



## **Review Article**

# REVIEW OF AYURVEDIC HERBAL DRUGS FOR MANAGEMENT OF INSOMNIA (ANIDRA) ALONG WITH THEIR EXPERIMENTAL STUDIES

# Annu Sharma<sup>1\*</sup>, Banshidhar Behera<sup>2</sup>

\*1PG Scholar, <sup>2</sup>Assistant Professor, Ayurvedic and Unani Tibbia College, New Delhi, India.

#### Article info

### **Article History:**

Received: 22-03-2023 Revised: 10-04-2023 Accepted: 26-04-2023

#### **KEYWORDS:**

Insomnia, sleeplessness, anxiety, Ayurveda, Herbal sedative drugs.

## **ABSTRACT**

Ayurveda "Science of life" is a unique combination of science and philosophy that balances the holistic aspects of health i.e. physical, mental, emotional and spiritual. Its aim is to promote and preserve physical and mental health and cure of ailments too. In order to lead a good quality of life both physical and mental health of a person should be maintained in good conditions. Now a days, even people know the importance of mental health as due to their busy lifestyle usually they succumb to unhealthy lifestyle which later pose harm to their health. Due to extreme stress in life people are becoming susceptible to various mental and lifestyle health issues like anxiety, depression, HTN, Diabetes and insomnia. Insomnia is defined as a condition where a person is unable to sleep or does not have a sound and sufficient sleep and wakes up usually tired and exhausted. The general causes of insomnia include stressful lifestyle, environmental influence, mental tension, changed food habits or any mental trauma. It is generally of two types: acute insomnia and chronic insomnia. The acute insomnia is referred to a condition one with short duration of few days to few weeks and the second chronic insomnia is which lasts for longer duration of few months to even years. Some of the major symptoms of insomnia include: difficulty in falling asleep at night, sleeplessness, waking up abruptly while sleeping and then not being able to fall asleep again, waking up tired and exhausted, irritability, sometimes wake up with headache, less concentration and low mood throughout the day, over thinking and worry related to sleep. There are various treatments available for this ailment in the form of oral medicines and therapies. In Ayurvedic treatment for insomnia some therapies such as Shirodhara and herbal medicines like Brahmi, Ashwagandha, Sarpgandha are known to produce calming and relaxing effect and result in sound and good sleep. This paper aims to compile and review the classical literature regarding management of Anidra; scientifically reported classical and nonclassical sedative herbs; and clinical trials conducted on Anidra.

## INTRODUCTION

In Ayurveda, the concept of *Trya upsthambha* consists of three components i.e., *Aahar* (food), *Nidra* (sleep) and *Brahmacharya*<sup>[1,2,3]</sup> i.e., three basic physiological requirement for sustenance of life. Sleep (*Nidra*) is one of the essential factors for healthy life. In order to explain the importance of *Nidra*, *Acharya Charak* has mentioned that happiness, proper development, strength and weakness, potency and

ccess this article online

A
Quick Response Code
DECEMBER 1

https://doi.org/10.47070/ijapr.v11i4.2751

Published by Mahadev Publications (Regd.) publication licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) impotency, intellect and non-intellect, life and death of an individual depends on the sleep whether it is proper or improper.[4] Insomnia (Anidra) is the disorder of inadequate or poor quality and also quantity of sleep either due to difficulty in initiation of sleep (sleep onset insomnia), difficulty in maintaining sleep because of frequently waking up in between (sleep maintenance insomnia) or waking up too early in morning (sleep offset insomnia). Chronic insomnia leads to severe fatigue, anxiety, depression and lack of concentration. [5] It is a common sleep disorder and 1.5 times more common in persons aged more than 65 years. Several lifestyle factors such as excessive caffeine consumption, alcohol and drug abuse, smoking, over-work, over exercise, poor sleep habits also play an important role in developing insomnia. Hence, insomnia can be categorized under lifestyle

disorder and geriatric disorder both. In Ayurveda, Anidra is mentioned under category of Nanatmaja vatvvadhi<sup>[6]</sup> and also as a symptom of various diseases<sup>[7]</sup> and psychological disorders.<sup>[8]</sup> Insomnia has emerged as a common sleep problem worldwide and further lead to many psvchosomatic manifestations like fatigue, high blood pressure, inability to perform physical and mental activities normally and badly hampers the quality of life<sup>[9]</sup>. Now a days many people depend on sleeping pills and became habitual to them which further leads to side effects such as daytime drowsiness, dizziness, difficulty in keeping balance, constipation, loss of appetite etc. are potentially harmful. Hence it is need of the hour to

look out for various herbal remedies for insomnia explained in Ayurvedic texts.

## MATERIALS AND METHODS

For this article, Ayurevda classics mainly Asthanga Hridaya, Asthanga Sangraha, Bhava Prakash, Charaka Samhita, Dhanwantari Nighantu, Sodhal Nighantu, Abhidhanmanjari, Priya Nighantu,Kaiyadev Nighantu, Madanpala Nighantu, Raja Nighantu, Sushruta Samhita and Aadarsh Nighantu have been thoroughly reviewed to collect the matter related with various herbal drugs for the management of Nidranasha. PubMed and other authentic journals, databases were also searched for compiling the list of the herbal drugs on which experimental studies have been done in order to study their sedative activities.

Table 1: Classical Herbs Mentioned in Different Ayurvedic texts having *Nidrakar* Effect as per texts

S.No.	Drug name	Abhidhan manjari	Kaidev Nighantu	Dhanva- ntari Nighantu	Bhav Prakash	Madanpala Nighantu	Raj Nighantu	Shabd chandrika	Sodhal Nighantu	Priya Nigha- ntu	Aadarsh Nighantu
1.	Aasuri Brassica juncea Hook. F & Th.	✓	✓	<b>√</b>					<b>&gt;</b>		
2.	Ahiphena Papaver somniferum Linn.			sinalo	Ayurv ntip://ijap	eda anors				1	
3.	Apamarga Achyranthes aspera Linn.			ational Jo		ay emire					<b>✓</b>
4.	Ashwagandha Withania somnifera Linn.			Eddy	I JAP	2 Uphagas					1
5.	Bhangaa Cannabis Sativa Linn.								<b>\</b>	<b>✓</b>	
6.	Ikshurak Asteracantha longifolia Nees.										<b>✓</b>
7.	Jatamaansi Nardostachys jatamansi DC.									✓	
8.	Kaakjangha Peristrophe bicalyculata Linn.										/
9.	Lanka Capsicum annuum Linn.										1
10.	Marich Piper nigrum Linn.										/

A	nnu Sharma, Bans	nianar Ber	iera. Ayurv	eaic Herba	ii Drugs	tor Managen	nent of ins	somnia wit	n Experime	entai Stu	aies
11.	Nali Equisetum arvense Linn.							1			
12.	Pippali Piper longum Linn.										<b>√</b>
13.	Potaki Basella rubra Linn.		1		✓	✓	<b>√</b>				
14.	Punarnava Boerhavia diffusa Linn.										<b>√</b>
15.	Rajpalandu Allium cepa Linn.						<b>✓</b>				
16.	Sadampushpa Lochnera rosea Linn.									1	
17.	Sahadevi Vernonia cineria Less								<b>✓</b>		
18.	Sarpagandha Rauwolfia serpentine Benth ex Kurz.			John Maria	Ayurv http://ijap	and John				<b>✓</b>	
19.	Shankhapushpi Convulvulus pluricaulis Choisy		1	Kennational		rma Resolution					
20.	Sunnishanak Marsilea minuta Linn.				UAP					1	
21.	Vartaki Solanum indicum Linn						1				
22.	Vanbarbarika Ocimum gratissimum Linn.						1				
23.	Vatarkani Merremia emarginata L.								1		

Table 2: Reported Classical herbs having sedative activity along with their mode of action and experiments done and effects observed

S.No.	Herbs with Sanskrit & Latin name	Part used or chemical composition	Used Experimental models/ mode of action/ Effects seen
1.	Aasuri	Leaf methanolic extract	Rodent diabetes modal used
	<i>Brassica juncea</i> Hook. F & Th. <sup>[17]</sup>		Learned helplessness, behavioral despair, tail hanging test, and motor activity were observed
			The effect of the extract treatment on serum serotonin, norepinephrine and dopamine levels

	T	j. Ayur. Pnarma Research, 2			
			was also determined		
2.	Ahiphena Papaver somniferum Linn. <sup>[18-22]</sup>	Hydroalcoholic extract (15-60 mg/kg in male mice)	Reduced depression and increased the neurotransmitters involved in depression, including dopamine, serotonin, and norepinephrine. Enhanced the secretion of glucocorticoids. Sedative effects of aqueous and alcoholic extracts have also been observed, being more marked when 10% ethanol was used as solvent for extraction		
3.	Apamarga Achyranthes aspera Linn. <sup>[23]</sup>	Methanolic extract of the leaves (200, 400 & 600 mg/kg)	Forced swimming test in mice and rats Tail suspension test in rats Immobility time was determined		
4.	Aswagandha Withania somnifera (Linn.) Dunal [24,25]	Ethanolic (70%) extract of roots	Produced sedation in mice, dogs, monkeys, rabbits and rats		
5.	Bhanga Cannabis sativa Linn. <sup>[26]</sup>	Ethanolic fractions and petroleum-ether fractions in crude form	Spontaneous motor activity in mice		
6.	Ikshurak       Petroleum       ether         Asteracantha longifolia       extract of root         Nees.[27]       Petroleum       ether		Administration of crude petroleum ether extract in mice potentiated the sedative-hypnotic action of chlorpromazine, diazepam, phenobarbitone, chlordiazepoxide and protected against strychnine induced convulsions		
7.	Jatamaansi Nardostachys jatamansi DC.[25,28,29]	Jatamansone (isolated from airdried rhizomes), sesquiterpene valeranone	Prolongation of barbiturate hypnosis, the impairment of rotarod performance		
8.	Marich Piper nigrum Linn.[30,31]	Ethanolic extract	Hypnosis induced by Midazolam seen in male wistar albino rats		
9.	Nali Equisetum arvense Linn. [32,33]	Hydroalcoholic extract (200 and 400mg/kg),  Ethanolic extract of Equisetum arvense (50 and 100mg/kg)  Hydroalcoholic extract of Equisetum arvense	Possessed significant activity on the open-field, enhanced the number of falls in the rota-rod reducing the time of permanence in the bar and increased the sleeping time (46% and 74% respectively) in the barbiturate-induced sleeping time  Increased the time-spent and the percentage of the open arm entries in the elevated plus-maze model, the effect was comparable to diazepam. Ethanolic extract (100mg/kg) prolonged the ketamine-induced total sleeping time and decreased the locomotor activity in mice  Significant increase in ketamine induced sleep and showed anxiolytic, sedative and preanesthetic effects at a dose of 200 mg/kg ip		
10.	Pippali Piper longum Linn. <sup>[34]</sup>	Methanol extract of Leaves	Open field and hole cross tests  Significant dose-dependent CNS depressant properties with reduced locomotor activity		
11.	Potaki Basella rubra Linn. [35]	Leaf extract	Restraint stress test Forced swim test Open field test		

12.	Punarnava Boerhavia diffusa Linn. <sup>[36]</sup>	Hydro ethanolic extract	Cold restraint stress
13.	Rajpalandu Allium cepa Linn. <sup>[37]</sup>	Ethanol extract at the dose of 500mg/kg in mice	Grip strength and chimney test in mice.  Hypnotic and sedative activity of <i>Allium cepa</i> L. may be due to flavonoids and saponins.
14.	Sadampushpa Lochnera rosea Linn. <sup>[38]</sup>	Root was administered intraperitoneally to rats at a dose of 120.0mg/kg	CNS Depressant Activity
15.	Sahadevi Vernonia cineria Less [39]	Water soluble Extract	In vivo studies in mice at the dose of 1000mg /kg caused significant reduction in locomotor activity and depressant action.
16.	Sarpagandha Rauwolfia serpentine Benth ex Kurz. <sup>[40]</sup>	Root alcoholic extract	Pro-long the sleep duration
17.	Shankhapushpi Convulvulus pluricaulis Choisy <sup>[28,41]</sup>	Alcoholic extracts of the whole plant	Potentiation of pentobarbitone hypnosis in rats. Plant shows maximum barbiturate hypnosis potentiating activity during spring season
18.	Sunnishanak Marsilea minuta Linn. <sup>[42]</sup>	Marsiline Ethanolic extract	Sedative and anticonvulsant property.  At a dose of 400 mg/kg, p.o concentration decreased immobility time, forced swimming test (FST) and tail suspension test (TST) also reduced the number of escape failures learned helplessness,  Antidepressant effect exhibited by Marsilea minuta extract may be due to its effect on 5-HT2A density in the rat frontal cortex.
19.	Vartaki Solanum indicum Linn. <sup>[43]</sup>	Methanolic extract of fruit (500 mg/kg)	Spontaneous locomotor activity of adult wistar albino rats was evaluated  Maximum locomotor inhibitory activity after 1 hr observed
20.	Vanbarbarika Ocimum gratissimum Linn. <sup>[44]</sup>	Essential oil	Open field test in rats  It was established that linalool as a predominant compound of essential oil possess significant sedative properties

# **CONCLUSION**

The herbal medicinal drugs for treatment of Anidra along with the other non pharmacological guidelines mentioned in Ayurvedic texts for healthy and good sleep can be advised as supportive therapy for all kind of sleep disorders. Modern studies also support the effectiveness of non-pharmacological approach for the management of insomnia along with drug therapy. The holistic approach which should dietary factors, physical, mental environmental factors is necessary to manage the insomnia. In view of this, Manaha-sukham (happiness of mind), Manonukula-vishaya (objects which pleasant to mind) etc., are mentioned in management of sleeplessness, which indicates the perspective of psychic management in Anidra. Many drugs which are mentioned in classic literature for Anidra like Upodika,

Kaakjangha, Lanka, Vatarkani etc., are not evaluated experimentally as well as clinically. Moreover, Sarpagandha, Aswagandha, Jatamansi, etc., drugs which are scientifically evaluated for their sedative activity, have limited clinical data availability. So, more experimental and clinical studies on these classical drugs should be conducted regarding Ayurvedic concepts. However, the drugs mentioned above for the management of Anidra should be thoroughly studied regarding their potential in relieving the symptoms of Anidra, so that better management of Insomnia can be achieved with high success rate in the coming future where the prevalence of the disease has already withhold its foot. The tabulation of the drugs mentioned in different Ayurvedic texts along with the information regarding their experimental studies can

be further used as a knowledge base and reference for research purpose to find out their potency regarding management for evaluated safe, effective therapy for psychosomatic disorder insomnia in the coming future.

#### REFERENCES

- 1. Agnivesha, Charak Samhita with Ayurved Dipika commentary edited by Vaidya Yadavji Trikamji Acharya, Choukhambha orientalia, Varanasi, Sutra sthana, 2007; 11/35.
- 2. Vagbhatta, Ashtanga Hrdya with Sarvang Sundari commentary by Arundutta and Ayurved rasayana of Hemadri, Krishnadas academy, Varanasi, Sutra sthana, 2005; 7/52.
- 3. Vriddha Vagbhatta, Ashtanga Sangraha edited by Kaviraj Atridev Gupt, Krishnadas academy, Varanasi, Sutra sthana, 2002; 9/27
- 4. Agnivesha, Charak Samhita with Ayurved Dipika commentary edited by Vaidya Yadavji Trikamji Acharya, Choukhambha orientalia, Varanasi, Sutra sthana, 2007; 21/36
- 5. Ayurvedic management of select geriatric disease conditions, A CCRAS-WHO Country office, India collaborative project.
- 6. Agnivesha, Charak Samhita with Ayurved Dipika commentary edited by Vaidya Yadavji Trikamji Acharya, Choukhambha orientalia, Varanasi, Sutra sthana, 2007; 20/11.
- Agnivesha, Charak Samhita with Ayurved Dipika commentary edited by Vaidya Yadavji Trikamji Acharya, Choukhambha orientalia, Varanasi, Chikitsa sthana, 2007; 17/59.
- 8. Sushruta, Sushruta Samhita with Nibandh sangraha and Nyaychandrika commentary edited by Yadavji Trikamji, Choukhambha orientalia, Varanasi, Uttar tantra, 2005; 62/9.
- 9. Colten HR, Altevogt BM. Sleep disorders and sleep deprivation: an unmet public health problem. Washington (DC): National Academies Press (US); 2006. Pp. 59.
- 10. Mishra B., Editor, Bhavaprakasha samhita of Bhavamishra, Chaukhamba Sanskrita Bhavan, Varanasi, 2012.
- 11. Sharma PV, Kaiyadeva Nighantu (Pathya Apathya Vibodhaka), Chaukhambha Orientalia, Varanasi, 2009.
- 12. Sharma PV, Editor, Dhanwantari Nighantu, Chaukambha Orientalia, Varanasi, 2008.
- 13. Trivedi HP, Editor, Madanpal Nighantu of Acharya Madanapala, Chaukambha Krishnadas Academy, Varanasi, 2009.
- 14. Tripathi Indradev, Editor, Raja Nighantu of Narahari, 5<sup>th</sup> edition, Chaukambha Krishnadas Academy, Varanasi, 2006.

- 15. Bapalal G. Vaidya, Editor, Aadarsh Nighantu, 1<sup>st</sup> edition, Chaukambha Bharti Academy, Varanasi, 2006.
- 16. Sharma PV, Editor, Priya Nighantu, Chaukambha Surbharati Prakashan, Varanasi, 2008.
- 17. Thakur, A. K., Chatterjee, S. S., & Kumar, V. (2014). Antidepressant like effects of Brassica juncea L. leaves in diabetic rodents. Indian Journal of Experimental Biology, 52(6), 613–622.
- 18. R. Soulimani, C. Younos, S. Jarmouni-Idrissi, D. Bousta, F. Khalouki, and A. Laila, "Behavioral and pharmaco-toxicological study of Papaver L. in mice," Journal of Ethnopharmacology, vol. 74, no. 3, pp. 265–274, 2001.
- 19. T. A. Beck and B. A. Alford, Depression: Causes and Treatment, University of Pennsylvania Press, Pensilvania, USA, 2009.
- 20. M. Ranjbaran, P. Mirzaei, F. Lotfi, S. Behzadi, and H. Sahraei, "Reduction of metabolic signs of acute stress in male mice by Papaver hydro-alcoholic extract," Pakistan Journal of Bological Sciences, vol. 16, no. 19, pp. 1016–1021, 2013.
- 21. P. Mirzaei, F. Lotfi Kashani, S. Behzadi, and H. Sahraei, "The effect of Papaver distillate on learning, memory, corticosterone and anorexia in little laboratory mice under inescapable tension," Medical Science Journal of Islamic Azad Univesity-Tehran Medical Branch, vol. 23, pp. 21–29, 2013
- 22. N. Osanloo, A. Najafi-Abedi, F. Jafari et al., "Papaver L. hydroalcoholic extract exacerbates forced swimming test-induced depression in mice," Basic and Clinical Neuroscience, vol. 7, no. 3, pp. 195–202, 2016.
- 23. C.C. Barua, A. Talukdar, S.A. Begum, B. Buragohain, J.D. Roy, R.S. Borah, M. Lahkar. Pharmacology online, 2009, 2, 587-594.
- 24. Anonymous; Database on Medicinal Plants used in Ayurveda & siddha vol. 3, CCRAS, Dept. of Ayush, Govt. of India, 2004; p. 92,406
- 25. Sukha Dev; A Selection of Prime Ayurvedic Plant Drugs Ancient-Modern Concordance. Anamaya Publishers, New Delhi 2006. p. 313, 319, 437, 447.
- 26. Joan T. Pickens; Sedative activity of cannabis in relation to its trans- tetra hydro cannabinol and cannabidiol content, Br. J. Pharmac. (1981), 72, 649-56.
- 27. Mazumdar UK, Gupta M and Maiti S. (1999). Chemical and Pharmacological Evaluation of Hygrophila spinosa Root. Indian Journal of Pharmaceutical Sciences., 61(3): 181-83.
- 28. Anonymous; Database on Medicinal Plants used in Ayurveda & siddha vol. 7, CCRAS, Dept. of Ayush, Govt. of India, 2007; p. 138, 389, 436, 455

- 29. Rucker G et al.; Isolation and pharmacodynamic activity of the sesquiterpene valeranone from Nardostachys jatamansi DC. Arzneimittelforschung. 1978; 28(1):7-13.
- 30. Anonymous; Database on Medicinal Plants used in Ayurveda & siddha vol. 5, CCRAS, Dept. of Ayush, Govt. of India, 2004; p. 190
- 31. Gayasuddin, Parvez, Iqbal, G.Venkataiah; Effect of ethanolic extract of piper nigrum l. fruits on midazolam induced hypnosis in rats. International Journal of Pharmacology & Toxicology 2013; 3(1), 5-8
- 32. Singh N, Kaur S, Bedi PMS and Kaur D. Anxiolytic effects of Equisetum arvense Linn extracts in mice. Indian journal of experimental biology 2011; 49(5): 352-356.
- 33. Rezaie A, Ahmadizadeh C, Mosavi G, Nazeri M, Jafari B and Ebadi R. Comparative study of sedative, pre-anesthetic and anti-anxiety effect of Equisetum arvense (horse's Tail) extract with diazepam on rats. Australian Journal of Basic and Applied Sciences 2011; 5(10): 786-789
- 34. Mamun, A., Khatun, M. H., Islam, M. R., Nahar, L., Shams-Ud-Doha, K. M., & Ripa, F. A. (2011). Evaluation of CNS depressant and analgesic activities of the methanol extract of piper longum Linn. Leaves. International Journal of Pharmaceutical Sciences and Research, 2(11), 2874
- 35. Bamidele O, Okeke NC, Adedeji TG, Adedayo LD, Akinnuga AM. Methanol extracts of Basella alba leaves alleviate stress in rats. Chin Herb Med. 2020 Mar 5; 12(2): 163-170. doi: 10.1016/j.chmed.2019.11.004. PMID: 36119801; PMCID: PMC9476701.
- 36. Sandhya k. Desai, Soniya M. Desai, Navdeep S., antistress activity of Boerhaavia diffusa root

- extract and a polyherbal Formulation containing Boerhaavia diffusa using cold restraint stress model. International journal of pharmacy and pharmaceutical sciences, 2011; 3(1): 130-132.
- 37. Rampalli SVM, Gudepu R, Rabbani MM and Janapathi YK: Sedative and hypnotic activity of bulbs of Allium cepa Linn. Int J Pharm Sci Res 2013; 4(12): 4650-55. doi: 10.13040/IJPSR. 0975-8232.4(12).4650-55
- 38. Chopra IC, Jamwal KS, Chopra CL, et al. Preliminary pharmacological investigations of total alkaloids of Lochnera rosea (Rattonjot). Indian J Med Res. 1959; 47: 40-43.
- 39. C. K. Muir; (1981) Depressant action of an extract of Vernonia cinerea; Med J Malaysia. 1981 Jun; 36 (2): 119-21.
- 40. Gupta JC, Ghosh S, Dutta AT, et.al. A note on the hypnotic principle of Rauwolfia serpentina. J Am Pharm Assoc. 1947; 36: 416
- 41. Anonymus; Reviews on Indian medicinal plants, vol.7, ICMR, New Delhi, 2008; p. 123, 524, 178
- 42. Bhattamisra SK, Khanna VK, Agrawal AK, Singh PN, Singh SK. Antidepressant activity of standardised extract of Marsilea minuta Linn. Journal of ethnopharmacology. 2008 Apr 17; 117(1): 51-7.
- 43. Deb PK, Ghosh R, Chakraverty R, Debnath R, Das L, Bhakta T. Phytochemical and Pharmacological Evaluation of Fruits of Solanum indicum Linn. Int J Pharm Sci Rev Res. 2014; 25(2): 28-32
- 44. Shanaida, M., Golembiovska, O., Jasicka-Misiak, I., Oleshchuk, O., Beley, N., Kernychna, I. and Wieczorek, P.P. "Sedative Effect and Standardization Parameters of Herbal Medicinal Product Obtained from the Ocimum L. Herb" European Pharmaceutical Journal, vol.68, no.1, 2021, pp.1-9. https://doi.org/10.2478/afpuc-2020-0015

## Cite this article as:

Annu Sharma, Banshidhar Behera. Review of Ayurvedic Herbal Drugs for Management of Insomnia (Anidra) Along with their Experimental Studies. International Journal of Ayurveda and Pharma Research. 2023;11(4):83-89. https://doi.org/10.47070/ijapr.v11i4.2751

Source of support: Nil, Conflict of interest: None Declared

## \*Address for correspondence Dr. Annu Sharma

PG Scholar, Ayurvedic and Unani Tibbia College, New Delhi. Email:

annumudgal26@gmail.com Phone: 8059668606

Disclaimer: IJAPR is solely owned by Mahadev Publications - dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJAPR cannot accept any responsibility or liability for the articles content which are published. The views expressed in articles by our contributing authors are not necessarily those of IJAPR editor or editorial board members.