Original Article

Efficacy of nutritional supplement (Haras) on carbon monoxide levels in smokers and non-smokers: An observational study

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Abstract

Context: Carbon monoxide (CO) concentrations in exhaled air may impart a quick, non-invasive method to determine smoking status. Haras is a nutraceutical medication, which is slowly gaining recognition for its antioxidant and anti-inflammatory activities.

Aims: The effectiveness of the Haras therapy in smokers and non-smokers will be assessed by evaluating breath CO levels.

Methods and Materials: The study included 101 test subjects with 76 subjects of smokers and 25 subjects of non-smokers. Both the test groups were given 10 mL of Haras juice in divided doses per day for 30 days. The CO levels were evaluated using a breath analyser before drug trial and then on the 8th, 15th, 22nd and after the conclusion of the drug trial.

Statistical Analysis Used: The Wilcoxon signed-rank test was used to compare the CO and carboxyhemoglobin levels among smokers and non-smokers.

Results: Smokers had higher mean percent carboxyhemoglobin and mean parts per million CO values than non-smokers, and the difference between the two was shown to be statistically significant ($P < 0.001$). It was also found to be statistically significant from the first day to the eighth day, the first day to the 15th day, the first day to the 20th second day, first day to the 30th day ($P < 0.001$).

Conclusions: Haras can be used effectively as an alternative supportive treatment for the diminution of CO levels in smokers and non-smokers.

Keywords: Breath analyser, carbon monoxide, Haras, non-smokers, smokers

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INTRODUCTION

Smoking tobacco is one of the most harmful behaviors in the world.[1-4] With 6 million fatalities each year, 30% of which are due to cancer, it is regarded as a significant preventable cause of disease on a global scale.[2] Other significant global factors to the burden of cancer differ, although smoking continues to be the largest risk factor.[5,6] About 4,800 distinct chemicals make up the incredibly

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complex amalgamation that is cigarette smoke. One hundred of these chemicals are known as mutagens, cocarcinogens, and carcinogens. In addition to these chemicals, the intricate blend also includes an added stream of ozone, formaldehyde, ammonia, carbon monoxide, toluene, and benzene in amounts to ten billion specks of various sizes per millilitre of first-hand smoke.[7] A rapid, non-invasive means of determining smoking status may be found in the levels of CO in exhaled air.[8,9] Haras (liquid form of curcumin) is a nutraceutical drug, which is slowly gaining appreciation for its free-radical scavenging and counteracting inflammation. The effects of the nutritional additive (Haras) on CO levels in smokers and non-smokers were examined to take this into account.

SUBJECTS AND METHODS

The study included 101 test subjects with 76 subjects of smokers and 25 subjects of non-smokers. The study cohorts were the guard population of a gated community. They were grouped into smokers and non-smokers based on their smoking habits. They were divided into two groups: current smokers who have smoked at least 100 cigarettes in their lives and non-smokers who had never smoked or inhaled less than 100 cigarettes in their lifetime. Patients were eligible for inclusion if they had 1. Age 18–60 years 2. Healthy volunteers who were smokers without any history of systemic disease. 3. Healthy volunteers willing to return for follow-ups. The exclusion criteria included 1. Patients who were unwilling to sign the informed consent. The study's CTRI Number is CTRI/2022/10/046871, and it was registered with the Clinical Trials Registry, India.

Methodology

A single-arm design was used for the study. The Haras turmeric juice is the first turmeric extract juice in the world to be used as a daily lung protection cleanse for air pollution. It is suitable for all age groups. Both the test groups were given 10 mL of the Haras juice in divided doses per day for 30 days. Smokerlyzer, a breath analyser, was used to measure the carboxyhemoglobin (%CoHb) and the CO levels before, on the eighth, the 15th and the 22nd days, and after the drug trial. The cohorts were informed about the purpose of the smokerlyzer and their values of CO levels and CoHb levels were not revealed to reinforce accurate recording of smoking habits. Each participant was invited to give Smokerlyzer one breath. The participants were directed to complete a full exhalation, a full inhalation, a 15-s breath hold, and a fast exhalation into a single-use mouthpiece connected to the Smokerlyzer. The values of CO in ppm and %CoHb were then recorded. Confounding variables were identified and taken into consideration, including environmental exposure, cannabis or alcohol misuse, physical activity after smoking, nutrition, and other lung conditions.

Statistical analysis

Null Hypothesis: The mean value between the two groups did not significantly differ, that is, $\mu_1 = \mu_2$. Alternative Hypothesis: The mean value between the two groups differed significantly. i.e., $\mu_1 \neq \mu_2$. The level of significance was $\alpha = 0.05$. Wilcoxon signed-rank test was performed to compare values within a group at various time intervals because the data did not follow normality. The *P* value and level of significance were compared. The null hypothesis is rejected, and the alternative hypothesis is accepted if $P < 0.05$. The null hypothesis is accepted if $P \geq 0.05$.

RESULTS

Comparison of %CoHb at different time intervals within non-smokers: (Wilcoxon signed rank test) Table 1.

The reduction in mean %CoHb in non-smokers was found to be statistically significant from first day to eighth day ($P < 0.05$), first day to 15th day ($P < 0.05$), first day to 22nd day ($P < 0.001$), first day to 30th day ($P < 0.001$), eighth day to 22nd day ($P < 0.01$), eighth day to 30th day ($P < 0.001$), fifteenth day to 22nd day ($P < 0.01$), 15th day to 30th day ($P < 0.001$) as well as 22nd day to 30th day ($P < 0.001$). The reduction from the eighth day to the 15th day was not statistically significant ($P > 0.05$)

Table 1: Comparison of %CoHb at different time intervals within non-smokers: (Wilcoxon signed rank test)

Day	*n*	Mean	Std. Dev	SE of mean	Mean difference	*Z*	*P*
Day 1	25	0.90	0.10	0.02	0.028	-2.242	0.025*
Day 8	25	0.87	0.10	0.02			
Day 1	25	0.90	0.10	0.02	0.039	-2.552	0.011*
Day 15	25	0.86	0.11	0.02			
Day 1	25	0.90	0.10	0.02	0.119	-3.580	<0.001*
Day 22	25	0.78	0.15	0.03			
Day 1	25	0.90	0.10	0.02	0.275	-4.301	<0.001*
Day 30	25	0.62	0.13	0.03			
Day 8	25	0.87	0.10	0.02	0.011	-1.590	0.112
Day 15	25	0.86	0.11	0.02			
Day 8	25	0.87	0.10	0.02	0.092	-3.303	0.001*
Day 22	25	0.78	0.15	0.03			
Day 8	25	0.87	0.10	0.02	0.248	-4.301	<0.001*
Day 30	25	0.62	0.13	0.03			
Day 15	25	0.86	0.11	0.02	0.080	-2.937	0.003*
Day 22	25	0.78	0.15	0.03			
Day 15	25	0.86	0.11	0.02	0.236	-4.210	<0.001*
Day 30	25	0.62	0.13	0.03			
Day 22	25	0.78	0.15	0.03	0.156	-3.729	<0.001*
Day 30	25	0.62	0.13	0.03			

*Denotes a significant difference

Comparison of ppm (parts per million) CO at different time intervals within non-smokers: (Wilcoxon signed rank test) Table 2.

The reduction in mean ppm CO was found to be statistically significant from first day to 22nd day ($P < 0.01$), first day to 30th day ($P < 0.001$), eighth day to 22nd day ($P < 0.01$), eighth day to 30th day ($P < 0.001$), fifteenth day to 22nd day ($P < 0.01$), fifteenth day to 30th day ($P < 0.001$) as well as 22nd day to 30th day ($P < 0.05$). The reduction in mean ppm CO was not statistically significant from the first day to the eighth day, the first day to the 15th day as well as the eighth day to the 15th day ($P \geq 0.05$).

Comparison of %CoHb at different time intervals within smokers: (Wilcoxon signed rank test) Table 3.

The reduction in mean %CoHb in smokers was found to be statistically significant from first day to eighth day, first day to 15th day, first day to 22nd day, first day to 30th day, eighth day to 15th day, eighth day to 22nd day, eighth day to 30th day, 15th day to 22nd day, 15th day to 30th day as well as from 22nd day to 30th day ($P < 0.001$).

Comparison of ppm CO at different time intervals within Smokers: (Wilcoxon signed rank test) Table 4.

The reduction in mean ppm CO in smokers was found to be statistically significant from first day to eighth day, first day to 25th day, first day to 22nd day, first day to 30th day, eighth day to 15th day, eighth day to 22nd day, eighth day to 30th day, 15th day to 22nd day, 15th day to 30th day as well as from 22nd day to 30th day ($P < 0.001$).

Mean %CoHb according to the smoking habit. Graph 1

The mean %CoHb in non-smokers was 0.8 on the first day and 0.6 on the last day. The mean %CoHb in smokers was 2.4 on the first day and 2 on the last day.

Mean ppm CO according to Smoking habit. Graph 2.

The mean CO level in non-smokers was 2 ppm on the first day and 1 ppm on the last day. The mean CO level in

Table 2: Comparison of ppm CO at different time intervals within non-smokers: (Wilcoxon signed rank test)

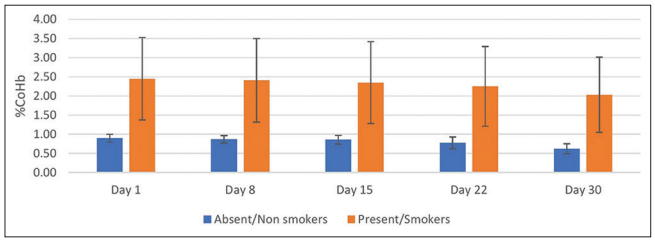
Day	*n*	Mean	Std. Dev	SE of mean	Mean difference	*Z*	*P*
Day 1	25	1.72	0.68	0.14	0.080	-1.414	0.157
Day 8	25	1.64	0.57	0.11			
Day 1	25	1.72	0.68	0.14	0.160	-2.000	0.050
Day 15	25	1.56	0.58	0.12			
Day 1	25	1.72	0.68	0.14	0.440	-3.317	0.001*
Day 22	25	1.28	0.46	0.09			
Day 1	25	1.72	0.68	0.14	0.680	-3.690	<0.001*
Day 30	25	1.04	0.20	0.04			
Day 8	25	1.64	0.57	0.11	0.080	-1.414	0.157
Day 15	25	1.56	0.58	0.12			
Day 8	25	1.64	0.57	0.11	0.360	-3.000	0.003*
Day 22	25	1.28	0.46	0.09			
Day 8	25	1.64	0.57	0.11	0.600	-3.873	<0.001*
Day 30	25	1.04	0.20	0.04			
Day 15	25	1.56	0.58	0.12	0.280	-2.646	0.008*
Day 22	25	1.28	0.46	0.09			
Day 15	25	1.56	0.58	0.12	0.520	-3.606	<0.001*
Day 30	25	1.04	0.20	0.04			
Day 22	25	1.28	0.46	0.09	0.240	-2.449	0.014*
Day 30	25	1.04	0.20	0.04			

*Denotes significant difference

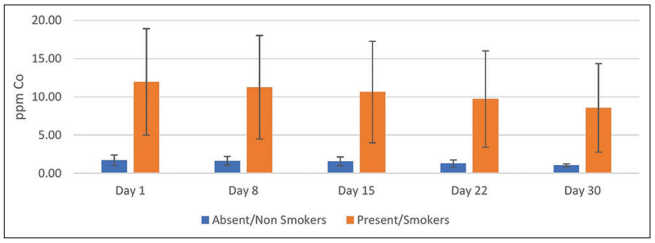
Table 3: Comparison of %CoHb at different time intervals within Smokers: (Wilcoxon signed rank test)

Day	*n*	Mean	Std. Dev	SE of mean	Mean difference	*Z*	*P*
Day 1	76	2.45	1.08	0.12	0.040	-4.951	<0.001*
Day 8	76	2.41	1.09	0.13			
Day 1	76	2.45	1.08	0.12	0.102	-6.145	<0.001*
Day 15	76	2.35	1.07	0.12			
Day 1	76	2.45	1.08	0.12	0.198	-6.234	<0.001*
Day 22	76	2.25	1.04	0.12			
Day 1	76	2.45	1.08	0.12	0.419	-6.980	<0.001*
Day 30	76	2.03	0.98	0.11			
Day 8	76	2.41	1.09	0.13	0.062	-4.691	<0.001*
Day 15	76	2.35	1.07	0.12			
Day 8	76	2.41	1.09	0.13	0.158	-6.282	<0.001*
Day 22	76	2.25	1.04	0.12			
Day 8	76	2.41	1.09	0.13	0.379	-7.170	<0.001*
Day 30	76	2.03	0.98	0.11			
Day 15	76	2.35	1.07	0.12	0.096	-5.892	<0.001*
Day 22	76	2.25	1.04	0.12			
Day 15	76	2.35	1.07	0.12	0.317	-7.063	<0.001*
Day 30	76	2.03	0.98	0.11			
Day 22	76	2.25	1.04	0.12	0.221	-7.172	<0.001*
Day 30	76	2.03	0.98	0.11			

*Denotes a significant difference



Graph 1: Mean %CoHb according to Smoking habit



Graph 2: Mean ppm CO according to Smoking habit

Table 4: Comparison of ppm CO at different time intervals within smokers: (Wilcoxon signed rank test)

Day	*n*	Mean	Std. Dev	SE of mean	Mean difference	*Z*	*P*
Day 1	76	11.95	6.97	0.80	0.697	-6.321	<0.001*
Day 8	76	11.25	6.78	0.78			
Day 1	76	11.95	6.97	0.80	1.316	-7.094	<0.001*
Day 15	76	10.63	6.64	0.76			
Day 1	76	11.95	6.97	0.80	2.237	-7.452	<0.001*
Day 22	76	9.71	6.30	0.72			
Day 1	76	11.95	6.97	0.80	3.395	-7.509	<0.001*
Day 30	76	8.55	5.80	0.67			
Day 8	76	11.25	6.78	0.78	0.618	-5.429	<0.001*
Day 15	76	10.63	6.64	0.76			
Day 8	76	11.25	6.78	0.78	1.539	-7.199	<0.001*
Day 22	76	9.71	6.30	0.72			
Day 8	76	11.25	6.78	0.78	2.697	-7.367	<0.001*
Day 30	76	8.55	5.80	0.67			
Day 15	76	10.63	6.64	0.76	0.921	-6.678	<0.001*
Day 22	76	9.71	6.30	0.72			
Day 15	76	10.63	6.64	0.76	2.079	-7.286	<0.001*
Day 30	76	8.55	5.80	0.67			
Day 22	76	9.71	6.30	0.72	1.158	-7.042	<0.001*
Day 30	76	8.55	5.80	0.67			

*Denotes a significant difference

smokers was 12 ppm on the first day and 9 ppm on the last day.

DISCUSSION

Turmeric (*Curcuma longa* L.) rhizome contains curcumin (diferuloylmethane), an orange-yellow secondary metabolic product.[10-15] Evidence showing that it targets several signaling molecules and also displays cellular activity supports the claims that it has a variety of health benefits.[16-20] Curcumin's counteracting inflammation, antioxidant, and antiangiogenic attributes make it potentially useful in the cure and prevention of cancer.[21-25] Its beneficial effects are achieved via modulating signaling molecules such as cytokines, chemokines, transcription factors, adhesion molecules, microRNAs, tumor, and suppressor genes.[26-30] Inflammatory disorders, metabolic syndrome, pain, and degenerative eye conditions have responded favourably to its use.[31-36] A meta-analysis of 10 trials with 5,870 individuals, conducted by Naghsh, Musazadeh *et al*.[37] in 2023, showed a substantial reduction in C-reactive protein (CRP), interleukin 6 (IL-6), and tumour necrosis factor (TNF) levels after curcumin administration. Trials with a sample size >300 people and a mean age >45 years old had a stronger impact on CRP and TNF-α. Curcumin is a promising drug for lowering inflammation as an adjuvant therapy approach in disorders whose pathophysiology is connected to a higher level of inflammatory biomarkers, according to the meta-analysis overview. Piyush, Mahajan, *et al*.'s (2019)[38] randomised placebo-controlled parallel clinical trial included 90 OSMF patients who were split into three therapy groups. For a period of 6 months, 30 patients in Group A received curcumin tablets (300 mg) twice daily, 30 patients in Group B were given lycopene capsules (8 mg) twice daily, and 30 patients in Group C received placebo capsules once daily. When compared to placebo, clinical results for the curcumin and lycopene therapy groups both improved statistically. The effects of curcumin and products derived from turmeric on various cancers, including chronic myeloid leukaemia, multiple myeloma, prostate, colorectal, and pancreatic cancers, as well as cancer therapy-related complications, such as oral mucositis and radiation dermatitis, were examined by Karaboga Arslan *et al*.[39] in their analysis of the literature from finalised clinical trials (2010–2020). Curcumin has the ability to prevent and treat cancer, according to newly released evidence from clinical trials. A 6-year retrospective observational cohort analysis was carried out by Shie *et al*. (2017)[40] on smokers who took part in an intervention programme. On days 1, 8, 15, and 22 of the intervention programme, successive measurements of the exhaled CO were taken. The primary outcome variable was whether or not a participant was still smoking after a year. A total of 162 people were signed up, of whom 52 successfully quit and 110 unsuccessfully. They found that the intention to stop smoking, the usage of varenicline, and the level of CO in exhaled breath on day 8, all independently predicted quitting smoking for one year. Vasthare *et al*.[41] conducted a literature analysis to investigate the validity of CO breath monitors in determining smokers and their contribution to tobacco use remission initiatives. For the purpose of gathering information for the review, a web-based search of PubMed and Scopus from their establishment to 2016 was conducted. In total, 118 articles were found using the databases; 66 of them were chosen to provide an update on the sought-after information. They came to the conclusion that there is sufficient evidence to demonstrate the CO analyser's comparatively high sensitivity and specificity in differentiating between smokers and non-smokers. Our study on Haras therapy in smokers showed a significant decline in CO levels of smokers, thus enhancing their lung efficiency.

CONCLUSION

To conclude Haras can be used effectively as an alternative supportive treatment for the reduction of CO levels in smokers and non-smokers. CO analysers should be considered as an invaluable tool for identifying smokers and also should be used for tobacco cessation programmes.

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Conflicts of interest

There are no conflicts of interest.

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