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## RESEARCH ARTICLE

## AN OBSERVATIONAL STUDY OF EMERGENCE REACTIONS OF KETAMINE ANAESTHESIA IN RELATION TO DEH-PRAKRITI.

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### Abstract

Prakriti takes its origin at the very moment of the fertilization of the Shukra with Shonit where the predominance of particular Dosha determines the Prakriti. Every individual has some specific physical and mental qualities which remains same throughout the life. The examination of the individual is essential while administering medicines. It is of utmost clinical importance to ascertain the degree of patient's strength by knowing the tone of the system, compactness, body proportion, state of mind, digestive power, tolerance to exercise and age. The determination of all the above factors may reveal the incidence of emergence reactions found with Ketamine anaesthesia. This analysis on the basis of Deh-Prakriti may decide the particular constitution in which these emergence reactions are common. In this way it would be possible to take precautionary measures pre-operatively in particular patients and thus prevent these worrisome psychological reactions.

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### Introduction:-

In the clinical practice, it is seen that the patients behave differently to the same anaesthetics, in uniform techniques, surgical procedures and positions. It has been a matter deliberation for many anesthetists to find out the scientific reasons lying behind it. The anesthetist has to work within the safety margin of the drug by assessing patients before surgery. The therapeutic effects of the drug are quite dependent on its binding sites. The metabolism and fate of the drug are dependent on the production of specific enzymes, which is determined as per the expression of the genetic code of the individual.<sup>[1]</sup> The genes of the specific individual control the expression of characters and the biochemical processes.

Ketamine produces a most useful state of dissociative anaesthesia. When used intravenously, the patient immediately goes into trance like state. Patient becomes unconscious, amnesic and deeply analgesic. His airway remains intact. Blood pressure, heart rate and cardiac output are maintained. In spite of these very useful properties, Ketamine has not settled into clinical anaesthesia mainly because of unpleasant emergence reactions seen in post-operative phase, which is not liked by the theatre's personnels, the patient himself, co-patients and patient's relatives.<sup>[2]</sup> The abnormal behaviors also elicited the fear of permanent or long lasting psychological changes.<sup>[3]</sup> Some degree of cardio-stimulation appears to be an almost constant finding after Ketamine anaesthesia.<sup>[4]</sup> These reactions are common in young adult females recovering from Ketamine alone. The patient has vivid dreams or may have visual or auditory hallucinations and become restless, or shout, or cry. The patient may talk in sleep. The incidences of all these reactions are markedly increased if the patient is disturbed during recovery period. Few patients may recover smoothly and few may exhibit exaggerated response.

In ancient time, Acharya Charak and Acharya Sushruta have given a detailed description about 'Prakriti' and explored the relationship of characteristics like physical, physiological, psychological and biochemical function to a specific Prakriti determined during fertilization of Shonit.<sup>[5]</sup> Prakriti has two components – Doshaj Prakriti and Jataja Prakriti. Doshaj Prakriti is determined during the fertilization of Shukra and Shonit.<sup>[6]</sup> This cannot change throughout life. So, this is the genetic component of human being. The Jataja Prakriti is the environmental component; sub-divided into Jati (caste), Kula (family), Vaya (age), Desh (place), Kala (time) and Pratyatmaniyata (idiosyncrasy).<sup>[7]</sup>

This research work is therefore, designed to evaluate the incidence of emergence reactions in three groups of patients, viz; Vata Pradhan, Pitta Pradhan and Kapha Pradhan determined as per the ancient literature described in Ayurvedic literature.

### **Aims and Objectives:-**

- ❖ To analyze on the basis of Deh-Prakriti, the incidence of emergence reactions and to reach the conclusion that in which Deh-Prakriti it is common.
- ❖ To take precautionary measures preoperatively so as to prevent emergence reactions.

### **Methodology of the research work:-**

**Methods of collection of Data:-** The patients in this study were randomly taken and were young adult females within the age group of 15 to 50 years. According to ASA scale, all these patients were grouped in category-I. All patients were admitted in department of Shalya Tantra and Prasuti Tantra in affiliated hospital of Post Graduate Education and Research in Ayurveda, Paprola, Kangra, Himachal Pradesh for short elective surgical procedures.

### **Inclusion Criteria:-**

- ❖ Patients undergoing short-term surgical intervention in ano-rectal region and short gynecological procedures.
- ❖ Written consent of the patient was taken before inclusion in trial.
- ❖ Routine hematological investigation, Urine- Routine and Microscopic investigation, stool for ova and cyst, chest X-ray, ECG and other specific examination were done.

### **Exclusion Criteria:-**

- ❖ Patients not willing for trial
- ❖ Patients below 15 years and above 50 years.
- ❖ Male patients
- ❖ Hypertensive patients
- ❖ Patients with IHD and other metabolic diseases

### **Grouping of the Patients:-**

All the patients selected for study purpose were divided into 3 groups – Vata Pradhan, Pitta Pradhan and Kapha Pradhan Prakriti. Each patient was clinically scrutinized according to the set proforma for Prakriti Vinishchaya. Patients were pre-medicated with injection Atropine 0.6mg intramuscularly one hour before surgery. All the patients were given injection Ketamine intravenously in bolus dose as per calculated dose from the weight of the patient (2mg/kg). Before giving Ketamine the blood pressure, pulse rate, respiration rate, general condition, CVS, RS, GI system were examined and recorded.

**Assessment Criteria:-** For evaluation of various events after premedication an assessment of the following signs and symptoms was made.

**Mean Blood Pressure Changes:-** The cardiovascular depression or excitations as manifested by the changes in the Mean blood pressure were recorded. The mean blood pressure was calculated as  $MBP = \text{Diastolic Pressure} + \frac{1}{3} \text{ of the pulse pressure}$ .

**Pulse Rate Changes:-** At every step of clinical study any fall or rise in pulse rates were recorded. If the pulse rate was increased by 20 beats per minute it was recorded as tachycardia.

**Effects of Subsequent Anaesthesia:-**

**Total Anaesthetic time:-** The total anaesthetic time was recorded in minutes beginning from the administration of injection Ketamine intravenously up to the recovery of the patient. This was assessed on the basis of response of the patient to leading questions.

**Respiratory Depression:-** This was indicated by the necessity for assisting ventilation at any stage of Ketamine anaesthesia. It was recorded as present or absent.

**Blood Pressure Changes:-** This was measured after every five minutes interval during the anaesthetic maintenance period. The fall or rise of blood pressure was recorded.

**Pulse Rate Changes:-** During the total maintenance period of anaesthesia and surgical procedures a close watch was kept on rise or fall in pulse rate. This change was recorded.

**Observation during the Post Operative Recovery Period:-** After coming out of anaesthesia the patient was shifted from the operation theatre to the recovery room. All the patients were observed in noise free dark room until they were fully awake and well oriented with reference to place, time and person.

**Emergency Reactions:-** Recorded as Present or Absent.

**Illusion:-** Illusion is abnormal perception of normal external stimuli. It occurs most commonly in auditory and visual modalities. In visual type, normal object appears to the patients as large (macropsia), small (micropsia), distorted or more vividly coloured. In auditory type sound appears muffled or louder than normal. So following a stimulus patient starts shouting incomprehensible sounds or muttering inappropriate words and sometimes repeating a single sentence again and again.

**Confusion:-** This is disturbed orientation with reference to place, time and person.

**Fear-** This is manifested by alarm, apprehension and disquiet.

**Vivid Dreaming:-** Recorded on the basis of the replies in response to the leading questions.

**Euphoria:-** It is the sense of well-being. The judgment was based on the personal assessment of the investigator.

**Excitation:-** This was assessed as a somatic motor equivalent of psychic apprehensive response, which comprised of tossing and fidgeting in the bed and inability to relax the body when asked to do so.

**Extra corporeal experiences:-** It is the sense of floating out of body.

**Nausea and Vomiting:-** The incidence of nausea and vomiting were noted immediately in the postoperative period up to 2 hours after the end of anaesthesia.

**Recovery Time:-** This was recorded after shifting the patient from operation theatre up to the full recovery of the patient.

**Blood Pressure and Pulse Rate:-** At the time of recovery any change in blood pressure and pulse rate was also recorded.

**Observations and results:-**

In this study 30 female patients in the age group of 15 to 50 years were assessed on the basis of Deh-Prakriti for the incidences of these emergency reactions. The observations were as follows: The mean age for group I, II and III was 30, 30.4 and 28.1 years respectively. Similarly the mean weight was 42.7, 48.4 and 49.3 kgs respectively in all the three groups. All the patients taken in the trial groups were married females. 90% patients were of rural background and only 10% belonged to urban habitat. Educational qualification of the patients showed that 36.66% patients were illiterate and rests 63.33% were able to read and write. Most of the patients 70% were working women and 30% patients were housewives. Maximum number of patients i.e. 18 (60%) belonged to low income class, 30% belonged to middle class and 10% belonged to high class. Dietetic habits showed 36.66% were pure vegetarian, 63.33% preferred mixed diet while none of them belonged to non-vegetarian class. All the patients were free from any type of addictions. 40% of the patients under trial had constipation. Rest 30% of the patients had regular bowel habits, 26.66% had history of passing loose stool daily and only 3.33% had irregular bowel habits.

The Assessment of various events after premedication were documented in tables -

**Table 1:-** Evaluation of Data during Pre-operative Period

Parameters	Group	Before Premedication		After Premedication		't'	P	Remarks
		Mean	SD	Mean	SD			
Pulse Rate	I	82.7	9.6	106.8	19.41	4.44	<0.01	HS
	II	87.5	9.9	110.5	17.71	5.02	<0.01	HS
	III	81.8	8.2	105.3	16.8	4.78	<0.01	HS
Blood Pressure	I	84.73	8.65	87.23	9.69	1.14	>0.05	NS
	II	90.79	7.50	89.83	7.33	0.33	>0.05	NS
	III	90.19	8.51	89.46	5.52	0.26	>0.05	NS
Respiratory Rate	I	20.4	2.63	21.0	2.35	0.53	>0.05	NS
	II	21.7	3.19	22.7	3.49	0.66	>0.05	NS
	III	19.4	2.31	21.0	2.82	1.38	>0.05	NS

**Table 2:-** Evaluation of Data during the Subsequent Course of Anaesthesia

Parameters	Group	After Premedication		During Anaesthesia		't'	P	Remarks
		Mean	SD	Mean	SD			
Pulse Rate	I	106.8	19.41	133.3	20.01	4.24	<0.01	HS
	II	110.5	17.71	132.3	15.64	3.35	<0.01	HS
	III	105.3	16.8	126.6	14.67	4.92	<0.01	HS
Blood Pressure	I	87.23	9.69	104.19	8.28	4.81	<0.01	HS
	II	89.83	7.33	105.33	10.27	4.61	<0.01	HS
	III	89.46	5.52	110.66	9.7	5.04	<0.01	HS

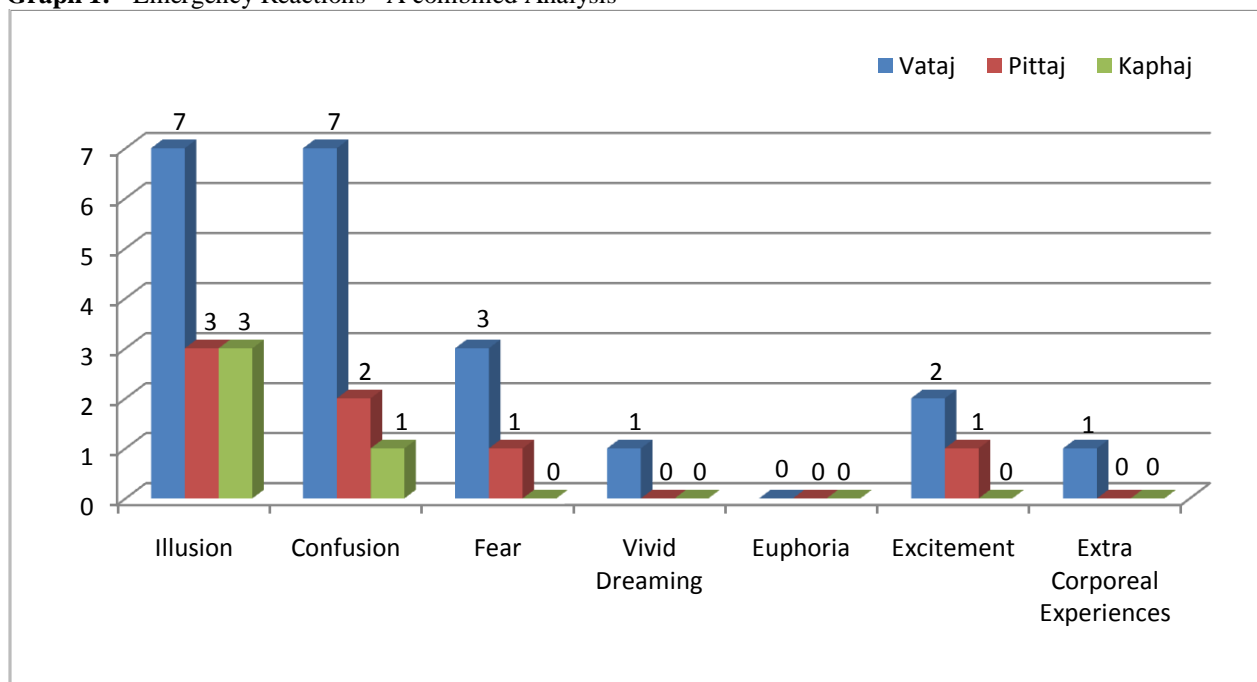
**Table 3:-** Evaluation of Data during the Subsequent Course of Anaesthesia

Parameters	Group	Number of Patients	Mean	SD	Comparison within Groups	't'	P	Remarks
Total Anaesthetic Time	I	10	16.2	5.92	I & II	0.66	>0.05	NS
	II	10	18.0	6.09	II & III	0.83	>0.05	NS
	III	10	16.1	3.90	I & III	0.04	>0.05	NS
Total Recovery Time	I	10	93.5	35.0	I & II	2.70	>0.01	Significant
	II	10	58.5	17.0	II & III	1.09	>0.05	NS
	III	10	67	17.0	I & III	2.10	>0.01	Significant
Total Dose of Ketamine	I	10	82.0	24.85	I & II	0.37	>0.05	NS
	II	10	86.0	22.21	II & III	0.30	>0.05	NS
	III	10	83.0	21.10	I & III	0.09	>0.05	NS

**Table4:-** Emergency Reactions during the Subsequent Course, Recovery Period and Post-operative Recovery Period

Emergency Reactions		Group I		Group II		Group III	
		Freq.	% Age	Freq.	% Age	Freq.	% Age
Respiratory Depression	Present	2	20	2	20	1	10
	Absent	8	80	8	80	9	90
Emetic Sequel	Present	3	30	3	30	5	50
	Absent	7	70	7	70	5	50
Illusion	Present	7	70	3	30	3	30
	Absent	3	30	7	70	7	70
Confusion	Present	7	70	2	20	1	10
	Absent	3	30	8	80	9	90
Fear	Present	3	30	1	10	0	0
	Absent	7	70	9	90	10	100
Vivid Dreaming	Present	1	10	0	0	0	0
	Absent	9	90	10	100	10	100
Euphoria	Present	0	0	0	0	0	0
	Absent	10	100	10	100	10	100
Excitement	Present	2	20	1	10	0	0
	Absent	8	80	9	90	10	100
Extra Corporeal Experiences	Present	1	10	0	0	0	0
	Absent	9	90	10	100	10	100

**Graph 1:-** Emergency Reactions –A combined Analysis



**Discussion:-**

The post anaesthesia emergence reactions of Ketamine anaesthesia are a common problem when Ketamine is used as a sole anaesthetic agent. These emergence reactions also elicit the fear of permanent or long lasting psychological changes.

During the immediate post-operative recovery phase, patient often has visual disturbances and difficulty in speaking. At the same time, patient has a variety of mental states ranging from a dreamy, floating feeling to unpleasant dreams and aggressive violence. They feel isolated, negative, hostile, apathetic, drowsy or drunk. Severe reactions occur in 20 to 50 percent of the patients and all patients were females and age wise we did not mention young, old etc. Therefore, it is necessary to inhibit these bizarre post-operative emergence reactions seen with Ketamine anaesthesia.

The pulse rates of Vata, Pitta and Kapha Pradhan Prakriti patients were significantly increased by the vagolytic action of Atropine. The change in mean blood pressure was found to be statistically insignificant. The total anaesthetic time was identical in all patients. There was rise of mean blood pressure and mean pulse rate during the intra-operative period in all the three groups. This action of Ketamine is attributed largely to the direct stimulant effect of the drug on the central nervous system as it stimulates sympathetic nervous system. While respiratory depression was seen more in cases of Vata and Pitta Pradhan Prakriti, only one patient of Kapha Pradhan Prakriti displayed the need for assisted ventilation.

The prolonged recovery time taken by patients of Vata Pradhan Prakriti can be explained on the basis of more incidences of emergency reactions in this group during the immediate post-operative recovery period.

The haemodynamic status was relatively stable in all the patients of trial groups. Emetic complications were present in all the three groups but the percentage was higher in patients of Kapha Pradhan Prakriti (50%). Vata and Pitta Pradhan Prakriti patients exhibited complications in only 30% of cases. The post operative recovery was significantly prolonged in patients of Vata Pradhan Prakriti.

Emergency reactions were seen more in patients of Vata Pradhan Prakriti (70%). In comparison to this only 40% patients of Pitta Pradhan Prakriti and 30% of patients of Kapha Pradhan Prakriti displayed this bizarre post-operative behavior.

### **Conclusion:-**

The Prakriti plays a definite role in the conduct of Ketamine anaesthesia. It has been observed that with the use of same anesthetic drug (Ketamine), patients of different Prakriti behave differently during the recovery period showing emergence reactions.

Vata Pradhan Prakriti patients display maximum and Kapha Pradhan Prakriti patients display minimum incidences of emergence reactions. Respiratory depression during the subsequent course of anaesthesia is more in Vata and Pitta Pradhan Prakriti patients. Vata Pradhan Prakriti patients take longest duration to recover completely from Ketamine anaesthesia.

The above mentioned conclusions obtained in preliminary study are encouraging. Hence, further comprehensive clinical trial is needed on large number of patients.

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