CHAPTER- V
MAJOR FINDINGS, DISCUSSION, SUMMARY, CONCLUSION, IMPLICATION, LIMITATION AND RECOMMENDATIONS

The chapter deals with the major findings of the study, discussion, summary, and conclusion, its implication to nursing, limitations and recommendations for the future study.

‘The sections of research are to discuss, interpret and identify the limitations and generalization relevant to the investigation thereby furthering nursing research.’

Summary

This study was undertaken to assess the effectiveness of sensory stimulation program on neurological status of patients with stroke in the selected hospitals of Pune city.

A stroke occurs all of a sudden and puts the person in such a state that suddenly he or she becomes completely or partially dependent on others. Usually, they are in a confused state for 3-4 days. Later they are fully conscious but disabled to do their activities of daily living. Cognitive impairment is not much in many of stroke patients. After stroke attack due to changes in brain and the disability conditions cause mood and emotional instability is commonly seen in stroke patients. These symptoms are stressful for patients as well as to the family members. There may be negative impact on family members and patients. Post-stroke nervousness, gloominess, emotional incontinence, anger and fatigue is commonly seen in CVA clients. Recent researches have proved that nerve plasticity of the damaged nerve cells can be regained by early interventions. So early sensory stimulation will help in the better recovery of brain cells. Even though there are many new advanced treatments, nursing interventions are supportive remedies and must for all brain-related conditions in order to get quick recovery and to prevent further complications. This motivated the researcher to conduct this study. So the present study was undertaken by the Investigator with the main purpose to assess the efficacy of SSP on neurological condition of patients with stroke in the selected hospitals of Pune city.

The study was undertaken by the Investigator with objectives mentioned below:

1. To assess the neurological status of the patients with stroke in experimental and control group before the implementation of Sensory Stimulation Program.
2. To assess the neurological status of the patients with stroke in experimental group after the implementation of SSP; and control group.
3. To assess the effectiveness of SSP on neurological status of patients with stroke.
4. To associate the findings with selected demographic variables.

Study hypotheses:

$H_{01}$ – There is no difference in neurological status of the patients with stroke after the implementation of sensory stimulation program as measured by Hemispheric Stroke Scale at 0.05 level of significance.

$H_{02}$ – There is no difference in dependence level of the patients with stroke after the implementation of sensory stimulation program as measured by Barthel Index scale at 0.05 level of significance.

$H_{03}$ – There is no association between demographic variables with the neurological status of patients with stroke as measured by Fisher’s exact test at 0.05 level of significance.

A review related to research and nonresearch written works published articles facilitate the researcher to prepare a theoretical skeleton work and to take up an appropriate methodology for the research. The theoretical skeleton work selected for present study was supported by ‘Calista Roy’s Adaptation Model’.

Literature reviewed was related to:

1. Literature related to stroke in general.
2. Literature related to Multi Sensory Stimulation
3. Literature related to Auditory Stimulation
4. Literature related to Mirror Therapy
5. Literature related to Olfactory Stimulation
6. Literature related to Gustatory Stimulation
7. Literature related to neurological outcome of stroke patients in general
8. Literature related to Tactile Stimulation

The literature further reviewed enabled the researcher to select a suitable a tool for data collection. It is also helped her to make a decision about plan for data analysis and interpretation of data.

A Quantitative Study Approach was selected for the study. Study design was Quasi Experimental non equivalent Pretest Posttest Control Group Design. Sensory Stimulation Program was the independent variable in this research, & dependent variable is neurological status in terms of level of consciousness, language, motor function, sensory function and other cortical functions, and cranial nerves of the stroke patients.
The study was conducted in various hospitals of Pune city in ICU, HDU, and general wards. 100 samples were selected using Non Probability Purposive Sampling Technique and they were assigned to the groups (control & experimental). The sample comprised of 50 stroke patients in each experimental and control group. Mini-mental status examination score was assessed to select the samples for study. To assess the neurological status of patients with stroke Modified Hemispheric Stroke Scale and Barthel Index Scale tools were used. Hemispheric stroke scale comprised of 22 neurological assessment points under main headings of GCS, verbal communication, Cortical Functions and cranial nerves, Motor & Sensory. GCS contains eye response, verbal response, & motor response. Barthel index scale comprises of 10 points under the main headings Feeding, Bathing, Grooming, Dressing, Bowel, Bladder, Toilet Use, Transfer from Bed to Chair and back, Mobility, & Climbing Stairs.

Content validity of data collection tools were established by 25 specialists in the ground of neurology, physiotherapy, Ayurveda, and Nursing. The researcher received the tools from 22 experts after validation. The experts were neuro physicians, Physician from Intensive Care Unit, general physician, neurosurgeon, physiotherapist, and Ayurveda physician, biostatistician and experts from different fields of nursing education and clinical expertise in various medical units.

The proposed tool reported an interrater correlation coefficient of 0.98 which represents an excellent agreement. To check the feasibility of the study Pilot Study was conducted from 15/08/2015 to 15/04/2016 in Krishna General Hospital Pune and Shaswat Hospital Pune. The final data were collected from April 2016 to March 2017 in Bharati Hospital and Research Centre Pune, Shashwat Nursing Home, Kothrud Pune and Rao Nursing Home, Pune. Samples were selected after Mini-Mental Status Examination. Established interpersonal relation. Explained the purposes of the research to the relatives & patients. Assured about maintaining Confidentiality of the information collected. Willingness was asked and informed written consent was obtained from each participant’s relative. SSP is given according to the protocol decided by researcher and patient’s relative. Data collection was done according to the research design. The data collected were arranged as required for statistical analysis.
MAJOR FINDINGS OF THE STUDY

Major findings of the study are summarized as follows:

1. **A. Findings regarding personal characteristics of sample:**
   - Majority of the samples in experimental and control group were between 51-70 years i.e. 68.0% and 66.0% respectively. Age is considered as a Risk Factor for many vascular disorders & the same fact is depicted in this study findings also.
   - Majority of the samples i.e. 84% in control group and 54% in experimental group were male. According to Indian scenario many people who found with habits like smoking, alcohol consumption and tobacco chewing were males. This may be reason that male suffer more frequently which researcher had found in her study also.
   - Majority of the samples in interventional group 52% & in control group i.e. 76% were unemployed. This finding may be related to age factor as the maximum samples in the study were above 50 years of age and might have retired from jobs.
   - Majority of the samples in experimental group majority of the samples i.e 64 % of them earned a monthly family income Rs.15000 to Rs.25000. In control group majority of the samples i.e. 76 % were having the monthly income of Rs 5000 to Rs.15000. The monthly income had not played any significant role in the present study. But it is observed by the Investigator that those who are economically sound have positive attitude in getting well soon and also were very supportive.
   - Majority of patients in both experimental and control group i.e. 88% in control group and 66.0% in experimental group were literate. The Researcher found that there was good support, co-operation and understanding in families of samples with high literacy.
   - Majority of patients in control group, i.e. 78% and in experimental group 52% belonged to a joint family. According to the Indian culture the old people prefer to stay in joint family. This is strongly found in this study. Even it is observed during interventional period that the patients in joint family have shown more interest to have treatment and wants to get well soon.
   - Except 2 samples in control group, all 98 samples in the study were having single or multiple habits i.e. 26% in control group 52% in experimental group were addicted to chewing tobacco, 20% in control group and 6% in the experimental
group were addicted to smoking and alcohol, 16% of patients in the experimental group were smokers and tobacco users. 26% of patients in the experimental group were addicted to smoking. Many researches have shown that smoking and using tobacco are major risk factors of vascular and Coronary Artery diseases. The findings in this study also depict that habits like smoking and chewing tobacco are major risk factors for brain attack.

- The study data depicts that majority of samples in both experimental and control group i.e. 70% and 50% respectively were having moderate physical activity. Sedentary life style is again one of the risk factors for stroke and in present study findings also researcher found the same point.

- The data depicts that majority of patients in both the group i.e. 70% of control group & 58% of investigational group were doing 1 to 3 hours of exercise per week before they had stroke attack. The data shows that majority of samples were neither very active (>3 hours exercise) or inactive (< 1 hour exercise per week). These findings reveal that as the age increases physical activity become less.

**B. Findings regarding clinical characteristics of sample:**

- The data proved that majority of samples in the study were suffering from a right sided stroke. In the experimental group 50% of them had a right-sided stroke and in control group, 56% of them had a right-sided stroke. It is observed during the study that the right sided stroke patients were more disabled, this may be because the left side of the brain parts have important functions like analytic thought, language, logic, reasoning, number skills etc.

- Majority of the samples in the study i.e. 88% of control group & 74% in the interventional group are overweight. As obesity cause many life style disorders Researcher has included in this study. Maximum patients were unable to stand on weighing machine and on height measure. Hence the Researcher used visual estimation of weight to categorize patients in three categories i.e. obese, overweight and normal. Many researches have shown that while administration of medication in emergency department visual estimation of weight has shown errors. In this research the Researcher has used this data only to categorize the patients.

- Majority of patients with stroke in both the groups i.e. 68% in control group and 78% in the experimental group were with a cholesterol level between 200mg/dl -
250mg/dl which is considered as high. High cholesterol or hyperlipidemia causes plaque formation in the blood vessels which cause narrowing of the blood vessels. These plaques are responsible for thrombus formation and cause diseases of the vascular system. Study findings also depict the fact that high cholesterol is one of the risk factors for brain attack.

- Vascular Risk Factors included in clinical characteristics are Hypertension, Diabetes mellitus, Hypercholesterolemia, Coronary artery diseases. In experimental group 52% of patients had high blood pressure, increased cholesterol level, & Coronary Artery Disease (CAD), 28% of samples had HTN, DM, increased cholesterol level, Coronary CAD. In control group, 26% of them had Hypertension, Diabetes mellitus, Hypercholesterolemia; 18% of them had HTN, DM, increased cholesterol level, CADs. The data in this study also proves the known factor, that those as many as vascular risk factors there is more chances to suffer with stroke attack. All the patients with stroke in the study were having more than one vascular risk factors.

- The patients with stroke included in the study suffered with right and or left Anterior Cerebral Artery Infarct or Hemorrhage, Posterior Cerebral Artery Infarct Or Hemorrhage, Right And Or Left Middle Cerebral Artery Infarct Or Hemorrhage, any other cerebral artery infarct or hemorrhage. In experimental group 46% samples were involved with the left middle cerebral arterial territory, 26% samples were involved in Anterior Cerebral Artery-Right and 22% were involved with the Right Middle Cerebral Arterial Territory. In control group also 38% patients were involving with Middle Cerebral Arterial, 28% were involved with Left Middle Cerebral Artery, 22% of them had Anterior Cerebral artery-left. The present data depicts that maximum samples in this study were with Middle Cerebral Artery Infarct. During literature search the researcher found that Middle Cerebral Arterial infarct is more common than any other cerebral artery.

- Majority of patients with stroke in both the group i.e. 62% in both experimental and control group were suffering from ischemic stroke. While working in clinical area the researcher has observed that almost 80% strokes were suffering with ischemic stroke. Even during literature review it is found that the incidence of stroke due to ischemia is more frequent than due to cerebral haemorrhage.
2. Findings of neurological status of stroke patients in interventional & control group before implementation of Sensory Stimulation Program.

- The data shows that all the patients with stroke i.e. 100% samples in both the groups were showing bad neurological status with a score >63 before the implementation of SSP. According to hemispheric stroke scale, bad neurological status score is score more than 63. In this scale maximum score is 100 and as the score decreases the patients neurological condition improves. So score 0-42 is good neurological status, score 43-63 is satisfactory neurological status, and score >63 is bad neurological status. The score includes the assessment of GCS, speech, other cortical functions and cranial nerves, motor & sensory assessment.

- The data in the study shows that in experimental and control group, all of the patients had total dependence with a score of <20. Means they were not able to do any activities like feeding, bathing, grooming dressing, bowel and bladder activities, movements like walking, sitting etc independently. They were completely dependent on others. In this study Barthel Index scale is a scale used to assess ADL of patients with stroke which indirectly depict the neurological status of the patients. Maximum score of this scale is 100 and minimum score is 20. In this scale as patients condition improves the score increases. The scale is categorized in 5 stages starting with total dependence (0-20), severe dependence (21-40), moderate dependence (41 - 60), Slight dependency (61 - 80), independency (81 - 100).

3. A. Findings related to the neurological condition of patients with stroke assessed by using Hemispheric Stroke Scale in interventional & control group after the implementation of Sensory Stimulation Program only to the experimental group.

- On day 7, even after sensory stimulation programme the neurological score remained same i.e. above 63 in both experimental and control group all were in bad neurological status. No improvement was seen in speech, cortical functions, Cranial Nerves, motor & sensory assessment except GCS.

- But on 21st day, there was considerable improvement in experimental group which is seen in data as the score of 12% samples improved to satisfactory level from bad status.
On 42\textsuperscript{nd} day in experimental group, 90\% patient’s neurological status improved to satisfactory level and 2\% patients achieved good neurological status. There is substantial improvement in neurological score of patients in experimental group.

On 63\textsuperscript{rd} day, the data in the diagram shows further improvement in neurological status of patients. 30\% patients were showing good neurological status with a score of less than 42, 70\% patients were in satisfactory neurological status with a score between 43-63. No patients were found in bad neurological status.

On 84\textsuperscript{th} day, in the experimental group, 60\% patients were in good neurological status, and 40\% with satisfactory neurological status with a very good improvement in speech, cortical functions, cranial nerves, motor & sensory assessment.

On the contrary at the same interval and same period, the neurological status of the control group was also assessed and the data showed that there was slow and steady improvement in neurological status of patients in control group also. It may be a natural process of brain cells that is brain spasticity. It was observed that in control group till 21\textsuperscript{st} day all the patients were in bad neurological status. After that there was slow improvement in the neurological status of the patients. Still by 84\textsuperscript{th} day the control group was able to reach the score between 63-43 i.e. up to satisfactory level. No samples in control group were found in good neurological status till 84\textsuperscript{th} day.

The above data shows that in this study there is a steady continuous recovery in neurological status of patients with stroke, in both interventional & control group, but the clients in interventional group were showing better improvement in neurological status. Recent research studies have shown that brain cells can recover very well with stimulation.

B. Findings related to the Dependence of the patients with stroke in interventional & control group after implementation of SSP only to interventional group based on Barthel Index Scale

All the clients with cerebral stroke in this research study in both interventional and Control Group had total dependence status on day 7 based on Barthel index scale even after implementation of sensory stimulation programme for one week. No improvement is seen in activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements.
➢ On 21\textsuperscript{st} day, in experimental group, 28\% patients were able to perform some of the activities and their independence score improved from less than 20 to 40. So their dependence status also improved from total dependence to moderate dependence.

➢ On 42\textsuperscript{nd} day, the percentage of patients in moderate dependence status increased to 72\% and other 28 \% patients achieved slight dependence with an increased score up to 80 out of 100. No patients in the experimental group were in total dependency status. They were able to perform maximum activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements with assistance.

➢ On 63\textsuperscript{rd} day, majority of patients in experimental group were still in same status i.e. 52\% of them had slight dependence status and 48\% of them had moderate dependence status. There was no considerable improvement in score. Only the number of patients in slight dependence is increased from 28\% to 52\%.

➢ On day 84, the neurological status in the experimental group had considerably improved. 26\% of them achieved independence status. They were able to perform maximum activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements with the help of some aids like walking stick. Other samples in experimental group were in moderate and slight dependence status. They were also able to perform ADL with least support.

➢ Same time the samples in control group also were showing slight improvements from 21\textsuperscript{st} day to 84\textsuperscript{th} day. On 42\textsuperscript{nd} day only 44\% patients were with moderate dependence. On the contrary in experimental group the same day the number of patients in that status were 72 \%. till 84\textsuperscript{th} day all samples in control group were able to achieve up to moderate dependence status only.

➢ No samples in control group were able to achieve slight or independent status till 84\textsuperscript{th} day of study. They were still dependent for their daily activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements on others. The above data shows that there was a steady continuous recovery in dependence status of samples in study i.e. from total dependence state to independence state in both the group. But the samples in the experimental group who had received sensory stimulation programme have shown considerable speedy recovery and achieved slight dependence and total
independent status. But the data in control group shows that all the patients in control group on 84\textsuperscript{th} day had moderate dependence status.

4. **A. Findings related to the effectiveness of SSP on neurological status of the patients with stroke based on hemispheric stroke scale:**

    Paired t-test was applied by the researcher for the effectiveness of SSP on neurological status of patients with stroke in the experimental group based on hemispheric stroke scale. On first day the neurological score was high i.e. above 63 with a mean score 87.6 which indicates a bad neurological status. Sensory stimulation programme was introduced from very first day after pre assessment. Then there was continuous improvement is seen in experimental group which is proven by a considerable decrease in neurological status score and its mean score which is depicted in above table. Average neurological status score after intervention were 84, 68.5, 53.9, 46.6 and 39.2 on day7, day21, day42, day63 and day 84 respectively. (Hemispheric Stroke Scale score is in negative order in the tool). T values were 9.8, 30.1, 39.5, 45 and 55.8 respectively with 49 degrees of freedom. Corresponding p-values were small (less than 0.05). This illustrates that the obtained mean variation was a factual variation, not opportunistic. Therefore, the researcher rejected the null hypothesis. This result indicated that SSP was found significantly efficient in improving neurological status of stroke patients.

    **B. Effectiveness of SSP on dependence status of the patients with stroke based on Barthel Index scale in experimental group.**

    Researcher applied paired t-test to assess the effectiveness of SSP on dependence status of patients with stroke in the experimental group based on Barthel Index scale. The dependence score on first day was less than 20 and all patients were in total dependence status. Sensory stimulation programme was introduced from very first day after pre assessment. Then there was continuous improvement seen in experimental group which was proven by a considerable increase in dependence score and its mean score which indicate that patient’s dependency status is improved to independent status. Average dependence scores were 5.7, 37.3, 55.4, 64.2 and 74.9 on day7, day21, day42, day63 and day 84 respectively. T values were 8.7, 25.3, 46.4, 63.3 and 44.7 respectively with 49 degrees of freedom. Corresponding p-values were small i.e. less than 0.05, the Null Hypothesis is rejected. SSP was proved to be significantly effective in improving the stroke patient’s dependence status to independent status.
5. **A. Findings related to comparison of average neurological status of the stroke patients in experimental group and Control Group based on Hemispheric Stroke Scale**

   Researcher applied two sample z-test for the comparison of the effect on the neurological status of stroke patients in interventional group and Control Group. Average effect in neurological status scores in the experimental group was 3.5, 19, 33.7, 41 and 48.3 on day7, day21, day42, day63 and day 84. Average effect in neurological status scores in control group were 0.5, 7.7, 16.4, 16 and 29.8 on day7, day21, day42, day63 and day 84. Z values were 5.2, 12.5, 16.2, 22.3 and 14.4 with 98 degrees of freedom. Corresponding p-values were small (less than 0.05), the null hypothesis is rejected. The effect in neurological scores in interventional group was considerably elevated than that in Control Group. SSP was found significantly helpful in improving neurological status in stroke patients.

   **B. Findings related to the comparison of the average neurological status of the stroke clients in experimental group with control group based on Barthel Index Scale.**

   The researcher applied two sample z-test for the comparison of the effect on the dependency of stroke patients in interventional & Control Group. Average effect in dependence scores in the experimental group were 5.7, 37.3, 55.4, 62.4 and 74.9 on day7, day21, day42, day63 and day 84. Average effect in neurological status scores in control group were 3.1, 17.9, 36.4, 43.7 and 53.2 on day7, day21, day42, day63 and day 84. Z values were 2.7, 11, 9, 17.6 and 12.4 with 98 degrees of freedom. Corresponding p-values were small (less than 0.05), the null hypothesis is rejected. The effect in dependence scores in interventional group was considerably more than that in Control Group. SSP was found significantly efficient in improving dependency of stroke patients.

6. **A. Findings related to association of demographic variables with neurological condition of stroke patients.**

   The findings of neurological condition of cerebral stroke patients in this study both in experimental and control group on 1st day was in bad status, hence it was not possible to do the association with demographic variables before intervention. So researcher decided to associate the demographic variables with the findings of neurological status of post intervention i.e. from 7th day to 84th day only with experimental group. The researcher applied Fisher’s exact test for association between demographic variables and neurological status of the patients with stroke. The data proved that among all the
demographic variables only educational status has some association with neurological status with p value 0.032 which is less than 0.05. The corresponding p-values for age (0.440), gender (0.388), occupation (0.317), monthly family income (0.074), Family Type (0.248), habits (0.804), physical activities (1.00), exercise (0.573) were more than 0.05. So there is no significant association between age, gender, family type, family income, habits, physical activities, and exercise with the neurological status of patients with stroke. P-value corresponding to Educational status was small (less than 0.05), the Educational status of the patients with stroke was found to have a significant association with their neurological status. The literate patients were found more likely to have satisfactory neurological status as compared to the illiterate patients.

7. B. Findings related to association of clinical variables with neurological status of the patients with stroke

The data in the study proved that the corresponding p-values for Side affected (0.773), Weight (0.798), Cholesterol level (1.000), Vascular risk factors (0.762), Cerebral arterial territory (1.000), Stroke Type (0.774) were more than 0.05. So there was no significant association between side affected, weight, cholesterol level, vascular risk factors, Cerebral arterial territory and stroke type with the neurological status of the patients with stroke.

CONCLUSIONS

Analysis of the findings proved that there is a considerable progress in ADL and a satisfactory improvement in the neurological status of stroke patients after the intervention. Sensory Stimulation Programme is found to be effective in improving the neurological status of the patients.

- The experimental group who has received Sensory Stimulation Programme has shown better improvement in level of consciousness, language, motor function, sensory function and other cortical functions and cranial nerves than the control group who had not received sensory stimulation programme.

- The patients with stroke in experimental group who had received Sensory Stimulation Programme were more independent in ADL like taking food, bath, clean up, wearing clothes, using toilet for emptying bladder and bowel, shifting self from bed to chair, & climbing stairs than the patients with stroke in control group who had not received sensory stimulation programme.
Therefore the study can be concluded that SSP is helpful in improving neurological status of clients with stroke. It helps them to be more independent to carry on their ADL. Stroke patients in experimental Group who were exposed to sensory stimulation programme had shown better improvement in following commands, in pronouncing words more clearly and improvement in the visual field. SSP help the experimental group for better improvement in gaze, dysarthria, dysphagia, and visual construction. Therefore researcher concludes that SSP is very good intervention to improve neurological condition of stroke patients.

DISCUSSION OF THE FINDINGS

The present study was undertaken to assess the effectiveness of sensory stimulation programme on neurological status of patients with stroke in the selected hospitals of Pune city. Cerebral stroke cause severe neurological impairment in patients. It affects balancing, motor and sensory functions of the victim and cause dependency. Dependency reduces quality of life. There are many types of researches conducted to assess the effect of some sensory stimulation like auditory stimulation, visual stimulation, tactile stimulation, olfactory stimulation and gustatory stimulation on neurological status of patients with stroke. In maximum studies, it is proved by many researchers that these stimulations are giving good results in improvement of stroke patients. In this section the main results have been discussed based on objectives and hypothesis of the current study and the results obtained by other researchers in their research studies.

General Characteristics

1. Age and Sex

Age and sex are considered as one of the risk factors for brain attack. Increasing age & male sex are important determinants. In this research study, 68% and 66% subjects in interventional and Control group were between 51-70 years respectively. The data showed stroke incidence increases with age. Other investigators have supported the current research study. Yao et al (2012) found out an impact of various risk factors like age and gender on the distribution of stroke risk factors in a Chinese population. The authors concluded that increasing age was associated with the stroke. Further, Hauer et al (2017) studied the incidence of Vascular Risk Factors in subtypes of stroke cases in relation to age in a forthcoming hospital based cohort of 4033 patients. The study also supported the findings of present study.
In the present study, the majority of the samples in control group were male i.e. 84% whereas in experimental group 54% samples were male. In the study by Yao et al, (2012) there was number of males were more than females. They did not find any association of sex with stroke. Additional, Sealy J et al (2012) determined age & racial explicit gender variation in stroke risk & concluded that a woman is protected from brain attack as contrast with men until about eighty years of age, later there is no sex difference in stroke occurrence.

2. Employment

Employment is one of the socio economic indices, which affects the quality of life and finally results in the risk of several diseases. In the present study, in the experimental group, 52% of clients were unemployed & 48% of them were self-employed. In Control Group 76% of them were unemployed and 24% of them were self-employed. Therefore, the majority of the subjects in the study are unemployed. This finding may be related to age factor as the maximum samples in the study were above 50 years of age and might have retired from jobs. Recent researches Xu et al (2008) investigate the use of family average income as the single index of socioeconomic status to examine the association with stroke prevalence in a region of China and they compared its performance as a single index of socioeconomic status with that of education and occupation. The study revealed that the prevalence of stroke was associated with rising levels of all socioeconomic indices, including family average income, education & occupation. This finding was negatively supported by a latest research study by Howard et al (2016) showed that the effect of falling community socioeconomic condition on prevalence of stroke occurrence has least association.

3. Family Income

In experimental group majority of the samples i.e. 64 % of them had monthly family income Rs.15000 to Rs.25000 and in control group majority of the samples i.e. 76 % are having the monthly income of Rs.5000 to Rs.15000 followed by 24% of samples in control group had monthly income of Rs.15000 to Rs.25000, and 36% of samples in experimental group had monthly family income of Rs. 5000 to Rs.15000. So in study majority of the samples were from low family income group i.e. Rs 5000 to Rs.15000. The monthly income had not played a major role in present research study. But it was observed by the investigator that those who are economically sound have positive attitude in getting well soon and were very supportive. The result of the current research study is
also reliable with the result of a study by Xu et al, (2008) in which investigator revealed that the occurrence of stroke was associated with increasing levels of family income along with all socio economic status of the Chinese population. However a significant gradient was only observed with family income, after controlling for important confounding factors. 86

4. Education

Illiteracy is a pervasive problem with major implication for reduced health status & health disparities. In spite of health education regarding primary and secondary prevention of stroke, considerable results are not seen regarding retention of this teaching effect. In the present research study, majority of patients in both groups i.e. 88% in Control Group and 66.0% in the interventional group are literate. Hence, illiteracy may not be a significant risk factor for induction CVA. But as an added point the Researcher has observed during interventional period that there was more co-operation, support and positive thinking in literate family. Xu et al (2008) prove that the prevalence of CVA was associated with educational status, socioeconomic index and status of Chinese population. 86

Sanders et al (2014) confirmed a clear relationship between health literacy and stroke education outcomes in a prospective cross-sectional study. Out of one hundred samples (patients with stroke) in the study 59% had poor knowledge regarding health information. It was found that CVA cases who had trivial knowledge regarding health information with a mean score 7.45 and SD 1.9 and CVA patients who had satisfactory knowledge regarding health information with a mean score 7.31 and SD 1.76 had statistically elevated instructional outcome scores than those identified as having too little knowledge regarding health information with a mean score 5.58 and SD 2.06. 88

5. Type of Family

Majority of patients in control group and experimental group i.e. 78% and 52% belonged to the joint family. Other 22% in control group and 48 % in experimental group belonged to the nuclear family. The data finding in the study shows that family type may not have any role in stroke occurrence. According to Indian culture the old people prefer to stay in joint family. This was strongly found in this study. Even it is observed during interventional period that the patients in joint family have shown more interest to have treatment and wanted to get well soon.
The findings also are supported by Xu et al (2008). According to Indian culture the old people prefers to stay in joint family. This is strongly found in this study. Even it is observed during interventional period that the patients in joint family have shown more interest to have treatment and wants to get well soon.

6. Tobacco Chewing

Tobacco in the form of smoke or smokeless is considered as an important factor which may cause CV disorders & associated vascular problems. Smoking Cigarette is a well-known risk factor stroke. While health care system all over the world knows that there is a strong relation between smoking and CVA, no change has been observed in the use of tobacco. In this research study, the majority of patients in both the groups i.e. 26 percent in Control Group & 52 percent in interventional group had tobacco chewing habit. 20% in Control Group & 6% in interventional group had both habits of smoking & alcohol. Further, 16% of patients in interventional group were smokers and tobacco users and 26% of patients in the experimental group had the habit of smoking. All the patients in the study had at least with one habit of tobacco chewing/smoking. This contention is further supported by the fact that the Paolo et al (2016) assessed whether people who use smokeless tobacco products are at increased risk of stroke. The analysis revealed the strong association between use of smokeless tobacco products and risk of stroke with the help of systematic review with meta-analysis. Shah et al (2010) summarized the literature regarding smoking-related stroke risk, the dose-response relationship, and the costs of this detrimental habit to both the individual and society as a whole. They stated that smoking in any form is significantly associated with risk of stroke.

7. Physical Activity

Physical activity is defined as any movement of the body produced by skeletal muscles that result in energy expenditure above a basal level and is associated with improved cardiovascular risk factors including reduced blood pressure. The risk of a first-ever stroke, ischemic or hemorrhagic, is associated with lower amounts of physical activity. In the present study, the majority of patients in both the group i.e. 50% in control group and 70% in the experimental group were involved in the moderate physical activity. Other patients 50% in control group and 30% in the experimental group led a sedentary lifestyle. No patients were found to be involved in the active physical activity. Lack of physical activity may be a risk factor for stroke. Exercise and physical activity
have a well established evidence base for their benefits in reducing cardiovascular risk factors. Exercising routinely helps to improve endothelial function, L.V. function, to elevate plasma tissue plasminogen activator and HDL concentration by increasing the secretion of nitric oxide. Improvement in glucose regulation enhances and promotes reductions in total serum and LDL cholesterol and triglycerides. Many research studies have shown that physical activity will reduce the risk of stroke by 25 to 30 percent (2017) which supports the findings of the present study.

Exercise and physical activity are useful tools in the rehabilitation and the functional recovery of patients who have suffered a stroke. In addition, physical activity potentially provides protective benefits in the prevention of stroke, which may extend beyond the positive effects of traditional cardiovascular risk factors (2011).

8. Exercise

Majority of patients in both the group i.e. 70% in control group and 58% in the experimental group were exercising for 1 to 3 hours of exercise per week. 24% of patients in experimental group and 14% of patients in control group were exercising for less than 1-hour exercise per week. Only 18% of samples in experimental group and 16% samples in control group were exercising for more than 3 hours of exercise per week. Maximum numbers of patients in the study were doing very less exercise and may be a risk factor for stroke. Exercise helps to prevent obesity, hypertension, dyslipidemia, and the development of type 2 diabetes, all of which are implicated in the pathogenesis of stroke. The conclusion of the research study is a help to support the findings of present study. According to a Meta analysis study (2004) the people with active occupation have reduced risk of stroke by 43% when compared to occupational inactivity and a relative stroke risk reduction of 23%. Moderate amounts of physical activity at work were associated with a 36% reduction in risk of stroke compared with being inactive at work. High levels of leisure time physical activity were associated with a stroke risk reduction of 20–25% when compared to being inactive during leisure time. The risk reduction when comparing moderate levels of leisure-time physical activity to inactivity was 15%. 92
CLINICAL CHARACTERISTICS

1. Side of Stroke

A stroke usually affects one side of the brain. The opposite side of the brain controls movement and sensation for one side of the body. This means that if the stroke affected the left side of the brain, and than the problems with the right side of the body. In the experimental group, 50% of them had a right-sided stroke and 50% of them had a left-sided stroke. In control group, 56% of them had a right-sided stroke and 44% of them had a left-sided stroke. It is observed during the study that the right sided stroke patients were more disabled may be because the left side of the brain parts have important functions like analytic thought, language, logic, reasoning, number skills etc. According a German research article published in Lancet (2005) left sided stroke patients were more likely to be admitted to hospital and treated promptly than counterparts. But the Signs shown by right-sided stroke patients may be harder to spot because they do not typically affect speech unlike left-sided strokes. But both types of stroke have similar impacts on activities of daily living. This article also state that the ratio of left and right sided stroke is about 11,300 to 8,700 cases, respectively.

2. Obesity

The detrimental effects of obesity on overall health are well understood, including an increased risk of developing hypertension and cardiovascular disease, and higher all-cause mortality. In the present study, the majority of the patients with stroke in the study i.e. 88% in control group and 74% in the experimental group are obese. The data further shows that 12% patients in control group and 10% patients in the experimental group are overweight. Obesity may an important factor for stroke. Obesity has been described as ‘the great humbler’ because many researchers have anticipated finding an easy cure, only but they learned that it is stubbornly difficult to treat. Further, the study observed that the obesity compared with BMI, measures of central obesity are better predictors of stroke in most patients (2010).93

In spite of obesity being a risk factor for stroke, several studies have reported a protective effect of obesity on stroke outcome in patients. In these studies, patients are grouped by BMI on admission, and the presence of other stroke risk factors assessed. As would be expected, obese and overweight BMI groups have a higher incidence of other risk factors including (but not limited to) hypertension, diabetes, and dyslipidemias. The relative impact of each factor on functional outcome is then assessed using multivariate
statistics. When the contribution of other factors is adjusted for, higher BMI has been associated with reduced long-term all-cause mortality after stroke when compared with normal BMI groups in several populations. Furthermore, increased BMI has also been associated with other improved outcomes post-stroke, including a reduced risk of recurrent stroke, reduced morbidity, improved functional recovery and reduced short-term mortality (2016).  

3. Cholesterol

Cholesterol is essential to human life. It is a primary constituent of cell membranes, essential to learning and memory, and the fundamental building block of bile acids, vitamin D, and the steroid hormones. But it needs to be maintained to certain limits. In this study, the majority of patients with stroke in both the groups i.e. 68% in control group and 78% in the experimental group are with a cholesterol level between 200mg/dl-250mg/dl, which is considered as high. Further 18% patients in both experimental and control group are with cholesterol level 251mg/dl-300mg/dl, which is considered as very high. So increased cholesterol level may be an important risk factor for stroke. This fact is supported by the observation of Mirghani and Zein (2017) who investigated the role of total and LDL-cholesterol as independent risk factors for ischemic stroke in Emirates patients. They concluded that the results did not support the association between isolated hypercholesterolemia and atherothrombotic stroke. Hypercholesterolemia is not an independent risk factor for ischaemic stroke but it can interact with other risk factors mainly hypertension to promote atherosclerosis.

The another supportive study gives association of hemorrhagic stroke and ischemic stroke. Honolulu Heart Study (2017) enrolled over 8,000 Japanese American men between 1965 and 1968, measured their cholesterol levels and recorded which of them died of stroke over the following six years. The men were between the ages of 45 and 68 at the time of enrollment. Although CAT scans were not yet available, the researchers distinguished between ischemic and hemorrhagic strokes using signs and symptoms, findings at surgery or autopsy. As published in a 1980 issue of the journal Stroke, they found no association between serum cholesterol and ischemic stroke and an inverse association between serum cholesterol and hemorrhagic stroke, meaning a higher cholesterol level was associated with a lower risk of hemorrhagic stroke.
4. **Vascular risk factors**

Vascular risk factors include hypertension, hypercholesterolemia, and coronary artery disease etc. In the present study, the majority of patients in experimental group i.e.52% of them had hypertension, hypercholesterolemia, and coronary artery disease. 28% of them had hypertension, diabetes mellitus, hypercholesterolemia, coronary artery disease. The data in the study showed that all the patients in the study are having at least one vascular risk factors. The study findings and related information about vascular risk factors are consistent with the study of Arborix A.(2015) reviewed updated data on risk factors for acute ischemic stroke as well as described the usefulness of new and emerging vascular risk factors in stroke patients. The author concluded that hypertension, atrial fibrillation and diabetes mellitus are the most disordered breathing, inflammatory markers or carotid intima-media thickness have been identified.

5. **Presence of haemorrhage or infarct**

Majority of patients are having either hemorrhage or infarct in middle cerebral artery i.e. 28% in control group and 46% in the experimental group are involved with the left middle cerebral arterial territory, and 38% in control group and 22% in the experimental group are involved with the right middle cerebral arterial territory. Arborix A (2015) found out the presence of hemorrhage or infarct is associated with risk of stroke.

6. **Presence of Ischemic Stroke**

Majority of patients with stroke in both the group i.e. 62% in both experimental and control group are having an ischemic stroke. 38% of patients with stroke in both control and experimental group are having a hemorrhagic stroke. While working in clinical area researcher has observed that almost 80% strokes are with ischemic stroke. Even during literature review it is found that the incidence of ischemic stroke is more than hemorrhagic stroke. The study by Arborix (2015) has shown the prevalence of Ischemic stroke. Furthermore, the cross-sectional, observational study of Aquil N et al (2011) supported the study facts that the risk factors including ischemic heart disease and/or infarct are positively associated with risk of ischemic stroke.

7. **Neurological status of the patients with stroke**

Early neurological deterioration is defined as the clinical worsening or recurrence during the first 72 hours after stroke. It is a common complication, although the incidence is variable across studies due to differences in the population studied and in the definition
of neurological deterioration. The present study assessed neurological status in both experimental and control group before the implementation of SSP using hemispheric stroke scale and Barthel Index Scale, and found that all the patients with stroke in the study had bad neurological status and total dependence status respectively. These findings are further supported by the study of Ryglewicz et al. (2000) compared neurological status in patients treated in a stroke unit and found neurological status and state of environmental dependency during the discharge time were similar in both groups, but the state of motor performance was significantly better in the group of patients treated in the stroke unit. The study is again supported by a study conducted by Christian W et al. (2005) on Neurologic Worsening during the Acute Phase of Ischemic Stroke. According to the researcher Neurologic worsening after acute ischemic stroke is a frequent observation in clinical routine. Before reaching the health care setting usually patients are not getting any medical help. That is why patients present hospitals with secondary worsening signs and symptoms.

8. Effect of SSP on neurological status in the patients with stroke depend on Hemispheric stroke scale

Study findings proved that on day 7 even after sensory stimulation programme the neurological score remained same i.e. above 63 in both experimental and control group all were in bad neurological status. No improvement is seen in Language, other cortical functions and cranial nerves, motor functions and sensory assessment except GCS. But on 21\textsuperscript{st} day there was considerable improvement in experimental group which is seen in data as the score of 12\% samples improved to satisfactory level from bad status. On 42\textsuperscript{nd} day in experimental group 90\% patient’s neurological status improved to satisfactory level and 2\% patients achieved good neurological status. There is substantial improvement in neurological score of patients in experimental group. On 63\textsuperscript{rd} day the data in the diagram shows further improvement in neurological status of patients. 30\% patients were showing good neurological status with a score of less than 42, 70\% patients were in satisfactory neurological status with a score between 43-63. No patients were found in bad neurological status. On 84\textsuperscript{th} day in the experimental group 60\% patients in good neurological status, and 40\% with satisfactory neurological status with a very good improvement in Language, other cortical functions and cranial nerves, motor functions and sensory assessment.
On the contrary at the interval and same period the neurological status of the control group is also assessed and the data showed that there was slow and steady improvement in neurological status of patients in control group also. It may be a natural process of brain cells that is brain spasticity. It is observed that in control group till 21\textsuperscript{st} day all the patients were in bad neurological status. After that there was slow improvement in neurological status of the patients. Still by 84\textsuperscript{th} day the control group is able to reach the score between 63-43 i.e. up to satisfactory level. No samples in control group were found in good neurological status till 84\textsuperscript{th} day.

The above data showed that in this study there was a steady continuous recovery in neurological status of patients with stroke, in both experimental and control group but patients in the experimental group showed better improvement in neurological status. Dependence of the patients with stroke in experimental and control group after the implementation of SSP only to experimental group based on Barthel Index Scale

All the patients with stroke in the study in both experimental and control group had total dependence status on day 7 based on Barthel index scale even after implementation of sensory stimulation programme for one week. No improvement is seen in activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements. On 21\textsuperscript{st} day in experimental group 28\% patients were able to perform some of the activities and their independence score improved from less than 20 to 40. So their dependence status also improved from total dependence to moderate dependence. On 42\textsuperscript{nd} day the percentage of patients in moderate dependence status increased to 72\% and other 28 \% patients achieved slight dependence with an increased score up to 80 out of 100. No patients in the experimental group were in total dependency status. They were able to perform maximum activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements with assistance. On 63\textsuperscript{rd} day majority of patients in experimental group were still in same status i.e. 52\% of them had slight dependence status and 48\% of them had moderate dependence status. There was no considerable improvement in score. Only the number of patients in slight dependence is increased from 28\% to 52\%. On day 84, the neurological status in the experimental group is considerably improved. 26\% of them achieved independence status. They were able to perform maximum activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements with the help of some aids like walking stick. Other samples in experimental group were in moderate and
slight dependence status. They are also able to perform their activities of daily living with minimal assistance.

At the same time the samples in control group also were showing slight improvements from 21st day to 84th day. On 42nd day only 44% patients were with moderate dependence. On the contrary in experimental group the same day the number of patients in that status were 72 %. Till 84th day all samples in control group were able to achieve up to moderate dependence status only. No samples in control group were able to achieve slight or independent status till 84th day of study. They were still dependent for their daily activities like bathing, feeding, grooming, dressing, bowel and bladder care, and other daily routine movements on others. Above data shows that there is a steady continuous recovery in dependence status of samples in study i.e. from total dependence state to independence state in both the group. But the samples in the experimental group who had received sensory stimulation programme have shown considerable speedy recovery and achieved slight dependence and total independent status. But the data in control group shows that all the patients in control group on 84th day had moderate dependence status.

Recent researchers have shown that brain cells can recover very well with stimulation. The findings are in compliance with the study conducted by Moattari et al (2016) investigated the effects of an SSP conducted by nurses and families on the consciousness, level of cognitive function, and basic cognitive sensory recovery of head injury comatose patients in a randomized controlled trial. The authors concluded that the application of sensory stimulation by families led to significant increases in the consciousness, level of cognitive function, and basic cognitive sensory recovery of comatose patients with severe injuries 100. Another supportive study of Schackers et al (2016) has also shown that SSP has truly an impact on the improvement of consciousness in patients recovering from coma. 101

Music is a multimodal stimulus that activates many brain structures related to sensory processing, attention, and memory, and can stimulate complex cognition and multisensory integration. Music therapy has a positive effect on mood in post-stroke patients and may be beneficial for mood improvement with stroke. Music cognition has of course always been a field of very active scholarship, but no conceptual links have been developed as to how cognitive processes in music perception could be transferred to retraining cognition and perception in therapy. Research has shown that music can serve
as an effective mnemonic device to facilitate verbal learning and recall in healthy persons, patients with memory disorders, and children with learning disabilities.

Mirror therapy (MT) is a low-cost and easy intervention developed to treat phantom limb pain that is currently used in post-stroke rehabilitation. MT is applied with a mirror positioned in the sagittal plane between the upper limbs. The science of MT is getting due attention in the management of half-sided paresis due to stroke. MT has the potential to induce motor recovery in the paretic limbs of post stroke patients. In addition to the motor control, MT also leads to improvement in the activities of daily living.\textsuperscript{102}

Schackers et al (2016) have shown that SSP has truly an impact on the improvement of consciousness in patients recovering from coma\textsuperscript{88}. Massage therapy is a noninvasive treatment that many individuals use to supplement their conventional treatment. Relaxation such as that promoted by massage therapy allows an individual to enter into a lower anxiety state by increasing parasympathetic signals. Preoperative massage treatments have been shown to reduce pain, anxiety, and tension in patients undergoing cardiac surgery.\textsuperscript{103}

Aromatherapy is a derivative of herbal medicine, which is itself a subset of the biological or nature-based complementary and alternative medicine (CAM) therapies. Aromatherapy has been defined as the therapeutic use of essential oils from plants for the improvement of physical, emotional, and spiritual well-being. Essential oils are volatile liquid substances extracted from aromatic plant material by steam distillation or mechanical expression. Oils produced with the aid of chemical solvents are not considered true essential oils because the solvent residues can alter the purity of the oils themselves and lead to adulteration of the fragrance or to skin irritation. There is growing evidence suggesting that lavender oil may be an effective medicament in the treatment of several neurological disorders. Several animal and human investigations suggest anxiolytic, mood stabilizer, sedative, analgesic, and anticonvulsive and neuroprotective properties for lavender.\textsuperscript{104}

\textbullet\ Comparison of dependence status of the patients with stroke in experimental group with control groups based on hemispheric stroke scale

The researcher applied two sample z-test for the comparison of the effect on the neurological status of the patients with stroke in experimental and control group. Average effect in neurological status scores in the experimental group was 3.5, 19, 33.7, 41 and 48.3 on day7, day21, day42, day63 and day 84 respectively. Average effect in
neurological status scores in control group were 0.5, 7.7, 16.4, 16 and 29.8 on day 7, day 21, day 42, day 63 and day 84 respectively. Z values were 5.2, 12.5, 16.2, 22.3 and 14.4 with 98 degrees of freedom. Corresponding p-values were small (less than 0.05), the null hypothesis is rejected. The effect in neurological scores in the experimental group was significantly higher than that in control group. SSP was found to be significantly effective in improving the neurological status of patients with stroke.

The above study results of neurological status of the stroke patients are also being supported by Kattenstroth et al (2012) have shown that long-term SSP applied to patients with chronic cerebral lesions can improve tactile and sensorimotor functions, which, however, developed in some cases only after many weeks of stimulation, and continued to further improve on a time scale of months.105

- **Comparison of neurological status of the patients with stroke in experimental group with control groups based on Barthel Index scale**

The present study used two sample z-test to compare the neurological status of the stroke patients in experimental with the control group. Mean Barthel Index Score in the experimental group was 5.7, 37.3, 55.4, 62.4 and 74.9 on day 7, day 21, day 42, day 63 and day 84 respectively. Mean Barthel Index Score in control group was 3.1, 17.9, 36.4, 43.7 and 53.2 on day 7, day 21, day 42, day 63 and day 84 respectively. Z values were 2.7, 11, 9, 17.6 and 12.4 with 98 degrees of freedom. Corresponding p-values were small (less than 0.05), the null hypothesis was rejected. The effect in Barthel Index Score in the experimental group was significantly higher than that in control group. It proves that SSP was found to be significantly effective in improving the Barthel Index Score of patients with stroke. The findings of the present study also support the preexisting results of Kang et al (2009) assessed the effectiveness of a computerized visual perception rehabilitation program using motion tracking technology for visual perception impairment. In this randomized controlled, single-blinded, pilot clinical trial. Barthel Index Score increased significantly in both groups, with the experimental group recording a higher increase. They concluded that computerized visual perception rehabilitation program with interactive computer interface using motion tracking technology was beneficial to help improve stroke patient’s visual perception impairment.106

- **Association of demographic variables with neurological status of the patients with stroke**
Our results showed that age (P=0.440), gender (P=0.388), occupation (P=0.317), monthly family income (P=0.074), family type (P=0.248), habits (P=0.804), physical activities (P=1.00), exercise (P=0.573) were not associated with neurological status while education (P=0.032) was associated with neurological status in the patients with stroke. The literate patients were found more likely to have satisfactory neurological status as compared to the illiterate patients. Demographic factors play an important role in determining the risk of stroke. Previous studies by having shown that age, sex, education, family income play an important role in the determination of the risk of stroke.\textsuperscript{84,96}

\begin{itemize}
\item \textbf{Association of Clinical Variables with Neurological Status of the Patients with Stroke}
\end{itemize}

Our analysis showed that side affected (P=0.773), weight (P=0.798), cholesterol level (P=1.000), vascular risk factors (P=0.762), cerebral arterial territory (P=1.000), stroke Type (P=0.774) were not associated with neurological status in the patients with stroke. Our results are contrary to previous studies (Discussed earlier in the section), where a significant association has been shown with the clinical variables.

**Neurological status of the patients with stroke in the study**

Findings of the present study indicate that the patients who received sensory stimulation programme have shown better improvement in their neurological status than the patients who have not received sensory stimulation programme. The findings are in conformity with the studies conducted by many researchers using different stimulations to stroke patients.

A review study was conducted by Martin Lotze and Tobias Kalisch (2012) on “Multisensory stimulation in stroke rehabilitation” in Germany. According to these researchers combining information from different sensory modalities facilitates our ability to detect, discriminate, and recognize sensory stimuli, and learning is often optimal in a multisensory environment. In this multi-sensory stimulation study, the researcher has used training with mirror, various music therapy, and a virtual environment.\textsuperscript{107}
IMPLICATIONS OF THE FINDINGS

The findings of the present research study have several implications for nursing profession i.e. in nursing practice, nursing administration, nursing education and nursing research. The study can be implicated to society as well.

**The implication in nursing practice:**

- Sensory Stimulation Program protocol can be added in the Nursing interventional protocol in Intensive Care Unit, High Dependency Care Unit, Medical Wards and also in Surgical Wards.
- A mini instructional guide/book/pamphlet can be prepared and make available to the public by keeping the booklet in the outpatient department, relative’s waiting areas CT/ MRI departments in hospitals.

**Education:**

- Sensory stimulation protocol used in this research can be added in medical-surgical nursing books in the nursing management of patients with stroke. As it is a noninvasive therapy, the nurse can plan this therapy in their intervention.
- Nursing students can have enough hand on practices, if this therapy is used in the clinical area in medical wards where most of the stroke patients are admitted.
- Planned to teach about sensory stimulation program protocol to the caregivers of the patients with stroke, nurses of various hospitals, caregivers in old age homes, in rural areas and urban centers.
- Sensory stimulation protocol can be added as an educational objective of geriatric courses, ayah bureaus, and nursing aid courses home nursing etc.
- Plan and arrange health education sessions to people staying in the rural areas. A mini instructional guide/book/pamphlet can be prepared and make available to the public by keeping the booklet in the outpatient department; relative’s waiting areas CT/ MRI centres in hospitals.
- A mini book can be written on neurological nursing which can help nurses for neuro assessment, to think about critically outcome of neurological disorders while writing NCP, in planning health education to patients and relatives.

**Administration:**

- Nursing in-charge can use SSP protocol in their clinical area as a routine nursing intervention to stroke patients. As this therapy is already approved by research
ethical committee there will be no ethical issues and no need to have physician’s order for this intervention.

- The Head nurses can add the sensory stimulation protocol in their ward protocol book.

**Research:**

- Many types of researches are done with single sensory stimulation like auditory stimulation with various types of music, olfactory stimulation with different aromas, on mirror therapy, gustatory stimulation, and tactile stimulation.
- There are researches with two sensory stimulation. The research findings are already applied in the clinical area and practised as an evidence-based practice. This present research has proved that multiple sensory stimulations are very good in improving the neurological status of the patients.
- The stimulation protocol can be used in various researches.

**Society:**

- Decided to prepare pamphlets of sensory stimulation protocol which can be made available in Neurology OPDs, Medicine OPDs, CT scan Departments of various hospitals.
- Pamphlets can be distributed to a Hospice Center, Neuro Center, Old age homes, and Community Health Centre.
- The demonstration can be shown in Neuro Rehabilitation Centre and Old age homes so that the protocol can be easily followed.
- Sensory stimulation protocol pamphlets can be distributed to old age group people in parks, their daily evening meeting places, and clubs.

**LIMITATIONS OF THE STUDY**

- Time management - Data collection period was very hectic as the interventions were time consuming.
- Long period of data collection.
RECOMMENDATIONS

- Mini-research with any single stimulation like music therapy with different music, aromatherapy with different aromas, massage therapy with specific oil or with specific massage techniques and only by using mirror therapy, can be conducted.
- Researches can be conducted with a combination of two therapies like aromatherapy and music therapy, aromatherapy and massage therapy, mirror therapy and massage therapy, music therapy and massage therapy etc.
- Researches can be conducted by using various aromas and different kinds of music.
- Researchers can be conducted by using sensory stimulation protocol on traumatic brain injury patients, on Parkinson’s patients, on patients with dementia, patients with Alzheimer, patients with quadriplegia, patients with paraplegia, patients in comatose state due to various reasons etc.
- Different types of stimulation protocol can be prepared and used for Researches.
- Researches can be conducted using various tools.
- Case studies can be conducted with small sample size and long period of intervention.
- RCTs can be conducted with small sample size with implementation of SSP.
- Qualitative Studies can be conducted with stroke patients on different aspects like, altered role in the family due to stroke, problems faced by family members etc.
- A research can be conducted to assess the effect of SSP on neurological condition specifying language, other cortical functions and cranial nerves, motor functions, and sensory functions.
- Studies can be conducted to assess the effectiveness of giving SSP for 8 weeks period and to assess the neurological status for 6-8 months in stroke patients.