

## Clinical Research

Physiological and biochemical changes with *Vamana* procedure

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### Abstract

*Vamana Karma* (therapeutic emesis) primarily a *Samshodhana Karma* (purification procedure) is one of the five *Pradhana Karmas* (chief procedures) of *Panchakarma*. It is mentioned in Ayurvedic texts that a person after *Samyak Vamana* (proper *Vamana*) experiences lightness of the body, *Hrit* (precordium), *Kantha* (throat/voice), and *Shirah* (head) and weakness. This procedure is effectively used in healthy and ailing persons for purification of body and extraction of *Doshas* (especially *Kapha*) in Ayurvedic system. It has been found worth to observe the physiological and biochemical changes during *Vamana* and after the procedure to understand the effect/safety margins of the procedure in healthy volunteers.

**Key words:** Biochemical changes, *Doshas*, *Hrit*, *Kantha*, *Panchakarma*, physiological changes, *Samshodhana Karma*, *Shira*, *Vamana*, *Virechana*

### Introduction

*Vamana* and *Virecana* are mainly used for extraction of vitiated *Doshas* from the body.<sup>[1]</sup> If the *Vamana* procedure is adopted properly, lightness of the body, clarity of precordium (*Hridaya*), throat (*Kantha*) and head (*Shirah*), happiness and weakness are the usual symptoms following *Samyak Shuddhi* (proper purification).<sup>[2,3]</sup>

It is also mentioned that the person undergoing *Vamana* never develops<sup>[4]</sup> *Kasa* (cough), *Malavridhi* in *Srotasas* (accumulation of waste in body channels), *Svarabheda* (hoarsness of voice), *Nidra* (sleepiness), *Tandra* (drowsiness), *Mukha Durgandhata* (bad smell in mouth), *Vishajanya Upadrava* (complications of poisoning), *Kapha Srava* (excessive salivation or toxemia), *Grahani* (malabsorption syndrome).

According to *Ashtanga Hridaya*, *Samyak Shodhana* results into<sup>[5]</sup> clarity of *Buddhi* (thought), strength of *Indriyas* (sense organs), stability of *Dhatu*s (body tissues), improvement of *Agni* (appetite and digestive capacity), delay of ageing.

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Considering these benefits, it is attempted to understand the physiological changes in apparently healthy volunteers during and after *Vamana* in terms of changes in blood pressure (BP), pulse, body temperature, respiration rate, appetite, bowel habit, heaviness of abdomen, sleep pattern and intestinal flora and the changes in biochemistry and immunological status of the body (if any). This study also evaluate the safety aspects of the procedure.

### Materials and Methods

The present study is carried out at Ayurveda Central Research Institute, Delhi in collaboration with Department of Physiology, All India Institute of Medical Sciences (AIIMS) on 30 apparently healthy volunteers between the age group of 18 to 60 years.

#### Exclusion criteria

- Patients of hypertension, diabetes, renal diseases, peptic ulcer, jaundice, acute infections, dehydration and any other chronic disease which is not suitable for *Vamana Karma* as detected by clinical history/investigations.
- Age group: Lesser than 18 and above 60 years.
- Patients with lactose intolerance.
- Pregnant/lactating women.

#### Procedure adopted

Volunteer's written consent in Hindi was taken and information

about the study was provided in information sheets on the day of registration. Physical examination along with physiological parameters were assessed before, during and after *Vamana*. Routine blood examinations like Total Leukocyte Count, Differential Leukocyte Count, Hemoglobin%, Blood Sugar, Kidney Function Tests, Liver Function Tests, etc. were done so as to exclude any underlying disease in the volunteers. The procedure of *Vamana* is as per the standard protocol prescribed in classics and adopted in earlier works.<sup>[6]</sup>

## Observations

### Changes in blood pressure

A rise in systolic BP has been observed in the volunteers during the procedure of *Vamana*. However, after completion of the procedure, systolic BP became normal. The systolic BP during *Vamana* ranged from 100 to 170 mmHg [Figure 1a]. A rise in diastolic BP has been observed during the procedure of *Vamana*. However, after completion of the procedure, diastolic BP became normal. The diastolic BP during *Vamana* ranged from 70 to 100 mmHg. The rise in systolic BP was more marked as compared to the rise in diastolic BP during *Vamana* procedure [Table 1, Figure 1b].

### Changes in pulse rate

It has been observed that the pulse rate increased during the *Vamana* procedure and was normal after the procedure. The pulse rate ranges from 65 to 106/min during the *Vamana* procedure [Table 2, Figure 2].

**Table 1: Change in blood pressure**

Measured	Minimum	Maximum	Mean
Systolic BP in mmHg			
Before <i>Vamana</i>	90	140	112.06
During <i>Vamana</i>	100	170	125.47
Just after <i>Vamana</i>	90	160	117.07
Diastolic BP in mmHg			
Before <i>Vamana</i>	60	90	76.77
During <i>Vamana</i>	70	100	85.07
Just after <i>Vamana</i>	60	94	76.80

BP: Blood pressure

**Table 2: Change in pulse rate**

Pulse rate per min	Range		Mean
	Minimum	Maximum	
Before <i>Vamana</i>	62	100	74.06
During <i>Vamana</i>	65	106	81.16
Just after <i>Vamana</i>	62	98	74.83

**Table 3: Change in body temperature**

Body temperature (°F)	Range		Mean
	Minimum	Maximum	
Before <i>Vamana</i>	97.0	99.0	98.08
During <i>Vamana</i>	98.0	99.0	98.50
Just after <i>Vamana</i>	97.0	98.6	98.13

### Changes in body temperature

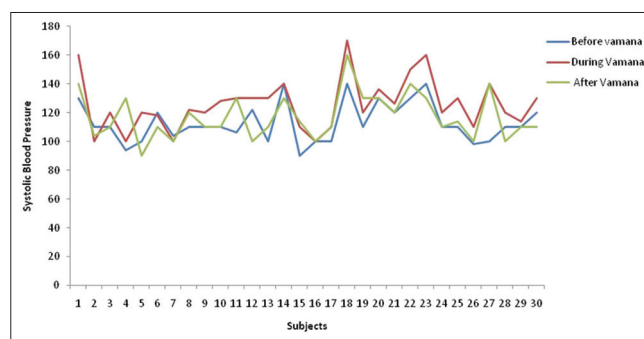
A mild rise in temperature was noticed during the *Vamana* procedure and was normal after the procedure. The temperature ranged from 98° to 99°F during the procedure [Table 3, Figure 3].

### Changes in respiration rate

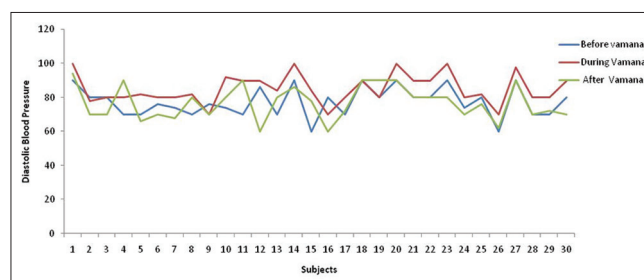
A mild rise in respiration rate was noticed during the *Vamana* procedure and was normal after the procedure. The respiration rate ranged from 16 to 26 per min during the procedure [Table 4, Figure 4].

### Effect of *Vamana* on appetite

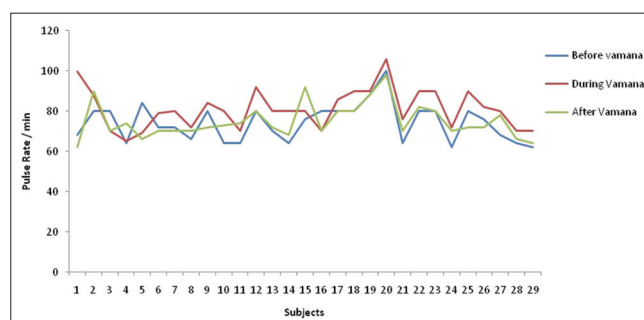
There was an improvement in appetite of the volunteers after *Vamana*. Before *Vamana* only 40% volunteers showed good appetite while after *Vamana* 73.3% of the volunteers showed good appetite. The volunteers with poor or irregular appetite reported improvement in their appetite. The improvement in appetite was significant [Table 5].



**Figure 1a:**The levels of systolic blood pressure before *Vamana*, during *Vamana* and after *Vamana*



**Figure 1b:**The level of diastolic blood pressure at before, during and after *Vamana*



**Figure 2:**The levels of pulse rate before *Vamana*, during *Vamana* and after *Vamana*

### Effect of *Vamana* on bowel habits

There was a marked improvement in the bowel habit of the volunteers after *Vamana*. Only 50% were having regular bowel habit with normal consistency before *Vamana*, but after *Vamana* 76.7% showed regular bowel habits with normal consistency. Volunteers with hard, loose consistency stool and irregular timings of bowel evacuation showed improvement in their symptoms. There was significant improvement in bowel habit [Table 6].

### Effect of *Vamana* on heaviness in abdomen after food

There was significant reduction in complaint of heaviness of abdomen after *Vamana*. Before *Vamana* 53.3% of the volunteers complained of heaviness of abdomen after food but after *Vamana* only 20% of the volunteers were having this complaint and rest of the 80% volunteers had no symptom of heaviness of abdomen [Table 7].

### Effect of *Vamana* on sleep pattern

There was a mild improvement in duration of sleep in volunteers after *Vamana*, however, the gross sleep pattern among most of the volunteers remained unchanged [Table 8].

### Effect of *Vamana* on intestinal flora

- (a) Pus cells count of intestinal flora before *Vamana* and 15 days after *Vamana*: The pus cells in stool of healthy volunteers before *Vamana* were within normal range. There was no change after 15 days of *Vamana* [Table 9a].
- (b) Bacteroids count of intestinal flora before *Vamana* and 15 days after *Vamana*: In two volunteers, the bacteroids were present in stools before *Vamana* ( $10^7$  and  $10^8$ ) which were absent after 15 days of *Vamana*. The changes were statistically insignificant [Table 9b].

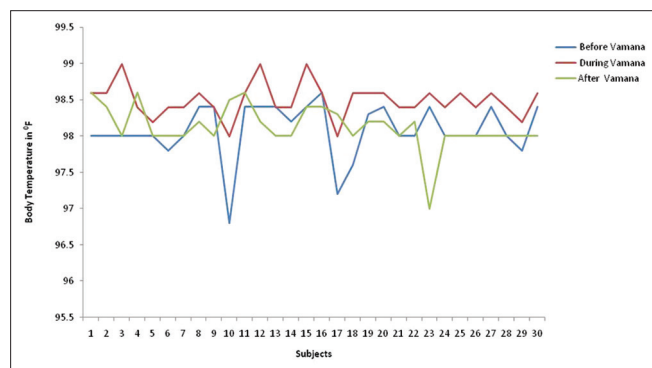


Figure 3: The levels of body temperature before *Vamana*, during *Vamana* and after *Vamana*

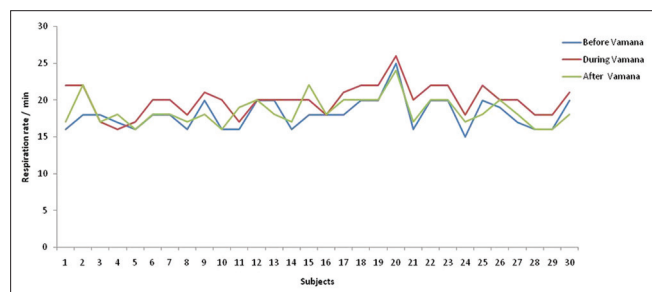


Figure 4: The levels of respiration rate before *Vamana*, during *Vamana* and after *Vamana*

- (c) *E. coli* count of intestinal flora before *Vamana* and 15 days after *Vamana*: The concentration of *E. coli* before *Vamana* ranged from 0 to  $10^{11}$  in healthy volunteers. After *Vamana* a mild shift in count was noticed as the *E. coli* count

Table 4: Change in respiration rate

Respiration rate per min	Range		Mean
	Minimum	Maximum	
Before <i>Vamana</i>	15	25	18.10
During <i>Vamana</i>	16	26	20.00
Just after <i>Vamana</i>	16	24	18.50

Table 5: Effect of *Vamana* on appetite

Appetite	Before <i>Vamana</i>		After 15 days of <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
Poor	4	13.3	1	3.3
Normal	13	43.4	7	23.4
Good	12	40.0	22	73.3
Irregular	1	3.3	-	-
Total	30	100.0	30	100.0

Table 6: Effect of *vamana* on bowel habits

Bowel habits	Before <i>Vamana</i>		After 15 days of <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
Regular-Normal	15	50.0	23	76.7
Regular hard	8	26.7	2	6.7
Irregular hard	2	6.7	1	3.3
Loose	5	16.6	4	13.3
Total	30	100.0	30	100.0

Table 7: Effect of *Vamana* on heaviness in abdomen after food

Heaviness in abdomen after food	Before <i>Vamana</i>		After 15 days of <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
Absent	14	46.7	24	80.0
Present	16	53.3	6	20.0
Total	30	100.0	30	100.0

Table 8: Effect of *Vamana* on sleep pattern

Sleep pattern	Before <i>Vamana</i>		After 15 days of <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
<6 h	5	17.3	4	13.3
6-8 h	15	51.7	16	53.3
>8 h	9	31.0	10	33.4
Total	29	100.0	30	100.0

decreased, though it remained within the normal limits. The changes were statistically insignificant [Table 9c].

### Effect of *Vamana* on hematological parameters

- (a) Hematology before *Vamana* and after 5 min of *Vamana*: Erythrocyte Sedimentation Rate (ESR) decreased significantly after 5 min of *Vamana*. Total Leukocyte Count (TLC) increased significantly after 5 min of *Vamana* [Table 10a].
- (b) Hematology before *Vamana* and after 15 days of *Vamana*: The hematological parameters were again assessed after 15 days of *Vamana* and the values were compared with the parameters assessed before *Vamana*. A significant decrease was observed in ESR after 15 days of *Vamana* [Table 10b].

### Effect of *Vamana* on lipid profile

- (a) Changes in lipid profile before *Vamana* and after 5 min of *Vamana*: Lipid profile was assessed at the day of registration (before *Snehana* and *Svedana*). The values were compared with the results of lipid profile obtained after 5 min of *Vamana*. Significant increase in High

Density Lipoproteins (HDL) and significant decrease in Low Density Lipoproteins (LDL) was observed. Total cholesterol was noticed after 5 min of *Vamana*, though the decrease was statistically insignificant [Table 11a].

- (b) Lipid profile before *Vamana* and after 15 days of *Vamana*: Lipid profile was assessed at the day of registration. The values were compared with the results of lipid profile obtained after 15 days of *Vamana*. It was observed that, HDL, Very Low Density Lipoproteins (VLDL), and serum triglycerides insignificantly increased. Statistically insignificant decrease in LDL and total cholesterol was noticed after 15 days of *Vamana* [Table 11b].

### Effect of *Vamana* on electrolytes

- (a) Serum electrolytes before *Vamana* and after 5 min of *Vamana*: There was statistically insignificant fall in serum sodium and serum potassium levels after 5 min of *Vamana*. All the values of serum electrolytes before and after *Vamana* were within the normal range [Table 12a]. As *Upadrava*, only one volunteer developed *Bhrama* (giddiness) and there was a fall in serum electrolyte level just after *Vamana*, and he was managed with Oral Rehydration Solution (ORS).
- (b) Serum electrolytes before *Vamana* and after 15 days of *Vamana*: Serum sodium and serum potassium level were assessed at the day of registration and after 15 days of *Vamana*. The values were compared and it was observed that there was statistically insignificant fall in serum sodium and serum potassium levels. All the values of serum electrolytes before and after *Vamana* were within the normal range [Table 12b].

### Effect of *Vamana* on Liver Functional Test (LFT) and Renal Functional Test (RFT)

- (a) Liver Functional Test (LFT) and Renal Functional Test (RFT) before *Vamana* and after 5 min of *Vamana*: LFT and RFT were assessed before *Vamana* and after 5 min of *Vamana*. It was observed that Blood Urea Level (BUL) decreased significantly. Total serum protein and serum creatinine decreased insignificantly. Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvic Transaminase (SGPT) were found to be increased significantly though all the values were within normal range. Serum bilirubin increased insignificantly [Table 13a].
- (b) LFT and RFT before *Vamana* and after 15 days of *Vamana*: LFT and RFT were assessed before *Vamana* and after 15 days of *Vamana*. It was observed that BUL, total serum protein and serum creatinine decreased insignificantly. SGPT, serum bilirubin were found to increase insignificantly. SGOT was found to increase significantly though all the values of above parameters were within the normal range [Table 13b].

### Effect of *Vamana* on immunological status

- (a) Immunological status before *Vamana* and after 5 min of *Vamana*: Biochemical investigations were performed before *Vamana* and after 5 min of *Vamana*. It was observed that plasma histamine and plasma adrenaline decreased insignificantly. Plasma dopamine and plasma nor-adrenaline increased after 5 min of *Vamana* insignificantly [Table 14a].
- (b) Immunological status before *Vamana* and after 15 days of *Vamana*

**Table 9a: Effect of *Vamana* on intestinal flora (pus cell count)**

Pus cells	Before <i>Vamana</i>		15 days after <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
0 to occasional	15	50.0	15	50.0
1-2/hpf	15	50.0	15	50.0
Total	30	100.0	30	100.0

**Table 9b: Effect of *Vamana* on intestinal flora (bacteroids)**

Bacteroids	Before <i>Vamana</i>		15 days after <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
Absent	28	93.3	30	100.0
10 <sup>7</sup>	1	3.3	0	0.0
10 <sup>8</sup>	1	3.3	0	0.0
Total	30	100.0	30	100.0

**Table 9c: Effect of *Vamana* on intestinal flora (*E. coli*)**

<i>E. coli</i>	Before <i>Vamana</i>		15 days after <i>Vamana</i>	
	No. of subjects	Percentage	No. of subjects	Percentage
Absent	1	3.3	1	3.3
10 <sup>4</sup>	1	3.3	3	10.0
10 <sup>5</sup>	6	20.0	10	33.3
10 <sup>6</sup>	6	20.0	9	30.0
10 <sup>7</sup>	6	20.0	2	6.7
10 <sup>8</sup>	3	10.0	2	6.7
10 <sup>9</sup>	3	10.0	0	0.0
10 <sup>10</sup>	1	3.3	3	10.0
10 <sup>11</sup>	3	10.0	0	0.0
Total	30	100.0	30	100.0

**Table 10a: Effect of *Vamana* on hematological parameters (after 5 min)**

Hematological parameters (%)	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
TLC ( $10^3/\mu\text{L}$ )	6320.00	7086.67	1853.112	2.266	<0.05	Significant increase
Neutrophils	61.27	59.49	12.916	0.755	>0.05	Insignificant decrease
Eosinophils	3.60	3.33	3.912	0.373	>0.05	Insignificant decrease
Monocytes	2.10	2.40	1.932	0.850	>0.05	Insignificant increase
Lymphocytes	32.00	32.97	9.611	0.551	>0.05	Insignificant increase
ESR (mm/hr)	26.62	23.33	6.726	2.674	<0.05	Insignificant decrease
Hb (g/dl)	13.38	13.11	1.519	0.997	>0.05	Insignificant decrease
Absolute eosinophils (count/ $\text{mm}^3$ )	199.39	172.01	186.74	0.773	>0.05	Insignificant decrease

TLC: Total Leukocyte Count; ESR: Erythrocyte Sedimentation Rate; Hb: Hemoglobin

**Table 10b: Effect of *Vamana* on hematological parameters (after 15 days)**

Hematological parameters (%)	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 15 days of <i>Vamana</i>				
TLC ( $10^3/\mu\text{L}$ )	6320.00	6500.00	1064.927	0.926	>0.05	Insignificant increase
Neutrophils	61.27	60.70	7.030	0.441	>0.05	Insignificant decrease
Eosinophils	3.60	3.37	4.546	0.281	>0.05	Insignificant decrease
Monocytes	2.10	2.63	2.047	1.427	>0.05	Insignificant increase
Lymphocytes	32.00	32.57	11.655	0.266	>0.05	Insignificant increase
ESR (mm/hr)	26.62	21.40	10.258	2.785	<0.05	Insignificant decrease
Hb (g/dl)	13.383	13.317	.9223	0.396	>0.05	Insignificant decrease
Absolute eosinophils (count/ $\text{mm}^3$ )	192.51	215.82	192.93	0.651	>0.05	Insignificant increase
RBC count	4.7013	4.7900	.59115	0.822	>0.05	Insignificant increase
Platelets count	212.73	225.40	43.969	1.578	>0.05	Insignificant increase

TLC: Total leukocyte count; ESR: Erythrocyte sedimentation rate; Hb: Hemoglobin; RBC: Red blood corpuscles

**Table 11a: Effect of *Vamana* on lipid profile (after 5 min)**

Lipid profile parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
LDL (mg/dl)	101.92	100.60	22.711	0.318	>0.05	Insignificant decrease
HDL (mg/dl)	39.50	42.30	7.227	2.122	<0.05	Significant increase
VLDL (mg/dl)	31.00	31.47	10.749	0.238	>0.05	Insignificant increase
Total cholesterol (mg/dl)	172.43	169.51	34.449	0.465	>0.05	Insignificant decrease
Serum triglycerides (mg/dl)	155.03	157.37	53.747	0.238	>0.05	Insignificant increase

LDL: Low density lipoproteins; HDL: High density lipoproteins; VLDL: Very low density lipoprotein

**Table 11b: Effect of *Vamana* on lipid profile (after 15 days)**

Lipid profile parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
LDL (mg/dl)	101.927	95.56	23.723	1.470	>0.05	Insignificant decrease
HDL (mg/dl)	39.50	40.97	07.860	1.022	>0.05	Insignificant increase
VLDL (mg/dl)	31.00	32.97	14.315	0.752	>0.05	Insignificant increase
Total cholesterol (mg/dl)	172.43	168.33	22.727	0.988	>0.05	Insignificant decrease
Serum triglycerides (mg/dl)	155.03	159.87	60.735	0.436	>0.05	Insignificant increase

LDL: Low density lipoproteins; HDL: High density lipoproteins; VLDL: Very low density lipoprotein

: Biochemical investigations were performed before *Vamana* and after 15 days of *Vamana*. It was observed

that plasma histamine and plasma adrenaline decreased insignificantly. Plasma dopamine and plasma



**Table 12a: Effect of *Vamana* on serum electrolytes (after 5 min) (n=25)**

Serum electrolytes	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
Serum sodium (mmol/L)	142.68	142.28	4.444	0.450	>0.05	Insignificant decrease
Serum potassium (mmol/L)	4.496	4.352	0.4519	1.593	>0.05	Insignificant decrease

**Table 12b: Effect of *Vamana* on serum electrolytes (after 15 days) (n=25)**

Electrolytes	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 15 days of <i>Vamana</i>				
Serum sodium (mmol/L)	142.68	141.48	3.969	1.512	>0.05	Insignificant decrease
Serum potassium (mmol/L)	4.496	4.472	0.4539	0.264	>0.05	Insignificant decrease

**Table 13a: Effect of *Vamana* on liver function test and renal function test (after 5 min)**

Parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
Total serum protein (g/dl)	7.383	7.137	1.0559	1.279	>0.05	Insignificant decrease
Serum bilirubin (mg/dl)	0.826	0.837	0.2939	0.205	>0.05	Insignificant increase
SGOT (U/L)	20.93	23.23	5.140	2.451	<0.05	Significant increase
SGPT (U/L)	22.40	25.53	7.816	2.196	<0.05	Significant increase
BUL (mg/dl)	23.580	22.040	3.7120	2.272	<0.05	Significant decrease
Serum creatinine (mg/dl)	0.957	0.907	0.1676	1.634	>0.05	Insignificant decrease

SGOT: Serum glutamic oxaloacetic transaminase; SGPT: Serum glutamic pyruvic transaminase; BUL: Blood urea level

**Table 13b: Effect of *Vamana* on liver function test and renal function test (after 15 days)**

Parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 15 days of <i>Vamana</i>				
Total serum protein (g/dl)	7.383	7.350	1.1336	0.161	>0.05	Insignificant decrease
Serum bilirubin (mg/dl)	0.826	0.923	0.3171	1.670	>0.05	Insignificant increase
SGOT (U/L)	20.93	23.70	5.935	2.553	<0.05	Significant increase
SGPT (U/L)	22.40	24.47	7.611	1.487	>0.05	Insignificant increase
BUL (mg/dl)	23.58	22.43	5.9678	1.055	>0.05	Insignificant decrease
Serum creatinine (mg/dl)	0.957	0.940	.2627	0.347	>0.05	Insignificant decrease

SGOT: Serum glutamic oxaloacetic transaminase; SGPT: Serum glutamic pyruvic transaminase; BUL: Blood urea level

nor-adrenaline increased after 15 days of *Vamana* insignificantly [Table 14b].

### Effect of *Vamana* on IgE

There was insignificant increase in Immunoglobulin E (IgE) level when compared before *Vamana* with just after 5min *Vamana* and 15 days after *Vamana* [Table 15].

## DISCUSSION

*Panchakarma* procedures are also recommended in healthy individuals in Ayurvedic classics. It is important to understand the physiological, biochemical and immunological changes in the healthy volunteers. The present study was carried out on 30 apparently healthy volunteers, between the age group of 18 and 60 years to observe the changes during and after *Vamana* procedure.

Volunteers with lactose intolerance were excluded as milk was used in this study. Pregnant and lactating mothers were also excluded from the study because of physiological variations and specified Do's and Don'ts for them.

The physiological parameters were assessed before, during and after *Vamana*. Rise in systolic and diastolic BP, pulse rate, temperature and respiration rate were noticed during the *Vamana* procedure which may be attributed to the sympathetic system involvement caused by physiological stress.

There was an improvement in appetite (*Agni*) of the volunteers after *Vamana*. Volunteers with poor or irregular appetite showed improvement. Volunteers with hard, loose consistency of stool and irregular timings of bowel evacuation showed improvement in symptoms. Maximum volunteers developed

**Table 14a: Effect of *Vamana* on Immunological status (after 5 min)**

Parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 5 min of <i>Vamana</i>				
Plasma histamine (ng/ml)	3.04	2.927	0.7873	0.788	>0.05	Insignificant decrease
Plasma dopamine (ng/ml)	14.703	14.807	1.1291	0.501	>0.05	Insignificant increase
Plasma adrenaline (ng/ml)	32.30	30.53	10.695	0.905	>0.05	Insignificant decrease
Plasma nor-adrenaline (ng/ml)	206.47	216.83	34.232	1.659	>0.05	Insignificant increase

**Table 14b: Effect of *Vamana* on immunological status (after 15 days)**

Parameters	Mean		Standard deviation of difference	t value	P value	Statistical significance
	Before <i>Vamana</i>	After 15 days of <i>Vamana</i>				
Plasma histamine (ng/ml)	3.04	2.87	0.8813	1.057	>0.05	Insignificant decrease
Plasma dopamine (ng/ml)	14.703	15.027	0.9369	1.890	>0.05	Insignificant increase
Plasma adrenaline (ng/ml)	32.30	31.93	7.476	0.269	>0.05	Insignificant decrease
Plasma nor-adrenaline (ng/ml)	206.47		44.481	1.773	>0.05	Insignificant increase

**Table 15: Effect of *Vamana* on IgE**

Parameter	Assessment stage	Mean	Standard deviation of difference	t value	P value	Statistical significance
IgE (IU/ml)	Before <i>Vamana</i>	77.17	-	-	-	
	Just after 5 min of <i>Vamana</i>	77.60	31.620	0.075	>0.05	Insignificant increase
	After 15 days of <i>Vamana</i>	73.90	23.165	0.772	>0.05	Insignificant decrease

regular bowel habit with normal consistency of stool after *Vamana*. Improvement in heaviness of abdomen after *Vamana* was also observed. This may be due to *Shodhana* of *Kapha* and *Pitta* and improvement of *Agni*. As the obstruction caused by *Kapha* and *Pitta* were reduced, *Vata* in *Pakvashaya* was also regularized resulting in regularized bowel habits. There was an improvement in duration of sleep in volunteers after *Vamana*.

The intestinal flora was studied before *Vamana* and 15 days after *Vamana*. The pus cells (0-2/hpf) and *E. coli* ( $10^4$ - $10^{11}$ ) were within the normal range before *Vamana* and 15 days after *Vamana*. In few volunteers, the bacteroids ( $10^7$ - $10^8$ ) were present before *Vamana* and were absent after 15 days of *Vamana*. This indicates that the *Vamana* is a cleansing procedure which does not disturb intestinal flora as such.

ESR decreased significantly after 5 min, as well as, after 15 days of *Vamana*. TLC increased significantly after 5 min of *Vamana*. There was a fall in plasma electrolyte, BUL and serum creatinine levels but, all values are within physiological limits.

Significant fall in plasma adrenaline, plasma histamine and insignificant increase in plasma dopamine and plasma nor-adrenaline was observed in the volunteers after *Vamana*.

## Conclusion

Thus, it can be concluded that, *Vamana* is a safe *Panchakarma* procedure if undertaken methodically. It is a cleansing process that improves appetite, regulates bowel habits and improves

sleep pattern. It decreases LDL and serum cholesterol level as a part of its *Kapha-Hara* action. Mild elevations in BP (systolic and diastolic), pulse, temperature and respiration during the *Vamana* procedure may be attributed to sympathetic stimulation. Thus its use in hypertensive subject may be avoided. It improves appetite and regularizes bowel habits. It also gives some relief to the feeling of heaviness of abdomen after taking food. It shows a mild cleansing action on intestinal flora, however, the bacteroids and *E. coli* remain within normal limits after *Vamana*.

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## हिन्दी सारांश

### वमन प्रक्रिया में शरीर क्रियात्मक एवं जैव-रासायनिक परिवर्तन

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इस अध्ययन में पंचकर्म में 'वमन' प्रक्रिया के सभी वैज्ञानिक पहलुओं का अध्ययन करना ही उद्देश्य था। ऐसा माना जाता है कि वमन द्वारा विषैले पदार्थ शरीर से बाहर निकलते हैं जिससे शरीर की प्रतिरक्षा शक्ति की वृद्धि होती है। आयुर्वेदिक चिकित्सा द्वारा रोगी का संक्षिप्त इतिहास लेकर एवं उसके बल के अनुसार लाभ हानि ध्यान में रखते हुए प्रोटोकॉल के अनुसार उसे ३ से ७ दिन तक स्नेहपान व अगले दिन प्रातः अभ्यंग, स्वेदन, तत्पश्चात 'वमन' करवाया गया। ऐसा देखा गया कि वमन क्रिया के दौरान व्यक्ति की नाड़ी, तापमान तथा श्वास गति बढ़ जाती है जो क्रिया के बाद पुनः सामान्य हो जाती है। वमन क्रिया के पश्चात अग्नि की वृद्धि होती है तथा पाचन संबंधी क्रियाएं नियमित होती हैं। वमन के पाँच मिनट पश्चात इ.एस.आर. में कमी पायी गयी, तथा टी.एल.सी. थोड़ा बढ़ गया। वमन के १५ दिन पश्चात प्लाज्मा इलेक्ट्रोलाइट में कुछ कमी देखी गई जो कि सामान्य सीमा में थी। वमन के पश्चात प्लाज्मा एंटीनालिन तथा प्लाज्मा हिस्टामिन के स्तर में भी कुछ गिरावट आयी जो सामान्य सीमा में थी।