

# “A study to assess the effectiveness of sensory stimulation to improve the level of consciousness among traumatic brain injury patients in selected hospital at Udaipur city, Rajasthan”

Mr. Naresh Vyas and Mr. Aakash Chavda

<sup>1</sup>(Medical Surgical Nursing Department, Geetanjali college of Nursing/Geetanjali University, India)

<sup>2</sup>(Associate Prof. & HOD, Medical Surgical Nursing Department, Geetanjali college of nursing/Geetanjali university, India)

## Abstract

**Unconsciousness**, more appropriately referred to as loss of consciousness or lack of consciousness, is a dramatic alteration of mental state that involves complete or near- complete lack of responsiveness to people and other environmental stimuli. **Sensory stimulation** is a service to stimulate the senses of coma patients, to try and awaken them.

Researcher conducted a study to assess the effectiveness of sensory stimulation to improve the level of consciousness among traumatic brain injury patients in selected hospital at Udaipur city, Rajasthan.

**Material and method:** In the study 60 samples were selected through purposive sampling technique. Researcher used Quasi experimental non randomized control group design to assess the level of consciousness among traumatic brain injury patients. Variables under study were sensory stimulation as independent variable and level of consciousness in traumatic brain injury patients as dependent variable. Researcher used conceptual framework based on general system model. Data were collected through glasgow coma scale and data were analyzed through suitable statistical method.

**Result:** Result revealed that calculated t value was 7.23 is found highly significant at the level of 0.05. Hence, the research hypothesis  $H_1$  was proved and accepted. In experimental group the socio demographic variable such as Gender  $\chi^2=5.66$  was found significant at 0.05, Educational status  $\chi^2=9.60$  was found significant at 0.05, Lesion of brain injury  $\chi^2=14.72$  was found significant at 0.05, Duration of hospital stay  $\chi^2=6.55$  was found significant at 0.05, where Age in years  $\chi^2=1.61$ , Occupation status  $\chi^2=1.75$ , Habit  $\chi^2=5.34$ , Mechanism of injury  $\chi^2=3.86$  & Accompanying injury  $\chi^2=3.89$  was found to be non-significant at 0.05 level. Hence research hypothesis  $H_2$  is proved and accepted.

**Conclusion:** This study concluded that there was improvement in level of consciousness among traumatic brain injury patients which indicates that the sensory stimulation was effective. The socio-demographic variables of traumatic brain injury patients were significantly associated with the pre-test level of consciousness score. The sensory stimulation will help the traumatic brain injury patients to improve their level of consciousness.

**Keyword:** Effectiveness, Sensory stimulations, Traumatic brain injury, Level of consciousness.

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## I. Introduction

Patients in unconsciousness experience sensory deprivation because their ability to respond to internal and external stimuli is altered. Because of this alteration, the threshold of activation of the reticular activating system may increase. The practical implication of sensory deprivation is that controlled stimulation (consisting of auditory, gustatory, olfactory, tactile, kinesthetic, and visual modes) may meet the higher threshold of the reticular neurons and increase cortical activity or that the undamaged axons may actually send out collateral connections, called collateral spouting, which assist in reorganizing the brain's activity.<sup>1</sup>

Sensory stimulation programs for coma patients act by increasing environmental stimulation to the part of the brain that controls levels of consciousness, attention and concentration. It has been proposed that with intense and repeated stimulation, and following very precise protocols, a patient could be awakened earlier from coma and returned to a higher level of functioning. Therefore, improved health outcomes would be anticipated by reducing the time a patient spends in a coma state. Structured sensory stimulation programs propose to provide this type of health outcome to patients.<sup>2</sup>

## **II. Material And Methods**

This experimental study was carried out on traumatic brain injury patients at Geetanjali Medical College & Hospital and Pacific Institute of Medical Science Hospital, Umarda of Udaipur, Rajasthan from 1<sup>st</sup> March, 2021 to 1<sup>st</sup> April, 2021. A total 60 traumatic brain injury patients with GCS 6-10 were selected for this study.

**Study Design:** Quasi experimental non randomized control group design was adopted in this study with an experimental and control group.

**Study Location:** This study was conducted in the Geetanjali Medical College & Hospital and Pacific Institute of Medical Science Hospital, Umarda of Udaipur, Rajasthan.

**Study Duration:** 1<sup>st</sup> March, 2021 to 1<sup>st</sup> April, 2021.

**Sample size:** 60 traumatic brain injury patients with GCS 6-10.

**Population:** In the present study the population consist that traumatic brain injury patients from selected hospital of Udaipur.

**Sampling Technique:** Non probability Purposive sampling technique.

### **Inclusive Criteria-**

- Patients with GCS 6-10.
- Both male and female traumatic brain injury patients.
- Patients who are willing to participate.
- Patients with medically diagnosed as TBI.
- Patients who are able to understand Hindi and English.

### **Exclusive Criteria-**

- Patients with GCS below 6.
- Patients with increased Intra cranial pressure.
- Patients on endotracheal intubation.
- Patients with mechanical ventilator.

**Procedure Methodology:** The researcher adopted a purposive sampling technique was using to collect the sample. 30 experimental and 30 control group participants were selected for the study. Researcher obtained informed written consent from the study participants. Their socio-demographic variables were collected by structured questionnaire. The pre-test was done by using standardized glasgow coma scale to assess the level of consciousness in both experimental and control group. After pre-test in experimental group investigator perform the sensory stimulations to the experimental group for 45 minutes twice a day for 6 days. Patient in control group did not receive any intervention other than routine care. The post-test was done after 6 days of the sensory stimulations by using the same scale.

**Statistical analysis:** The obtained data were analyzed in terms of objectives of the study using descriptive and inferential statistics. The plan for data analysis was as follows organization of data in master sheet. Obtained data were analyzed in terms of frequencies and percentages. Description Statistics: Description of demographic characteristics mean, median, SD and used to describe the area wise pre-test, post-test in experimental and control group of the participant regarding sensory stimulation. Inferential Statistics: ‘t’ test is used to find out the effectiveness of sensory stimulation on the level of consciousness in traumatic brain injury patients in selected hospital of Udaipur. Chi-square is used to find the association between pre-test score of experimental group & control group participant with socio-demographic variables.

## **III. Result**

**Section – I:** Description of socio-demographic variables.

**Section – II:** Distribution of level of consciousness among traumatic brain injury patients in experimental and control group.

**Section – III:** Effectiveness of sensory stimulations on level of consciousness among traumatic brain injury patients in experimental and control group.

**Section – IV:** Association between pre-test levels of consciousness with selected socio-demographic variables in experimental and control group.

**Section – I: Description of socio-demographic variables:** According to the distribution of the participants by **Age in years**, the majority of respondents in experimental group i.e. 36.67% belonged to age group of 21-30 years, whereas 23.33% belonged to the age group of 41-50 years and 20% - 20 % belonged to age group of 31-40 years or above 51 years, while in control group majority of respondents i.e. 40% belonged to the age group of 21-30 years, whereas 30% belonged to age group of 31-40 years, 23.33% belonged to age group of 41-50 years and 6.67% belonged to age group of above 51 years. **Gender**, the majority of respondents in experimental group i.e. 53.33% were females, whereas 46.67% were males, while in control group majority of respondents i.e. 63.33% were males, whereas 36.67% were females. **Educational Status**, the majority of the respondents in experimental group i.e. 30% belonged to non-formal education, whereas 23.33% belonged to primary

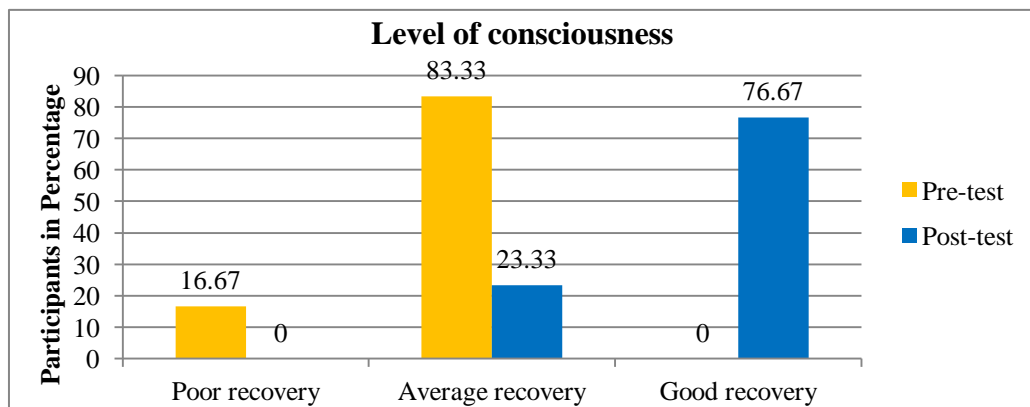
education, 16.67% belonged to secondary education or graduation and above, 13.33% belonged to higher secondary education, while in control group majority of the respondents i.e. 30% belonged to graduation and above, whereas 26.66 % belonged to higher secondary, 16.67% belonged to non- formal education or secondary education and 10% belonged to primary education. **Occupational Status**, the majority of the respondents in experimental group i.e. 36.66% belonged to government sector, whereas 30% belonged to private sector, 20% were unemployed and 6.67% were self employed or from other category, while in control group majority of the respondents i.e. 40% belonged to private sector, whereas 26.66 % belonged to government sector, 16.67% were self employed, 10% were unemployed and 6.67% belonged to other category. **Habit**, the majority of the respondents in experimental group i.e. 36.67% had smoking habit, whereas 26.67% were using tobacco, 20% had alcohol drinking habit, 13.33% had no bad habits and 3.33% had consuming drugs, while in control group majority of the respondents i.e. 30% were using tobacco, whereas 26.67 % had smoking habit or alcohol drinking habit, 13.33% had consuming drugs and 3.33% had no bad habits. **Mechanism of Injury**, the majority of the respondents in experimental group i.e. 46.67% were injured in car accident, whereas 23.33% were injured in motor accident, 20% injured by falling and 10% injured from other regions, while in control group majority of the respondents i.e. 33.34% were injured in car accident, whereas 23.33 % were injured in motor accident or from other regions and 20% injured by falling. **Accompanying Injury**, the majority of the respondents in experimental group i.e. 40% had rib fracture, whereas 33.34% had other injury, 23.33% had limb fracture and 3.33% had no injury, while in control group majority of the respondents i.e. 33.34% had rib fracture, whereas 30% had limb fracture or other injury and 6.66% had no injury. **Lesions of the Brain Injury**, the majority of the respondents in experimental group i.e. 23.33% had lesion in right frontal or B/L frontotemporal-parietal area of the brain, whereas 16.67% had lesion in Left frontotemporal area of the brain, 10% had lesion in B/L frontal, Left temporal or Right frontotemporal-parietal area of the brain and 6.67% had lesion in Left frontotemporal-parietal area of the brain, while in control group majority of the respondents i.e. 26.67% had lesion in right frontal area of the brain, whereas 23.33% had lesion in Left temporal area of the brain, 16.67% had lesion in B/L frontal area of the brain, 13.33% had lesion in B/L frontotemporal-parietal area of the brain, 10% had lesion Left frontotemporal area of the brain, 6.67% had lesion in Right frontotemporal-parietal area of the brain, and 3.33% had lesion in Left frontotemporal-parietal of the brain. **Duration of Hospital Stay**, the majority of respondents in experimental group i.e. 36.67% were stay in hospital for above 21 days, whereas 33.33% were stay in hospital for 7-14 days and 30% were stay in hospital for below 7 days, while in control group majority of respondents i.e. 43.33% were stay in hospital for 7-14 days, whereas 30% were stay in hospital for above 21 days and 26.67% were stay in hospital for below 7 days.

**Section – II: Distribution of level of consciousness among traumatic brain injury patients in experimental and control group:**

**Table-1: Frequency and percentage distribution of level of consciousness in experimental group.**

N = 30

Test	Level of Consciousness	Frequency (30)	Percentage (%)
Pre-test	Poor recovery	5	16.67
	Average recovery	25	83.33
	Good recovery	0	0
Post-test	Poor recovery	0	0
	Average recovery	7	23.33
	Good recovery	23	76.67



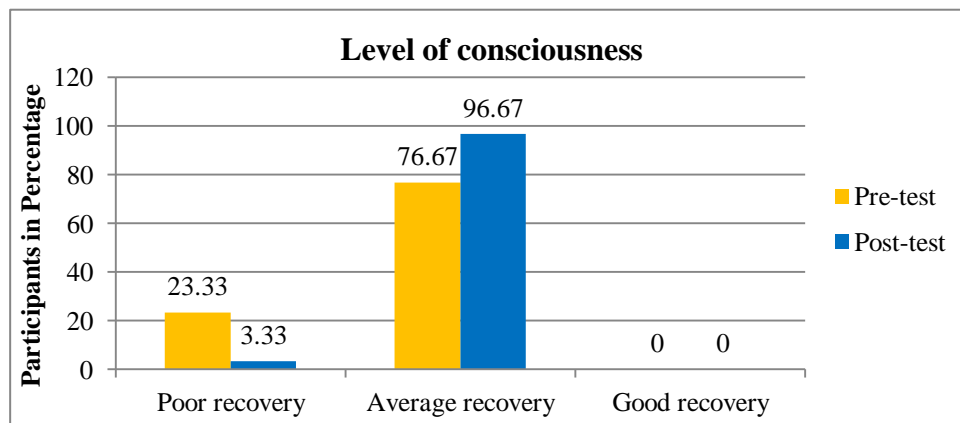
**Figure-1: Frequency and percentage distribution of level of consciousness in experimental group.**

**Table-1 Figure-1:** Depicted that pre-test and post-test level of consciousness among traumatic brain injury patients in experimental group. The result showed that in pre- test none of the respondents had good recovery whereas 83.33% had average recovery, and 16.67% had poor recovery while in post-test 76.67% had good recovery whereas 23.33% had average recovery, and none of the respondents had poor recovery among traumatic brain injury patients.

**Table-2: Frequency and percentage distribution of level of consciousness in control group.**

N = 30

Test	Level of Consciousness	Frequency (30)	Percentage (%)
Pre-test	Poor recovery	3	23.33
	Average recovery	27	76.67
	Good recovery	0	0
Post-test	Poor recovery	1	3.33
	Average recovery	29	96.67
	Good recovery	0	0



**Figure-2: Frequency and percentage distribution of level of consciousness in control group..**

**Table-2 Figure-2:** Projected that pre-test and post-test level of consciousness among traumatic brain injury patients in control group. The result showed that in pre-test none of the respondents had good recovery whereas 76.67% had average recovery, and 23.33% had poor recovery while in post-test 0% had good recovery whereas 96.67% had average recovery, and 3.33% of the respondents had poor recovery among traumatic brain injury patients.

**Section – III: Effectiveness of sensory stimulations on level of consciousness among traumatic brain injury patients in experimental and control group:**

**Table-3: Comparison of pre-test and post-test level of consciousness score in experimental group.**

N=30

Test	Experimental Group							Inference (P Value = 0.05)
	Mean	Mean (%)	SD	Mean Difference	Mean Difference (%)	df	Paired 't' Test	
Pre test	7.73	51.56	1.05	5.57	37.11	29	7.23	Significant (2.05)
Post test	13.30	88.67	1.32					

**Table-16** revealed that in experimental group the improvement in level of consciousness from pre-test to post-test the mean was 7.73 to 13.30, SD was 1.05 to 1.32; mean % was 51.56% to 88.67%.The mean difference % was 37.11. The data further represent that the, “t” value of 7.23 was significantly higher than the table value 2.05 at 0.05 level. This indicates that there was difference in pre-test and post-test level of consciousness score of respondents and the sensory stimulations was effective to improve the level of consciousness among traumatic brain injury patients.

**Table-4: Comparison of pre-test and post-test level of consciousness score in control group.**

**N=30**

Test	Control Group						Inference (P Value = 0.05)	
	Mean	Mean (%)	SD	Mean Difference	Mean Difference (%)	df		
Pre test	7.70	51.33	0.92	0.73	4.59	29	0.01	Non Significant (2.05)
Post test	8.43	56.22	1.10					

**Table-17** revealed that in control group the score of level of consciousness from pre-test to post-test the mean was 7.70 to 8.43, SD was 0.92 to 1.10; mean % was 51.33% to 56.22%. The mean difference % was 4.59. The data further represent that the, “t” value of 0.01 was not significantly higher than the table value 2.05 at 0.05 levels. This indicates that the pre-test and post-test level of consciousness score of respondents and the sensory stimulations was not significant among traumatic brain injury patients.

The hypothesis was tested at 0.05 levels. In experimental group, the calculated “t” value 7.23 was significantly higher than the table value 2.05 at 0.05 levels. This indicates that there was significant difference between pre-test and post-test level of consciousness score among traumatic brain injury patients in experimental group. Hence, the research hypothesis **H<sub>1</sub>** is proved and accepted.

#### IV. Discussion

In experimental group the mean difference percentage on level of consciousness of the respondents was “37.11” with the “t” value of “7.23” which was higher than the table value 2.05 at 0.05 levels. Result showed the significant effectiveness sensory stimulations on level of consciousness among traumatic brain injury patients. Hence research hypothesis **H<sub>1</sub>** was proved and accepted. Whereas in control group the mean difference on level of consciousness of the respondents was “4.59” with the “t” value of “0.01” which was lower than the table value 2.05 at 0.05 level. There was no significant result on level of consciousness among traumatic brain injury patients.

A study was conducted by **R. Sathiya Priya, S. Lavanya (2014)** at Thanthai Perriyar Government Head Quarters Hospital, Erode. %. The combined pre-test post test mean consciousness score of experimental group is 10.50% and 13.0% with enhancement of 2.50% with paired ‘t’ value of 9.32 which is significant at 0.05 level. The combined pre-test post test mean consciousness score of control group is 8.95% and 9.20% with enhancement of 0.25% with paired ‘t’ value of 1.86 which is not significant at 0.05 level. The findings shows sensory stimulation has a significant effect in improving the level of consciousness of experimental group than control group. So the researcher concluded that sensory stimulation has played a significant role in improving the level of consciousness of traumatic brain injury patients with GCS 7 – 10.<sup>3</sup>

In experimental group there was a significant association between pre-test level of consciousness score with selected socio-demographic variables. In experimental group such as gender ( $\chi^2=5.66$ ), educational status ( $\chi^2=9.60$ ), lesion of brain injury ( $\chi^2=14.72$ ), duration of hospital stay ( $\chi^2=6.55$ ) were significant at 0.05 level. Hence research hypothesis **H<sub>2</sub>** was accepted. Where as in control group there was significant association between age in years ( $\chi^2=9.52$ ), lesion of brain injury ( $\chi^2=12.75$ ), duration of hospital stay ( $\chi^2=7.92$ ) were found to be significant at 0.05 level. Hence research Hypothesis **H<sub>2</sub>** was accepted.

A study was conducted by **R. Sathiya Priya, S. Lavanya (2014)** at Tamilnadu. There was a significant association between the post-test level of consciousness scores of experimental group and variables like age ( $\chi^2 = 6.82$ ,  $p < 0.05$ ), gender ( $\chi^2 = 7.40$ ,  $p < 0.05$ ), type of family ( $\chi^2 = 7.58$ ,  $p < 0.05$ ), areas of admission ( $\chi^2 = 11.67$ ,  $p < 0.05$ ), duration of hospital stay ( $\chi^2 = 7.50$ ,  $p < 0.05$ ). But there was no significant association with other variables. There was a significant association between the post- test level of consciousness scores of control group and variables like age ( $\chi^2 = 13.70$ ,  $p < 0.05$ ), gender ( $\chi^2 = 7.35$ ,  $p < 0.05$ ), type of family ( $\chi^2 = 7.58$ ,  $p < 0.05$ ), patients Glasgow coma scale ( $\chi^2 = 11.39$ ,  $p < 0.05$ ), duration of hospital stay ( $\chi^2 = 8.45$ ,  $p < 0.05$ ). But there was no significant association with other variables.<sup>3</sup>

#### V. Conclusion

Study concluded that there was improvement in level of consciousness among traumatic brain injury patients which indicates that the sensory stimulation was effective. The socio-demographic variables of traumatic brain injury patients were significantly associated with the pre-test level of consciousness score. The sensory stimulation will help the traumatic brain injury patients to improve their level of consciousness.

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