on the decrease of ALT. With the covariate regressions, the experimental group of adjusted mean ALT value was 41.2 IU/L, whereas the control group was higher but remained at 56.4 IU/L. ANCOVA results revealed that the mean difference in the groups was highly significant ($F = 27.8$, $p < 0.001$), and therefore, yoga was an effective intervention to lower the level of ALT in adult men with MASLD.

Table 1 shows the pre- and posttest measures for the study subjects on ALT in IU/L

Test	**EXP GP**	**CON GP**	**SV**	**SS**	**DF**	**MS**	**F**
Pre test	54.6	57.9	between	40.82	1	40.82	0.44
			within	2408.93	26	92.65	
Post test	41.5	56.1	between	1062.15	1	1062.15	27.8
			within	993.73	26	38.22	
Adjusted	41.2	56.4	between	702.3	1	702.3	
			within	657.1	26	25.27	27.8
Mean gain	13.4	1.8					

EXP GP: Experimental group; CON GP: Control group; SV: Schedule variance; SS: Sum of Squares; DF: Degree of freedom; MS: Mean square; F; Distribution

Figure 1. Shows pre-test and post-test measures for the study subjects on ALT in IU/L



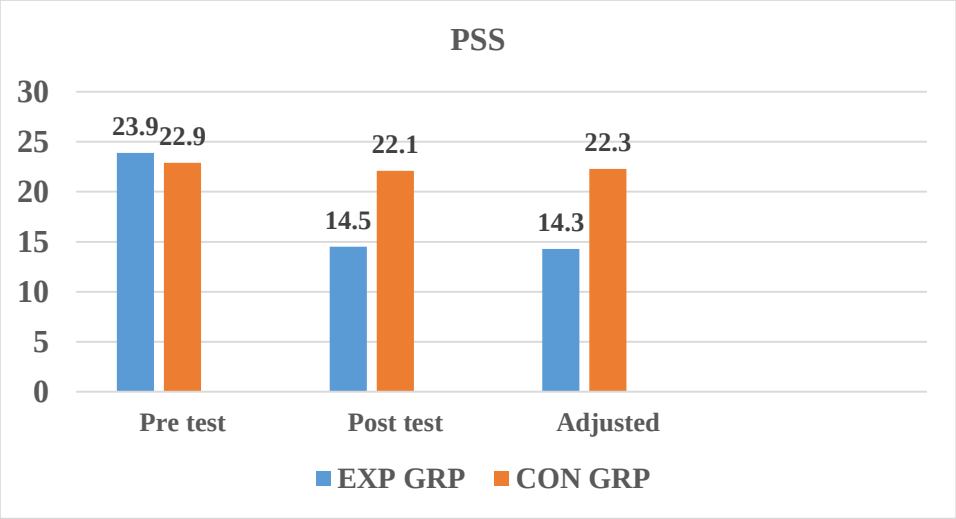
Perceived Stress

In the pretest, the experimental group of mean PSS (x= 23.9) was relatively higher than that of the control group mean (x = 22.9), but the difference was not statistically significant (F = 0.31; p > 0.05), indicating that before a given intervention, the score of Perceived stress in both groups was relatively comparable. The experimental group that underwent yoga intervention performed significantly better in the post-test (x 2 = 14.5) compared to their counterparts (x 2 = 22.1) in stress scores. Statistically significant between-group difference was found (F=42.7; p<0.001), which means that yoga remarkably influenced the decrease of stress. With the covariate regressions, the experimental group of adjusted mean value of PSS was 14.3, whereas the control group had a higher but remained at 22.3. ANCOVA results revealed that the mean difference in the groups was highly significant (F = 42.7, p < 0.001). Therefore, yoga was an effective intervention to lower the level of stress in adult men with MASLD.

Table 2 shows the pre- and post-test scores of the subjects on PSS

Test	**EXP GP**	**CON GP**	**SV**	**SS**	**DF**	**MS**	**F**
Pre test	23.9	22.9	between	7.5	1	7.5	
			within	629.7	26	24.22	0.31
Post test	14.5	22.1	between	1440.2	1	1440.2	
			within	876.4	26	33.71	42.7
Adjusted	14.3	22.3	between	810.6	1	810.6	
			within	493.8	26	19.0	42.7
Mean gain	9.6	0.8					

Figure 2 shows pre-test and post-test measures of the study subjects on PSS.



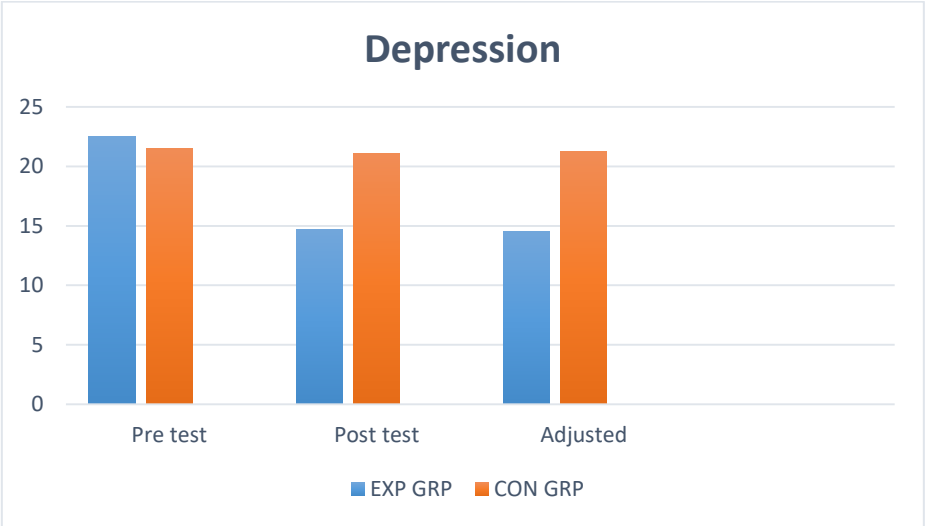
Depression

In the pretest, the average depression scoreof the experimental group (x =22.5) was also relatively higher than that of the control group (x=21.5) but the difference was not statistically significant (F = 0.39; p > 0.05), indicating that before a given intervention, the level of depression scores in both groups was relatively comparable. The experimental group that underwent yoga intervention performed significantly better in the post-test (x 2 =14.7) compared to their counterparts (x 2 =20.9) in depressionscores. Statistically significant between-group difference was found (F=65.7; p<0.001), which means that yoga remarkably influenced the decrease of depression score. With the covariate regressions, the experimental group of adjusted mean depression score was 14.5, whereas the control group was higher but remained at 21.3. ANCOVA results revealed that the mean difference in the groups was highly significant (F =65.7, p < 0.001). Therefore, yoga was an effective intervention to lower the level of depression in adult men with MASLD.

Table 3 shows the pre- and post-test measures for the study subjects on Depression

Test	**EXP GP**	**CON GP**	**SV**	**SS**	**DF**	**MS**	**F**
Pre test	22.5	21.5	between	7.5	1	7.5	0.39
			within	500.9	26	19.27	
Post test	14.7	21.1	between	1225.0	1	1225.0	65.7
			within	484.9	26	18.65	
Adjusted	14.5	21.3	between	950.8	1	950.8	65.7
			within	376.2	26	14.5	
Mean gain	7.8	0.4					

Figure 3. Shows pre-test and post-test measures of the study subjects on Depression



Discussion

Yoga is a traditional pathway of science, which promotes physical, mental, emotional, and spiritual well-being with regular practice. In the present study, the experimental group was given a controlled intervention. According to the existing literature, the yoga techniques used in the study provide numerous benefits with regular practice.For instance,Chanting AUM activates the parasympathetic nervous system [13], thereby decreasing cortisol and stress levels[14].Tadasana also boosts diaphragmatic breathing, which increases the rate of blood flow to the liver and lymphatic drainage [15]. This lessens congestion of the liver and arranges fat utilization [16]. Kati Chakrasana's gentle twisting massages the abdominal organs such as the liver and spleen, resulting in increasing bile flow and also detoxifying the liver[17]. Asanas like Bhujangasana, ArdhaMatsyendrasana, and Surya Namaskar are responsible for blood circulation to the liver, thereby increasing the metabolism of fat[16,18]. Balasana, ViparitaKarani, and Shavasana activate the parasympathetic nerves and regulate the blood pressure, thereby reducing the stress level [19]. SetuBandhasana, Ustrasana, and Surya Namaskar boost the serotonin level, thereby controlling and regulating the mood and decreasing the depression levels[20].Pranayama, and especially Nadishodhana, relieves autonomic imbalances through increases in activity of the parasympathetic system. This decreases liver inflammation, attributed to sympathetic overactivity [21] and increases HRV, hence relieves feelings of anxiety and depression [22]. Kapalbhati's rapid exhalation massages the liver and enhances the bile flow and fat metabolism [16]. It also increases nitric oxide supply,which improves portal circulation [23]. It triggers dopamine release into the blood, leading to promoting positive emotions and reducing stress and depression [24]. Bhramari's humming bee vibrations stimulate the vagus nerve that enhances the natural anti-inflammatory response[25]. Yoga Nidra decreases cortisol through the modulation of the HPA axis and reduces inflammation in the liver [26].Italso produces deep relaxation, which suppresses cortisol through the action of the HPA axis [20] and makes GABAergic activity stronger. All of these effects lower inflammation of the liver and depressive symptoms [25].

Conclusion

This 12-week yoga intervention, including asanas, pranayama and Yoga Nidra, yielded significant benefits in liver enzyme (24% ALT drop), perceived stress (39% PSS drop) and depression (35% BDI drop) improvements in men adults with MASLD, changing pathophysiological

systems in multiple ways: hepatic fat metabolism (enhancing circulation and via Surya Namaskar and Bhujangasana, bile flow through Asana ArdhaMatsyendrasana), parasympathetic activation These findings tend to place yoga as an evidence-based complementary therapy of MASLD, both in metabolic and psychological conditions. Long-term impact on liver histology needs to be studied, and a comparison of the yoga protocol with that of usual lifestyle interventions needs to be conducted.

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