

Efficacy of *Vasantik Vaman Karma* (Therapeutic Emesis) on Oxidative Stress Markers in Healthy Volunteers- A Pilot Randomised Controlled Study

PRADNYA D DANDEKAR¹, VAISHALI KUCHEWAR²

ABSTRACT

Introduction: *Vamana karma* is a therapeutic emesis procedure recommended for maintaining health in healthy individuals. It is said to be conducted during the *Vasant rutu* (spring season) and is referred to as *Vasantik Vaman*. During this season, there is an aggravation of *Kapha dosha*, which can lead to various diseases. The bio-purification of the body in *Vasant rutu* through the *Vaman* procedure helps to detoxify and rejuvenate the body. To make this practice evidence-based, the present study was planned to evaluate the efficacy of *Vamana karma*, which is also considered a *shodhana karma*, in reducing oxidative stress.

Aim: To compare the efficacy of *Vasantik Vamana karma* on Malondialdehyde (MDA) and Superoxide Dismutase (SOD) levels as markers of oxidative stress in healthy volunteers, compared to a non interventional group.

Materials and Methods: The present randomised controlled study was conducted in the Department of Kriyasharir, Mahatma Gandhi Ayurved College, Hospital and Research Centre, under the auspices of Datta Meghe Institute of Higher Education University, Wardha, Maharashtra, India, from March 2023 to April 2023 during the *Vasant rutu*. A total of 58 healthy individuals aged between 20 years and 40 years were sensitised regarding the procedure and benefits of *Vasantik Vamana karma*. After sensitisation, 30 volunteers who provided written consent for participation in the study were enrolled, examined and randomly

divided into two groups: Group A (non interventional) and Group B (interventional). Both groups were assessed on the 0th day and the 15th day for oxidative stress markers, specifically free radicals (MDA) and antioxidant (SOD) levels. Statistical analysis was done using descriptive and inferential statistics, including Student's paired and unpaired t-tests.

Results: The mean±Standard Deviation (SD) age of participants was 21.23±0.37 years, with participation almost equal from both genders. Before the intervention, SOD and MDA levels were similar in both the control and interventional groups. After the intervention of *Vasantik Vamana karma*, Group B showed an increase in SOD levels and a decrease in MDA levels, which were statistically highly significant according to the paired t-test (p-value ≤0.001) in comparison to the non interventional group. In the non interventional group, p-value=0.951 for SOD levels and 0.551 for MDA levels by paired t-test, which were not significant. When both groups were compared using an unpaired test, at pre-intervention, both groups were at the same level, but after the intervention, statistically significant results were observed in Group B (p-value ≤0.001).

Conclusion: The present study concluded that *Vasantik Vamana karma*, as a bio-purification process, *Vasantik Vamana karma* has proven to be highly effective in detoxifying the body by reducing oxidative stress in healthy volunteers.

Keywords: Bio-purification process, Malondialdehyde, Shodhana karma, Superoxide dismutase

INTRODUCTION

Day by day, due to our changing lifestyles, the burden of non communicable diseases is increasing tremendously. In India, non communicable diseases contribute to around 5.87 million (60%) of all deaths, while globally, the rate is 38 million (68%). Cardiovascular diseases, respiratory diseases, cancers and diabetes mellitus, which fall under the category of lifestyle disorders, account for 82% of all these deaths [1]. This situation presents a significant challenge to control. The pathophysiology of these non communicable diseases reveals the need to modify our lifestyles and incorporate *dinacharya* (daily regimen) and *rutucharya* (seasonal regimen) as mentioned in Ayurveda for their prevention.

For all these non communicable diseases, the triggering factor is oxidative stress. Oxidative stress is defined as a state in which oxidation exceeds the antioxidant systems in the body due to the loss of balance between them [2]. This imbalance leads to tissue damage and ultimately causes diseases.

Ayurveda is the science of life as interpreted by Acharyas for human well being. Its primary objective is to maintain the health of healthy individuals and to cure the diseases of the sick [3].

To achieve this primary goal and maintain the health of healthy individuals, Acharyas have recommended *dinacharya*, *rutucharya*, *rasayan chikitsa*, and *shodhan karma* (body purification processes), including *vaman* in *vasant rutu*, *virechan* in *sharad rutu*, and *basti karma* in *varsha rutu* [4].

The ultimate aim of *shodhan karmas* is to purify the body, which means cleaning the body. The *swasthya* (health) of a person is defined as the balance of doshas in the body. Out of the six *rutus* mentioned in classical texts, during *hemant* and *shishir rutu*, there is an accumulation of *kapha dosha* due to our seasonal regimen. In *vasant rutu*, this accumulated *kapha dosha* gets converted into *Prakopawastha* (aggravation) at its own site [5]. Approximately, this season comes from mid-March to mid-May [6]. In the *Sushrut Samhita*, Acharya Sushrut has mentioned that when the roots of a tree are cut, the flowers, fruits and branches are also destroyed; in the same way, *kapha vyadhis* is destroyed by eliminating *kapha dosha* through *Vaman karma* [7].

The *vamanchikitsa* planned in *vasant rutu* is called *Vasantik Vaman*. During *vasant rutu*, due to the natural *prakopa* of *kapha dosha*, individuals may suffer from *agnimandya* (symptoms of *kapha vridhdhi*).

Agnimandya is the root cause of all diseases [8]. The treatment for *kapha vridhhi* requires either *deepan chikitsa* or *Shodhan chikitsa*, depending on the individual's constitution. *Vasantik Vaman chikitsa* is recommended for all to maintain their health by eliminating *kapha dosha* from the body.

There are many research publications that provide evidence for the free radical scavenging properties of various herbs, such as *Allium sativum*, *Curcuma longa*, and *Triphala*, as well as, *Rasaushadhi* preparations like *Aogyavardhini Rasa* [9-13]. *Rasayanchikitsa*, as mentioned in Ayurveda, functions as antioxidant therapy. Broadly, Ayurveda describes two types of therapy: *Shamanchikitsa* (pacification of dosha) and *Shodhanchikitsa*. *Rasayanchikitsa* is a part of *Shamanchikitsa* and has been found to be effective in managing oxidative stress. However, it is worth exploring whether internal cleansing through *Shodhan karma* during appropriate periods can help decrease oxidative stress. There is a need for research in this area.

Considering this fact, the present research was planned with the objective of evaluating the efficacy of *Vasantik Vamana karma* on free radicals, specifically MDA, and antioxidant SOD levels as markers of oxidative stress in healthy volunteers, compared to a non interventional control group.

MATERIALS AND METHODS

The present randomised controlled study was conducted in the Department of Kriyasharir, Mahatma Mahatma Gandhi Ayurved College, Hospital, and Research Centre in Salod (H), a constituent college of Datta Meghe Institute of Higher Education and Research, Deemed to be University, Wardha, Maharashtra, India, from March to April 2023, during the *Vasant Rutu* season. The study was approved by the Institutional Ethical Committee, with letter number MGACHRC/IEC/May 2022/478 dated 23/05/2022.

Inclusion criteria: Healthy subjects who are not suffering from any physical or psychological problems and have not taken any medications for any reason in the past six months, aged between 20 years and 40 years, and willing to participate in the study were included in the study.

Exclusion criteria: Subjects who were on any medication for physical or psychological problems and those contraindicated for *Vaman karma* were excluded.

Sample size: The sample size selected for the pilot study was 15 participants in each group.

Study Procedure

A group of healthy individuals was sensitised regarding the procedure and benefits of *Vasantik Vaman karma*. After sensitisation, volunteers who provided written consent for participation in the study were enrolled. All volunteers were assessed for *Prakriti*, *Agni*, *Koshtha*, and underwent a comprehensive systemic examination as part of routine care for the intervention of *Panchakarma*. These volunteers were then randomly divided into two groups, group A and group B, by a computerised randomisation method during the enrollment process.

Group A served as a non interventional group, which was only monitored for adherence to instructions and maintenance of their regular lifestyle.

Group B served as the interventional group. This group received the intervention of *Vasantik Vaman*.

All participants in both groups were instructed to avoid smoking, alcohol consumption, physical and mental stress and radiation, as these factors could exacerbate oxidative stress. The study was designed as a single-blind study, with the researcher unaware of the allocation of participants to their respective groups. The intervention was administered under the supervision of the *Kayachikitsa* department. Volunteers were examined and enrolled for the project in the *Kayachikitsa* Outpatient Department (OPD).

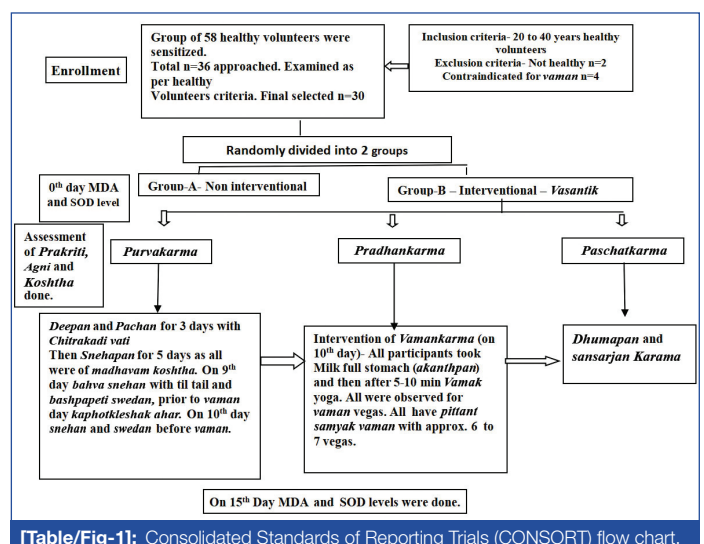
Intervention: *Vamana karma* is a procedure in which aggravated doshas are eliminated through the oral route [14]. The procedure is divided into three phases: *Purvakarma*, *Pradhankarma* and *Paschatkarma*. In the *Vamana* procedure, primarily *Kapha* and *Pitta doshas* from the entire body are brought into the *Aamashaya* (stomach) with the help of *Purvakarma*. These doshas are then eliminated through the mouth by inducing emesis with the administration of *Vamak Dravyas*. To pacify the remaining doshas and restore the capacity of digestive power (*agni*), *Paschatkarma* is required. According to the protocol, volunteers registered for *Vasantik Vaman* were examined, and healthy individuals meeting the specified criteria were selected and enrolled in the study after providing their written consent.

Procedure of *Vasantik Vaman*: This *Vamana karma* was conducted in the *Vasant Rutu*, hence it is referred to as *Vasantik Vaman*.

***Purvakarma* [Table/Fig-1]:** Before starting *Snehapan* as *Poorvakarma*, *Deepan* and *Pachan* were administered using *Chittrakadi Vati*, with each participant taking 1 tablet of 250 mg twice a day before meals for three days. This was helpful for *Agnideepan* (enhancing digestive power) prior to beginning *Snehapan* [15,16]. After the *Deepan* and *Pachan* phases, all participants underwent *Abhyantar Snehapan* (internal oleation) for five days, tailored according to their *Agni* (digestive capacity) and *Koshtha* (quality of the alimentary canal's internal oiling). The *Snehapan* began with a dose of 30 mL of *Goghrit* in the morning on an empty stomach, accompanied by lukewarm water. All volunteers were advised to drink lukewarm water until the sneha was digested and they felt hungry. The following day, the dose was increased as follows: 60 mL on the 2nd day, 90 mL on the 3rd day, 120 mL on the 4th day, and 150 mL on the 5th day, until the symptoms of *Samyak Snigdha Lakshanas* (indicating the completion of internal oiling) appeared. All enrolled volunteers exhibited *Samyak Snigdha Lakshanas* within five days. On the 9th day, all participants underwent *Bahya Snehakarma* with *Til Tail Abhyanga* and *Bashpapeti Swedan*. They were instructed to consume *Kaphotkleshaka Ahar* the day before *Vamana*. On the 10th day, prior to *Vaman Karma*, *Sarvang Snehana* and *Swedan* were performed.

***Pradhanakarma* [Table/Fig-1]:** In the morning at 7:30 AM, after bowel evacuation and *Sarvang Snehana* *Swedan*, all participants were seated. Each volunteer was asked to drink milk until full (*akanthpan*), and after 5-10 minutes, *Vamak Yoga*, consisting of *Madanphala Yog* (*Madanphalachoorna*+*Vachachoorna*+*Saindhava*+honey), was administered [12]. Participants were then observed for *Vaman Vegas*. All underwent *Pittant Samyak Vaman* with 6 to 7 Vegas.

***Pashchatkarma* [Table/Fig-1]:** After *Samyak Vamana*, all participants were given *Dhumapan* and instructed to take rest. They were advised



[Table/Fig-1]: Consolidated Standards of Reporting Trials (CONSORT) flow chart.

to avoid loud speaking, overeating, excessive walking, prolonged sitting, anger and daytime sleeping, among other things [17]. The *Sansarjana Krama* was prescribed to help restore the strength of *Agni* with the aid of a proper dietary schedule. This plan was based on the type of purification achieved by the volunteers.

On the first day after *Vamana*, they were instructed to consume *Peyadi Samsarjana Krama*, which consists of thin rice gruel without spices and fat, once a day. On the second day, they were to have thick rice gruel without spices and fat twice a day. On the third day, they were allowed rice and liquid soup made of green gram and rice without spices and fat, twice a day in moderate quantities. On the fourth day, they were provided liquid soup made of green gram and rice with spices and fat, twice a day in moderate quantities. From the fifth day onward, a normal diet was introduced. No one developed any *Vyapad*, complications, or any untoward effects during or after the *Vamana* procedure.

Assessment criteria: Both groups were assessed for oxidative stress before and after the intervention period [Table/Fig-2].

Day	Assessment	Group A (Non interventional)	Group B (Intervention of <i>vaman</i>)
0 th day	MDA and SOD levels	Done	Done
1 st to 14 th day		Only monitored	Intervention of <i>Vaman</i> , including <i>Purva</i> , <i>Pradhan</i> and <i>Paschatkarm</i>
15 th day		Done	Done

[Table/Fig-2]: Parameters assessment protocol for both the groups.

Specific parameters for assessment of oxidative stress:

- SOD levels were assessed using the method described by Marklund S and Marklund in 1974 [18].
- MDA levels were measured using the Thiobarbituric Acid method [19,20].

MDA and SOD levels are commonly recognised as markers of oxidative stress [21]. The plasma level of MDA in normal volunteers ranges from 0.18-2.87 ng/mL [22], whereas SOD levels in a healthy adult group range from 0.40-4.99 U/L [23].

STATISTICAL ANALYSIS

Statistical analysis was performed using descriptive and inferential statistics, including Student's paired and unpaired t-tests. The software used for the analysis was SigmaStat version 3.2, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 30 volunteers were selected, with 15 volunteers in each group. In group A, 8 (53.33%) were males and 7 (46.66%) were female. In group B, 7 (46.66%) were males and 8 (53.33%) were females. The mean±SD age of the volunteers involved in the study was 21.23±0.37 years [Table/Fig-3].

Parameters	Group A (n=15)	Group B (n=15)	Total
Gender, n (%)			
Male	8 (53.33)	7 (46.66)	15 (50)
Female	7 (46.66)	8 (53.33)	15 (50)
Age (years)			
19-21	10	7	17
22-24	5	8	13
25-40	0	0	0
Mean±SD	20.86±0.37	21.6±0.37	

[Table/Fig-3]: Age and gender-wise distribution of research participants.

Both the groups were assessed for oxidative stress markers SOD level and MDA level pre and postperiod of intervention

Before intervention the SOD levels in both groups were almost at same level. In group B the SOD level after intervention of *Vasantik Vaman* was significantly high. On using paired t-test the difference observed in between two periods was statistically highly significant (p-value <0.001). In a group A, the difference between pre and postperiod was not statistically significant (p-value=0.951). Before intervention the MDA levels in both groups were almost at same level. In Group B the MDA level after intervention of *Vasantik Vaman* was declined. On using paired t-test the difference observed i.e., declination of MDA levels inpost intervention of *Vamana karma* group was statistically highly significant (p-value <0.001). In a group A, the difference between pre and postperiod was not statistically significant (p-value=0.551) [Table/Fig-4,5].

Variables		SOD		MDA	
		Mean±SD	Std. Error mean	Mean±SD	Std. Error mean
Pretest	Group A	1.819±0.568	0.147	1.969±0.834	0.215
	Group B	1.626±0.345	0.0892	2.058±0.823	0.212
Post-test	Group A	1.803±0.784	0.202	2.265±0.954	0.246
	Group B	3.318±0.571	0.147	0.247±0.145	0.212

[Table/Fig-4]: Comparison of pre and post-intervention SOD levels and MDA levels in both the groups. Descriptive statistics

When both the groups compared with student's unpaired t-test; it showed there was no statistically significant difference in SOD levels at pre intervention period in between two groups (p-value=0.272, NS). Both groups were at same level. It showed statistically significant difference in post-interventional SOD levels of both groups. *Vasantik Vaman* intervention group showed good improvement in SOD levels after *Vasantik Vaman* intervention (p-value ≤0.001). When both the groups compared with student's unpaired t-test; it showed there was no statistically significant difference in SOD levels at the pre-intervention period between the two groups (p-value=0.272); both groups were at the same level. There was a statistically significant difference in post-intervention SOD levels between the two groups. The *Vasantik Vaman* intervention group showed a significant improvement in SOD levels after the intervention (p-value <0.001).

When both groups were compared using Student's unpaired t-test, there was no statistically significant difference in MDA levels at the pre-intervention period between the two groups (p-value=0.511); both groups were at the same level. There was a statistically significant difference in post-intervention MDA levels between the two groups. The *Vasantik Vaman* intervention group showed a significant decrease in MDA levels after the intervention (p-value <0.001) [Table/Fig-6].

DISCUSSION

Vasantik Vamana karma is a bio-purification process recommended for both healthy and diseased individuals. In healthy persons, it is suggested to maintain the body's health through detoxification. During the *Vasant* (spring) season, the recommended procedure for detoxification is *Vasantik Vaman*. The qualitative assessment of detoxification can be evaluated by examining the symptoms related to the *vridhhi* (increment) and *kshaya* (decrement) of *Kapha dosha*. Gupta B et al., observed quantitative measurements of physiological and biochemical changes after *Vasantik Vamana karma* across different parameters and found it to be very effective in decreasing cholesterol and Triglyceride (TG) levels [24]. These lipids are considered toxic substances in the body. *Vamana karma* corrects the malproduction of such lipids and restores them to an equilibrium state [25].

The *Yakrit* (liver), which is the site of *pitta* and controls lipid formation, is directly affected by *Vamana karma*, which corrects the metabolic processes of lipid formation and excretion. Free radicals formed

Assessment parameter	Group	Paired differences				T	df	p-value	
		Mean values			95% Confidence interval of the difference				
		Mean	Std. Deviation	Std. Error mean	Lower				Upper
SOD	Group A (Non interventional)	0.0158	0.975	0.252	-0.524	0.556	0.0626	14	0.951
	Group B (Intervention of <i>Vaman</i>)	-1.692	0.706	0.182	-2.083	-1.300	-9.276	14	<0.001*
MDA	Group A (Non interventional)	1.969	0.568	0.147	-0.404	0.225	0.612	-0.0897	0.551
	Group B (Intervention of <i>Vaman</i>)	2.265	1.018	0.263	1.454	2.582	7.675	2.018	<0.001*

[Table/Fig-5]: Student's paired t-test for intragroup comparison of SOD and MDA level.

*The p-value <0.05 was considered statistically significant

Assessment parameter	Test	t-test for equality of means						
		Mean values				95% Confidence interval of the difference		
		t	df	p-value	Mean difference	Std. Error difference	Lower	Upper
SOD	Pretest	1.122	28	0.272	0.193	0.055	-0.159	0.544
	Post-test	-6.047	28	<0.001*	-1.515	0.0578	-2.028	-1.002
MDA	Pretest	-0.665	28	0.511	-0.230	0.012	0.938	0.478
	Post-test	5.253	28	<0.001*	1.344	0.101	0.820	1.868

[Table/Fig-6]: Student's unpaired t-test for intergroup comparison of SOD and MDA levels.

during oxidative processes act as toxins for the body by damaging cell membranes. This destruction of cell membranes localises aggravated doshas, leading to the creation of diseases. To mitigate this type of damage, antioxidants are employed. Antioxidants prevent free radical-induced tissue damage by inhibiting the formation of radicals, scavenging them, or promoting their decomposition [26].

The use of antioxidants, i.e., *rasayan*, is part of *shamanchikitsa* (palliative treatment). Numerous studies have been conducted to demonstrate the role of *rasayan dravyas* (herbal preparations) in preventing free radicals by measuring MDA levels and improving SOD levels as antioxidants. However, to date, no studies have been conducted to examine the effect of *shodhanchikitsa* (purification therapy) on oxidative stress markers. The present pilot study was conducted with healthy volunteers to assess the efficacy of *Vasantik Vamana karma*. The results indicated a statistically significant reduction in MDA levels and a significant increase in SOD levels in the interventional group compared to a non interventional group.

The present study findings are supported by a single case study conducted by Shukla A and Bhatted S, which reported that *Vamana* showed a significant reduction in MDA levels, a free radical, and a significant increase in SOD and Glutathione Reductase (GSH), thereby demonstrating the potent action of the procedure in reducing oxidative stress [27]. A study by Patil NSG et al., on *Vaman Karma* followed by *Rasayan Karma* in *Akalaj Jara* (premature ageing) noted positive effects on the premature graying of hair, skin wrinkling, and overall ageing after the administration of *Vaman* followed by *Rasayanchikitsa* [28]. Free radicals are responsible for the premature ageing process, and the observed effects in the current study were the cumulative results of *Shodhan* and *Shamanchikitsa*.

The present study examined the effects of *rutu shodhanchikitsa* on free radicals and the body's self-generated antioxidants.

Limitation(s)

The study was conducted exclusively on *Vasantik Vaman* and involved healthy volunteers. It should be planned for individuals with diseases.

CONCLUSION(S)

The present study concluded that *Vamana karma*, as advised by Acharyas during *Vasant Rutu*, is effective in decreasing toxins in the body and improving antioxidant levels in healthy individuals. As a bio-purification process, *Vasantik Vamana karma* has been shown to be highly efficacious compared to a non interventional group in

detoxifying the body. The interventional group exhibited a significant decrease in MDA levels and an increase in SOD levels, indicating improved antioxidant activity. To further support its efficacy as a detoxification process, it is recommended that *Vamana karma* be conducted in healthy individuals to maintain health; however, this should be evaluated in a larger sample size. Similarly, the efficacy of *Sharadik Virechankarma* and *Basti* during *Varsha Rutu* also needs to be assessed.

REFERENCES

- Nethan S, Sinha D, Mehrotra R. Non communicable disease risk factors and their trends in India. *Asian Pac J Cancer Prev*. 2017;18(7):2005-10. Doi: 10.22034/APJCP.2017.18.7.2005. PMID: 28749643; PMCID: PMC5648412.
- Armstrong D, Stratton RD. (eds.) Text book of oxidative stress and antioxidant protection. Wiley; 2016. ISBN 9781118832486.
- Agnivesh, Charak Samhita; Prof. Ravidatta Tripathi Sutrasthana 3/26 Chaukhamba Sanskrit Pratishthan, 2009.
- Bhatted Sk, Shukla VD, Thakar A, Bhatt NN. A study on Vasantika Vamana [4](therapeutic emesis in spring season)- preventive measure for diseases of Kaphaorigin. *AYU*. 2011;32(2):181-86.
- Charak Samhita, Prof. Ravidatta Tripath, Sutrasthana 6/22, Chaukhamba Sanskrit Pratishthan, Reprint, 2009.
- Patil S, Komala A, Patil S. Concept of Vasantha Ritucharya - An overview. *Journal of Ayurveda and Integrated Medical Sciences*. 2020;5(02):232-28.
- Sushrut Samhita, Ambikadatta Shastri Sutrasthana 21/24 Chaukhambai Sanskrit Pratishthan, Reprint, 2015.
- Padmini, Yadahalli SL, Desai AS, Sharma A. Clinical study on effect of Vasantika Vamana Karma in the Management of Sthoulya. *IAMJ*. 2020;8(3).
- Kim KS, Lee S, Lee YS, Jung SH, Park Y, Shin KH. Anti-oxidant activities of the extracts from the herbs of *Artemisia apiacea*. *Journal Ethnopharmacol*. 2003;85(1):69-72.
- Marmitt DJ, Bitencourt S, da Silva GR, Rempel C, Goettert MI. Traditional plants with antioxidant properties in clinical trials-A systematic review. *Phytother Res*. 2021;35(10):5647-67.
- Ning W, Li S, Tsering J, Ma Y, Li H, Ma Y, et al. Protective effect of Triphala against oxidative stress-induced neurotoxicity. *Biomed Res Int*. 2021;2021:6674988.
- Liu F, Ng TB. Antioxidative and free radical scavenging activities of selected medicinal herbs. *Life Sci*. 2000;66(8):725-35. Doi: 10.1016/S0024-3205(99)00643-8. PMID: 10680580.
- Sapkota YR, Bedarkar P, Nariya MB, Prajapati PK. Hepatoprotective evaluation of Arogyavardhini Rasa against paracetamol-induced liver damage in rats. *BLDE Univ J Health Sci*. 2017;2(1):44-49.
- Rathod K, Desai AS. Effect of vasantika vamana on various kaphaja vikaras (kitibha kushta, sthoulya, tamaka swasa and hypothyroidism). *Int J Adv Res*. 2019;7(7):538-44.
- Ashok Kumar BN, Abhishek, Shruthi CS. Significance of Deepana and Pachana activity in the treatment of Amapradoshaja Vikaras. *Journal of Ayurveda and Integrated Medical Sciences*. 2016;1(3):48-52.
- Agnivesha, Charakaisamhita, Ayurveda dipika commentary by Sri Chakrapanidatta, (Ed) Vaidya Yadavji Trikamji Acharya, Chikitsasthana 15/ 16-17, Chaukhamba Surbharati Prakahana, Varanasi reprint. 2014; p-521.

- [17] Ganesh Krushna Garde. Sartha Vagbhata Ashtangahriday with the commentaries, Vamanaavirechanavidhim Sutrashtana 18/60; Chaukhamba Surbharati Prakashan, Varanasi, Reprint 2011; pp 79.
- [18] Marklund S, Marklund G. Involvement of the superoxide anion radical in the auto oxidation of pyrogallol and a convenient assay for superoxide dismutase. Eur J Biochem. 1974;47(3):469-74. Doi: 10.1111/j.1432-1033.1974.tb03714.
- [19] Lele RD. Rejuvenation of the elderly, Ayurveda and Modern Medicine, Bhartiya Vidya Bhavan, Bombay, India. 1986 pp. 405-15.
- [20] Marrocco Altieri F, Peluso I. Measurement and clinical significance of biomarkers of oxidative stress in humans. Oxid Med Cell Longev. 2017;2017(1):6501046. Doi: 10.1155/2017/6501046.
- [21] Gawel S, Wardas M, Niedworok E, Wardas P. Dialdehyd malonowy (MDA) jako wskaźnik procesów peroksydacji lipidów organicznych [Malondialdehyde (MDA) as a lipid peroxidation marker]. Wiad Lek. 2004;57(9-10):453-55. Polish. PMID: 15765761.
- [22] Turcu V, Wild P, Hemmendinger M, Sauvain JJ, Bergamaschi E, Hopf NB, et al. Towards reference values for malondialdehyde on exhaled breath condensate: A systematic literature review and meta-analysis. Toxics. 2022;10(5):258. Available from: <https://doi.org/10.3390/toxics10050258>.
- [23] Ghazizadeh H, Kathryn Bohn M. Age- and sex-specific reference intervals for superoxide dismutase enzyme and several minerals in a healthy adult cohort. J Clin Lab Anal. 2021;35(9):e23897. Doi: 10.1002/jcla.23897. Epub 2021 Jul 17. PMID: 34273186; PMCID: PMC8418512.
- [24] Gupta B, Sushil CM, Makhija R, Kumar A, Jirankalgikar NM, Padhi M. Physiological and biochemical changes with Vamana procedure. AYU. 2012;33(3):348-55.
- [25] Singh S, Srivastava AK. A clinical study to evaluate the efficacy of vamana karma in the management of dyslipidemia. Asian J Pharm Clin Res. 2018;11(12):350-53.
- [26] Chutia B, Basumatary K. Free radical mediated diseases and their prevention: An ayurvedic perspective. Int J Ayur Pharma Research. 2016;4(6):84-91.
- [27] Shukla A, Bhatted S. Role of Vamankarma and Saman Sneha(Vajrak Ghrit) in the management of psoriasis (Ekkakushtha). Journal of Biological and Scientific Opinion. 2016;4(1)05-06.
- [28] Patil NSG, Chavan S, Vedpathak S. Study of Vaman karma followed by Rasayana Karma in Akalaja Jara. International Journal of Research in Indian Medicine. 2020;4(5):01-09.

PARTICULARS OF CONTRIBUTORS:

1. Professor and Head, Department of Kriyasharir, Mahatma Gandhi Ayurved College Hospital and Research Centre, Salod (H.), Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.
2. Professor, Department of Kayachikitsa, Mahatma Gandhi Ayurved College Hospital and Research Centre, Salod (H.), Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Pradnya D. Dandekar,
Professor and Head, Department of Kriyasharir, Mahatma Gandhi Ayurved College Hospital and Research Centre, Salod (H.), DMIHER, Wardha-442001, Maharashtra, India.
E-mail: drpddandekar@gmail.com

PLAGIARISM CHECKING METHODS: [\[Jain H et al.\]](#)

- Plagiarism X-checker: Apr 20, 2024
- Manual Googling: Jun 10, 2024
- iThenticate Software: Aug 29, 2024 (8%)

ETYMOLOGY: Author Origin**EMENDATIONS:** 8**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Apr 20, 2024**Date of Peer Review: **Jun 05, 2024**Date of Acceptance: **Aug 30, 2024**Date of Publishing: **Oct 01, 2024**