



**EFFECT OF AUDITORY STIMULATION ON THE LEVEL OF CONSCIOUSNESS AMONG COMATOSE PATIENTS ADMITTED IN THE INTENSIVE CARE UNIT AT SELECTED HOSPITALS, KOLKATA, WEST BENGAL**

**Kakali Mandal\***

M. Sc. Nursing Student, West Bengal Government College of Nursing, I.P.G.M.E.&R. and S.S.K.M. Hospital. \*Corresponding Author

**Prof. Banani Pal**

Professor, West Bengal Government College of Nursing, I.P.G.M.E.&R. and S.S.K.M. Hospital.

**ABSTRACT**

**Background:** Coma is a state of impaired consciousness where a patient neither speak, open eyes nor respond to the external sensory stimuli but might hear the sounds as the brain of a coma patient may continue to work. **Objectives:** To assess the level of consciousness before and after administration of auditory stimulation and to evaluate the effect of auditory stimulation on the level of consciousness of comatose patients by the difference of pre-test and post-test score. **Methods:** Quasi-experimental study was conducted where 52 comatose patients (E=26, C=26) were randomly selected as sample by non-probability convenience sampling technique. Record analysis proforma and Glasgow Coma Scale was administered to collect data. Auditory stimulation (family member's recorded voice) was administered in the experimental group for seven days. **Results:** The study findings revealed that the mean pre-test GCS score of experimental group was (7.04±0.96) and for control group (7.08±1.02) on the Day1. No significant differences between the GCS scores were observed (t=0.14) (p>0.05). ANOVA represents that the mean post-test GCS score (10.31±2.02) of experimental group after auditory stimulation was higher than the mean pre-test GCS score (7.04±0.96) (p<0.00001) which was statistically significant as the F value (23.56) with df (7, 200) (p<0.05). The mean post-test GCS score was (10.31±2.02) for experimental group was higher than the mean post-test test GCS score (7.23±1.07) in control group on Day7 (t=6.88) (p<0.05). **Conclusion:** Auditory stimulation is effective in significantly improving the level of consciousness among comatose patients.

**KEYWORDS :** Auditory stimulation, Level of consciousness, Comatose patients, Intensive Care Unit.

**INTRODUCTION**

Coma and other conditions of impaired consciousness are associated with symptoms of massive dysfunction or injury involving the brainstem, dysfunction or cerebral cortex, and a substantial risk of death and disability. Disability consciousness management includes immediate stabilization of vital physiological functions to prevent secondary neurological trauma, etiological diagnosis, and brain-directed therapeutic or preventive measures. Neurological prognosis is determined by the underlying etiology and can be predicted by a combination of clinical symptoms and electrophysiological examination.<sup>4</sup>

Sensory stimulation program is based on environmental effect theory for the recovery of brain. Sensory stimulation is essential factors in stimulating the reticular activating system to maintain consciousness. The purpose is to awaken a patient from an unconscious state and try to awaken them. Many types of efforts are made including showing the patient to look at, playing music, speaking, touching and offering things to the patients to smell, taste and touch.<sup>3</sup>

There are very limited numbers of studies conducted on effect of auditory stimulation (family members' voice) on the level on consciousness among comatose patients admitted to the intensive care unit. Therefore, the researcher, from her clinical experience, review of literature and discussion with experts felt a strong need to conduct a study on this area.

**Objectives Of The Study**

1. To assess the level of consciousness before and after administration of auditory stimulation.
2. To evaluate the effect of auditory stimulation on the level of consciousness of comatose patients by the difference of pre-test and post-test score.

**Assumption Of The Study**

1. Comatose patients are at high risk of sensory deprivation.
2. Auditory stimulation may affect the level of consciousness of a patient in coma.

**Hypothesis**

**H<sub>1</sub>:** After implementation of auditory stimulation the mean

post-test level of consciousness in the comatose patients of experimental group is significantly higher than the pre-test level of consciousness as measured by Glasgow Coma Scale at 0.05 level of significance.

**H<sub>2</sub>:** After implementation of auditory stimulation there is a significant difference in mean post-test level of consciousness among comatose patients of experimental group than that of control group as measured by Glasgow Coma Scale at 0.05 level of significance.

**MATERIALS & METHODS**

Research design: Pre-test Post-test control group design

Schematic representation of research study is represented in Figure 1.

| Day 1    | Day 2       | Day 3        | Day 4         | Day 5 | Day 6 | Day 7 |
|----------|-------------|--------------|---------------|-------|-------|-------|
| O1 X1 O3 | X2 O5 X3 O7 | X4 O9 X5 O11 | X6 O13 X7 O15 | O2 -  | O4 -  | O6 -  |
| O8 -     | O10 -       | O12 -        | O14 -         | O16   |       |       |

A quasi experimental research approach was selected. Non-Randomized Pre-test-post-test control group design was used. Non-probability convenience sampling technique executed by lottery method was adopted to select the sample. Samples were randomly selected from an intensive care unit of selected hospitals in Kolkata, West Bengal, and randomly assigned to either an experimental or a control group.

Record analysis proforma on demographic profile on the background information & disease profile of study sample and standardized Glasgow Coma Scale for measuring the patient's consciousness level were used to collect data. Patients with endotracheal intubation or tracheostomy, the verbal component scored 1.

The reliability of the GCS tool was established by interrater reliability. Inclusion criteria in this study were comatose patients with a score of 8 or less on the Glasgow Coma Scale and patients who are available during the data collection period of one month. Exclusion criteria were previous disorder or decreased hearing function, history of repeated seizures or convulsion, patients who all are on sedation.

In this study, auditory stimulation refers to a kind of

stimulation that is use to improve arousal and awareness state among comatose patients. Auditory stimulation include familiar voices which refers to the voice pattern of caregiver in the family (father, mother, daughter, son, sister, brother, husband, wife) which are retained in memory endorsing a previous exposure. The caregiver in the family was asked to write the voice message in his or her own language on a piece of paper provided according to the voice message script criteria prior to the voice recording in the recording room. A normal conversational voice was recorded on a cell phone placed at a distance of 4-5 inches for a maximum of 5-10 minutes by the investigator in a separate room in the hospital, which includes introducing the speaker, place and time, calling by the name of patients that must be repeated at least 3 times during the total recorded voice, what had happened to the patient, sweet memories, some professional/ occupational information, sentences about recovery and expressing hope. The accuracy and adequacy of the written message was confirmed by the researcher before the original recording of the voice message. The recording of voice messages was strictly based on the script and was done in a separate sound-free waiting area in the hospital providing all necessary privacy and comfort to the patient's next of relative. Only messages with normal rhythm and appropriate content as judged by the researcher were included. The total time for recording, and editing voice messages was approximately 30 min to 1 hour per participant. Separate ear phone was used to play voices for each patient. For 7 days, patients received a voice of a loved person in their family once in the morning shifts.

Pilot study was conducted in Trauma Care Centre of I.P.G.M.E. & R. and S.S.K.M. Hospital, Kolkata. Final data was collected from 52 samples (Experimental: 26, Control: 26) in Bangur Institute of Neurosciences, I.P.G.M.E. & R. and S.S.K.M, Kolkata. Informed consent from the Ethical committee and relative of the comatose patients present during study period was taken.

**Intervention Protocol**

The demographic data of consented comatose patients was collected through record analysis proforma from the patient's bed head ticket and case record sheet. Pre-test (GCS Score) was conducted on Day 1 for both experimental (O<sub>1</sub>) and control group (O<sub>2</sub>) with standardized Glasgow Coma Scale (GCS). Following pre-test, auditory stimulation (X<sub>1,7</sub>) was administered to the experimental group once a day for 5-10 min with a recorded voice of a person in their family with an earphone in the morning shifts for seven consecutive days. Control group received only routine care in intensive care unit as per hospital protocol. Post-test was conducted after auditory stimulation on Day 7 for both experimental (O<sub>3,15</sub>) and control group (O<sub>4,16</sub>) with Glasgow Coma Scale. Ear phone was disinfected everyday after use. Data collection was done with strictly maintaining the Covid-19 protocol.

**RESULT**

**Table 1 Mean, Mean Difference, Standard Deviation And Independent 't' Value Of Pre-test Level Of GCS Score Of Comatose Patients In The Experimental And Control Group N=52 (n<sub>c</sub>=26; n<sub>e</sub>=26)**

| Group        | Mean | Mean difference | Standard deviation | S <sub>e</sub> | p value | 't' value | Remarks         |
|--------------|------|-----------------|--------------------|----------------|---------|-----------|-----------------|
| Experimental | 7.04 | 0.04            | 0.96               | 0.27           | 0.89    | 0.14      | Not significant |
| Control      | 7.08 |                 | 1.02               |                |         |           |                 |

't' df (50)=1.68, p<0.05

The data presented in table 1 depicted that the mean pre-test GCS score (7.04±0.96) of comatose patients in experimental group was almost equal to the mean pre-test score (7.08±1.02) of comatose patients in control group with a mean difference

of (0.04). Pre-test GCS score between experimental and control group is not significant as evident by the 't' value of 0.14 at df (50) of 0.05 level of significance as calculated by independent t-test. There is no significant difference between the GCS scores of experimental and control group before administration of auditory stimulation. Hence it can be concluded that both the group were similar in relation to their consciousness level according to their GCS score obtained during pre-test.

**Table 2: Mean, Standard Deviation And ANOVA "F" Value Of The Pre-test And Post-test Level Of Consciousness Among Comatose Patients In Experimental Group n<sub>e</sub> = 26**

| Experimental Group |                 |      |                    |         |           |             |
|--------------------|-----------------|------|--------------------|---------|-----------|-------------|
|                    | GCS score       | Mean | Standard deviation | F value | P Value   | Remarks     |
| Pre-test (Day 1)   | O <sub>1</sub>  | 7.04 | 0.96               |         |           | Significant |
| Post-test (Day 1)  | O <sub>3</sub>  | 7.04 | 0.92               |         |           |             |
| Post-test (Day 2)  | O <sub>5</sub>  | 7.19 | 0.98               |         |           |             |
| Post-test (Day 3)  | O <sub>7</sub>  | 7.77 | 1.03               | 23.56*  | p<0.00001 |             |
| Post-test (Day 4)  | O <sub>9</sub>  | 8.42 | 1.17               |         |           |             |
| Post-test (Day 5)  | O <sub>11</sub> | 8.81 | 1.44               |         |           |             |
| Post-test (Day 6)  | O <sub>13</sub> | 9.58 | 1.45               |         |           |             |
| Post-test (Day 7)  | O <sub>15</sub> | 10.3 | 2.02               |         |           |             |

F<sub>0.05, df(7, 200)</sub> = 23.56

Data presented in table 2 portrayed that the mean post-test Glasgow Coma Scale score of the comatose patients in experimental group on Day 2 (7.19±0.98), Day 3 (7.77±1.03), Day 4 (8.42±1.17), Day 5 (8.81±1.44), Day 6 (9.58±1.45), Day 7 (10.31±2.02) was seemingly higher than their mean pre-test Glasgow Coma Scale score (7.04±0.96) with a p value of <0.00001 which was found to be statistically significant as evident from corresponding 'F' ratio value (23.56) with df (7, 200) indicating that the mean differences were a true difference and not by chance. Hence null hypothesis H<sub>0</sub> was rejected and alternative hypothesis H<sub>1</sub> was accepted. So, it could be concluded that auditory stimulation was effective in improving consciousness level among comatose patients in experimental group.

**Table 3: Mean, Mean Difference, Standard Deviation And Independent 't' Value Of The Post-test Level Of Consciousness In The Experimental And Control Group N=52 (n<sub>c</sub>=26; n<sub>e</sub>=26)**

| Group        | Mean  | Mean difference | Standard deviation | SE    | 'p' value | 't' value | Remarks     |
|--------------|-------|-----------------|--------------------|-------|-----------|-----------|-------------|
| Experimental | 10.31 | 3.08            | 2.02               | 0.452 | 0.0001    | 6.88      | Significant |
| Control      | 7.23  |                 | 1.07               |       |           |           |             |

't' df (50)=1.68, p<0.05

Data presented in table 3 portrayed that the mean post-test Glasgow Coma Scale score (10.31±2.02) of the comatose patients in experimental group was higher than the mean post-test test Glasgow Coma Scale score (7.23±1.07) of the comatose patients in control group with a mean difference of 3.08. Independent 't' value computed from the above data which was found to be statistically significant as evident from corresponding 't' value (6.88) indicating that the mean difference (3.08) was a true difference and not by chance.

So, it could be concluded that the GCS score of comatose patients of the present study was not dependent on selected

demographic variables. It was proved that the auditory stimulation was effective in improving GCS score of comatose patients.

## DISCUSSION

In this present study, the mean post-test Glasgow Coma Scale score of the comatose patients in experimental group on Day 2 ( $7.19 \pm 0.98$ ), Day 3 ( $7.77 \pm 1.03$ ), Day 4 ( $8.42 \pm 1.17$ ), Day 5 ( $8.81 \pm 1.44$ ), Day 6 ( $9.58 \pm 1.45$ ), Day 7 ( $10.31 \pm 2.02$ ) was seemingly higher than their mean pre-test Glasgow Coma Scale score ( $7.04 \pm 0.96$ ) with a p value of  $< 0.00001$  which was found to be statistically significant. The finding was consistent with a study conducted by **Moghadam F, PayamiBousari M. et. al.**<sup>2</sup> where the result showed that the mean post-test GCS scores was 11.6 was which greater than the mean pre-test GCS score 6.5 in the experimental group with the mean difference 5.1 on day 14 after the intervention ( $p < 0.001$ ). Repeated measure ANOVA showed that auditory stimulation increased consciousness level in the experimental group.

In the present study, the mean post-test Glasgow Coma Scale score ( $10.31 \pm 2.02$ ) of the comatose patients in experimental group was higher than the mean post-test test Glasgow Coma Scale score ( $7.23 \pm 1.07$ ) of the comatose patients in control group with a mean difference of 3.08. Independent 't' value computed from the above data which was found to be statistically significant as evident from corresponding 't' value (6.88) indicating that the mean difference (3.08) was a true difference and not by chance. The finding was consistent with a study conducted by **Mathumathi S (2017)**<sup>1</sup> where the result revealed that in the post test, the mean Glasgow Coma Scale score of consciousness in the experimental group was  $10.72 \pm 2.09$  whereas in the control group the mean score of consciousness was  $8.40 \pm 1.26$ . The calculated unpaired 't' value of  $t = 4.752$  was found to be statistically significant at  $p < 0.001$  level. This clearly shows that there was significant difference in the post test level of consciousness among patients between the experimental and control group.

## CONCLUSION

The results of the present study revealed that there was a significant "t" test and difference in the level of consciousness after administration of auditory stimulation. Thus the investigator concluded that the auditory stimulation is effective method to improve the level of consciousness to some extent among comatose patients. Use of auditory stimulation might be an innovative and a simple non-invasive intervention that can be practiced in all the hospitals to fasten the recovery and improve the level of consciousness among comatose patients.

**Conflict Of Interest:** The authors declare no conflict of interest.

## REFERENCES:

1. Mathumathi, S. (2017). Effect of Sensory Stimulation Assessment Measure (SSAM) on level of consciousness among clients with Total Brain Injury (TBI) at selected hospital, Chennai (Doctoral dissertation, Indra College of Nursing, Pandur).
2. Moghadam, F., & PayamiBousari, M. (2015). Effect of auditory stimulation by recitation of prayers (Azan) on consciousness level of comatose patients: A clinical trial. *Preventive Care in Nursing & Midwifery Journal*, 5(1), 71-79.
3. Schnakers, C., Magee, W. L., & Harris, B. (2016). Sensory stimulation and music therapy programs for treating disorders of consciousness. *Frontiers in psychology*, 7, 297.
4. Stevens, R. D., & Bhardwaj, A. (2006). Approach to the comatose patient. *Critical care medicine*, 34(1), 31-41.