Chapter-5

METHODS

5.1 Introduction

Autism spectrum children are non-communicative and lack of attention, lack of body awareness and lack of social behavior problems, etc. definitely requires specialized education system with individual attention. Parents are the first sources of learning for ASD children as most of the time they require constant attention from a person. Because of this reason conventional schools don't admit ASD children and are sent to special education schools for mainly to learn basic life skills or vocational training. In special schools also 1:2 teacher to student ration has to be maintained to handle the children. For teaching physical based exercises like *Yoga* children require individualized physical prompt. Due to this reason this study was designed basically as parental based study keeping in mind large group of children in the study.

For this study sources of the sample were from a special school in Bengaluru West. Children were established previously as ASD children by psychiatrist and school records confirmed this. After a thorough briefing about the study to parents, children were recruited and methodology followed as below.

5.1.1 Sample size

Due to a special category of the population sample, availability and considering the minimum number required for doctoral study as advised by the university (n=30 each group) a total of 68 children were profiled. Sixty-four children were selected finally for this study at the recruitment stage dropping four children due to severe ADHD symptoms. The group was divided into two

as *Yoga* intervention and control group. Each group had 32 (n=32) children and it was arranged by school authorities themselves as per availability of parents and children to participate in the study. Considering the different factors of sources of the sample it was a convenient group.

5.1.2. Selection and source of participants

The participants were selected from a special school attached to a charitable trust by name Academy for Severe Handicaps and Autism (ASHA). It was a non-residential special school, situated in Basaweshvaranagara, Bengaluru West. Children were selected for this study in the month of January 2016 in the age group of 5 to 16 years. Children were regularly attending the same school for more than one year.

5.1.3. Inclusion criteria

- a. Both male and female children considered
- b. Children between the 5 to 16 years considered for the study.
- c. Children should have attended school for a minimum of 1 year.
- d. Children established as autistic under the classification of ICD-10. e. Children whose parents agreed to participate only selected for study

5.1.4 Exclusion criteria

a. Children with major physical impairment will be excluded. (Children with autism having locomotor impairment/disabilities were excluded as they were not able to use limbs for *Yoga* exercises)

b. Children with recurring seizure problem even after medication will be excluded.

c. Children with severe ADHD symptoms will be excluded.

5.1.5 Ethical consideration

The signed informed consent form was obtained wherever possible. Since children were totally dependent on caretakers, the entire protocol was briefed to parents before study along with teachers. We obtained signed an informed consent form on behalf of children from parents before the start of the study.

5.2 Design of the study

It was a two-group pre-post-test design. One group designated as *Yoga* intervention group and another control group with both group having 32 children each (N=32). A total of 64 children were present for post data collection.

5.3 Problems studied

a. Sleep disorder-related (Items SLEEP ITEM-1 TO SLEEP ITEM-15)

- b. Gastrointestinal disorder (Items G I-1 to G I-16)
- **c.** Behavior problems (Items B I-1 to B I-30)

5.3.1 Selection of variables

The variables selected for the study are a sleep disorder, gastrointestinal problems and behavioral problems for persons with autism. Recent studies on autistic children have proved that sleep disturbance; gastrointestinal disorders (food habits and digestion related problems) do have influences on the behavioral manifestation for the children with autism spectrum disorder. Based on the literature survey, it was assumed that 'enhancing qualitative sleep and appetite of children with ASD would have a positive influence on the behavioral manifestation of children with ASD. Based this it was decided to develop *Yoga* interventions to enhance their sleep and appetite so that the behavior problems can be reduced.

5.3.2 Preparation of Interview Schedule and Yoga Program

After visiting a number of schools and after discussions with school authorities, parents and teachers about the problems of ASD children and considering the latest researches the interview schedule was prepared. Before preparing an interview schedule extensive literature search was done to identify scales for assessing problems related to sleep disturbances, gastrointestinal disorder, and behavioral problems among children with Autism Spectrum Disorder. We could not get any standardized scale with psychometric properties measuring problem-related to sleep, gastrointestinal and behavioral problems. Hence it was decided to

develop an interview schedule assessing problems related to sleep, gastrointestinal and behavioral problems among children with autism spectrum disorder. Since the interview schedule does not have psychometric properties like reliability, validity, Cronbach alpha, etc. it was discussed with mental health professionals, psychosocial workers and clinical psychologists working in this field from NIMHANS along with the guides.

Asanas ware selected from the Integrated Approach of Yoga Therapy (IAYT) developed by S-VYASA Yoga University and being used in Arogyadhama for different ailments like Sleep problems, Anxiety and Depression, Gastrointestinal Disorders, Hypertension, Diabetes and many other diseases. Previous studies for behavior problems also considered while selecting asana for this study. For final *Yoga* program guide for this study who is specialized in children's yoga held discussions with the head of Arogyadhama and other experts from S-VYASA University then finalized the yoga program.

The experts gave opinion on relevance and feasibility of the interview schedule and *Yoga* program apart from giving a suggestion for removing some of the items and changing a few statements to make it clear and simple as follows.

5.3.2.1 1Interview schedules

- 1. Your child has problems in getting sleep was removed as it was repeated
- 2. Your child gets up early morning and does not allow you to sleep

3. Your child is very fuzzy with the food

4. Your child decided on what food to eat

5. Your child throws temper tantrums every day for attending school etc. were removed

5.3.2.2 Yoga Program

1. It was advised to exclude any fast breathing *Pranayama* from the *Yoga* Program.

Initially, an interview schedule was prepared just to get to tick mark 'Yes' or 'No' against each statement. But after discussion with the team as per the suggestions five ratings included in the interview schedule as 'Agree', 'Rarely', 'Some Times', 'Disagree' and 'Strongly Disagree'.

Items were as per interview schedule prepared based on three problem areas of ASD children as mentioned above.

a. SLEEP ITEM has 15 items starting from SLEEP ITEM-1 to SLEEP ITEM-15.

b. Gastrointestinal disorder with 16 items starting from G I-1 to G I-16 and

c. Behavior items list has 30 items starting from B I-1 to B I-30.

Tables are as shown in Appendices below.

5.4 Interventions

5.4.1 Yoga intervention and methods followed

There were 32 children in *Yoga* intervention group (n=32) with one of their parent or caretaker present during the intervention. It was made mandatory the present of one of the parents' presents with the child during the intervention and added in inclusion criteria. During the pilot study, it was decided that presence of teachers during the intervention helps in maintaining discipline among the children because all the children were attending school for more than one year and obeying teachers more than parents and *Yoga* teacher at the initial stage. The teachers are special educators hence, knows how to discipline the children. No ASD children were physically impaired or suffering from any visual defects. The main problem with ASD children was a lack of attention in attending in completing any task. Considering the large group of children practically it was not possible to lend helping hand in performing postures hence, it was decided to make it parents based program. Children were also not comfortable with physical contact from any stranger other than their mother or school teachers at the initial stage.

5.4.2. Yoga Program

Swamy Vivekananda Yoga Anusndhana Samsthana (S-VYASA) University has developed Integrated Approach of Yoga Therapy for different ailments like Anxiety and Depression, Arthritis, Gastrointestinal disorder, Sleep problems, Asthma, Epilepsy, Back pain, Neck and Shoulder pain, Hypertension, Diabetes and many other ailments. These yoga modules are being used in Arogyadhama attached to University for treating them successfully. Yoga program was prepared selecting asana from these IAYT modules related to problems of ASD children and

from previous studies for behavior problems.

Yoga is the process of uniting body and mind. Yoga helps to increase concentration, memory power, calming down the mind, body balance, body awareness, strengthening the muscular system, regulating breath, digestion system, sound sleep which total relaxation to the body and creates positive health. It helps to have control over our mind in carrying out natural activities to be carried out continuously. To have control over our mind, we need to have a healthy physical body, that's where Yoga helps. Yoga initially helps in strengthening the body and have control over the mind.

Yoga practice calm mind, increase focus and induce good sleep (Horvath, 2005). Yoga brings more quietness and sound sleep, which benefits physically, mentally and emotionally as per parents report post Yoga (Marech, 2006). In one of the study conducted previously shows how the breathing technique is useful in self-regulation, focus, heightened social interaction, reduced stress level and reduced tantrums (Leschm-Hoar, 2003). Yoga intervention increases imitation skills pertaining to communication, functional object use, playing with peers, gross motor movements, oral facial movements, verbal language, eye contacts will be improved (Radhakrishna, 2010a). Some of the postures included in this module like Sun Salutation (Surya Namaskar), Mountain Posture (Tadasana), Tree Posture (Vrikshasna), Triangle Posture (Trikonasana), Warrior Posture (Virabhadrasana), ThunderBolt (Vajrasana), Lotus Posture (Padmasana), Butterfly Posture (Titaliasana), Seated forward bend posture (Paschimottasna), Boat Posture (Navkasana), Bow Posture (Dhanurasana), Cobra Posture (Bujangasana), Shoulder Posture (Sarvangasana), Plough Posture (Halasana), Corps Posture (Shavasana) and

Regulate Breathing (Pranayamas) like Nadanusandhana, Anuloma Viloma reduces selfinjurious behaviors and aggressive behaviors of ASD children(Sharma & Sharma, 2016). Yoga effects at both physical and mental level. Combination breathing exercises (*Pranayamas*), physical postures (äsana), relaxation like corpse posture(corpse posture) and chanting slokas/kirtan (Sacred mantra) will bring changes in social withdraw or depression, stereotypic behavior, hyperactivity, irritability, agitation, crying, non-compliance and also inappropriate speech of ASD children (Koenig, Buckley-reen, & Garg, 2012). As listed in this Yoga module which reflects IAYT module being used in S-VYASA and using sequence of warm-up exercises, strengthening asana, loosening äsana, calming äsana (physical postures), vogic breathing practices and chanting slokas (sacred mantras) will bring total improvement in eye to eye gaze (EEG), sitting tolerance(SI), body posture(BP), body awareness(BA), perception and balance(DPPB), imitation skills(IS), self-stimulatory Behavior(SSB), receptive skills related to spatial relationship (RSRSR) and self-injurious(SI) Behaviors of ASD children (Radhakrishna, 2010b). Combined practice of breathing exercises and äsana improves sensory integration, body awareness and appropriate behavior in carrying on physical task and body awareness and balance (Kenny, 2002). The practice of breathing technique (Pranayama), Yoga postures (äsana) and Yoga relaxation (Shavasana) brings positive changes in ASD children's symptoms like externalization, internalization, hyperactivity, aggression Behavior anxiety, depression, somatization, sameness, withdrawal symptoms, attention deficit and other Behavior problems as mentioned in the Behavior item (Rosenblatt et al., 2011a). The Yoga module includes relaxation posture (Shavasana), cleansing or breathing which calms down the mind and physical postures like kneeling postures, shoulder posture (Sarvangasana), supine postures, prone postures, standing äsana like mountain posture (Tadasana) and tree posture (Vriksasana).

These are included to bring changes in sensory integration, gross motor movement, sense of personal space, ability to switch from one activity to another, develops self-esteem, improves communication skills and peer relationship (Behar, 2006). Mountain Pose (*Tadasana*), Forward bend pose (*Pada Hasthasana*) and Tree Pose (*Vrikshasana*) helps children in releasing tensions and be calm. Seated spinal twist (*Ardha Matsendrasana*), Down Dog pose (*Adhomukha Swanasana*), Warrior pose variant I and II (*Virabhadrasana*) and Triangle pose (*Trikonasana*) helps children in increasing core strength, tone up muscle, muscular flexibility. Spinal twist (*Matseyndrasasna*), Baby poses (*Balasana*) and Corpse Pose (*Shavasana*) help in balancing energy and to maintain calm (Studnitzer, Allen, 2014).

This study was first of this kind where an intensive *Yoga* program prepared keeping in mind three problematic areas of ASD children bring positive changes in both physiological and psychological problems. Sleep disorder and gastrointestinal disorder which is mainly due to the wrong lifestyle like food habits. The *Yoga* module was prepared to bring positive changes in deficiency like fine motor movement, sensory integration, communication and social interaction, lack of cognitive ability, some of the behavior like self-stimulation, self-injurious behaviors, anxiety, and depression. Children also lacking in imitating skills which are an essential skill for any life for proper development. This was another reason for making parents' part of this program.

5.4.3 The different process and steps followed during intervention

Yoga intervention was held on the 4 floor of the school without any disturbance and it was well ventilated and spacious to accommodate more than a hundred people. It was very calm away from vehicles or any other noises and pollution free. Before the start of the program, it was informed parents to bring Yoga mats for both children and themselves. Racks were arranged in one corner of the hall so that children roll the mat themselves and place it in their designated places. After few days when they come for the session they should able to identify their mat, pick the mat and spread on the floor in their designated places and sit in Vajrayana to wait for Yoga teacher's instructions.

A Yoga teacher appointed was a post-graduation in Yoga from a university with many years of teaching experience. Yoga teacher stood in the first row along with teachers facing children and their parents each other. Children and parents arranged their mat side by side in a row facing towards Yoga instructors and teachers with sufficient space to move hands and legs during practice. Yoga practice of six steps and eight steps method were followed with instructions in English.

5.4.3 Stages of *Yoga* intervention

Stage 1 - First Week

Since the name of the *äsana* was related to either some animals or things in nature, *Yoga* teacher used those names of the *äsana* where children can understand easily and turn their attention towards *Yoga* instructor during the intervention. Parents were also instructed to use

those names repeatedly so children should able to understand wherever possible which animal mimicry they are doing and this was made parent's work easy during practice.

During the pilot study, it was decided to divide the whole *Yoga* module into two groups. All the *äsana* were assigned with number 1 and 2. Some of the *äsana* were assigned to both the numbers. *Äsana* with number 1 and 2 practiced alternative days, whereas as *äsana* with both the numbers practiced all the days (for example Sun salutation). The whole of the first-week parents helped children physically apart from learning themselves. Some older children were able to understand the sequences, but younger children due playful mood have to be held by parents literally to make them remain on the *Yoga* mat. Irrespective of their understanding in the first week all the children were helped physically by parents to perform *Yoga*.

The intervention started with starting a prayer as parents helped children to sit in Thunderbolt (*Vajrasana*) posture with *Namaskara Mudra* after assembly of all children and parents. *Yoga* module list in sequence with the name of the asana mentioned both in Sanskrit and English along with a picture of animals or things related to particular asana and also demonstration picture of individual asana provided to individual parents to be followed during the intervention. All the children and parents made to sit in facing *Yoga* teacher during prayer.

After prayer steps followed as follows

a. *Yoga* teacher explained about the name of the asana, initial position, steps and breathing to be followed.

- b. Yoga teacher gave a silent demo of asana to be observed by all.
- c. Demonstration by Yoga instructor with other teachers with number counting.
- d. *Yoga* teacher gave instructions with the demo to be followed by only teachers and mothers so that children can observe movements.
- e. In the next step, parents helped children with physical touch to each and every step of the asana to be adopted by children.
- f. Many children could not understand breathing and parents were asked to practice separately at home standing in front of the mirror. Blowing balloons, blowing against mirrors where fog formation takes place, soap-water bubbles blowing, blowing light materials like a piece of paper or leaves were some of the activities to make children understand breathing. After each asana relaxed for a few seconds and parents advised to be playful with children always so that children feel relaxed. The children were unable to close the eyes and remain in Corps pose for relaxation. For this parent were asked to keep the handkerchief over the eyes and gently touch with hands to see that children practice closing the eyes. It took more than one week to learn children to remain in Corps pose with closed eyes.

Stage 2 - Second Week

Each week started with discussions with parents and teachers in the presence of the researcher to get the feedback from parents and teachers. Mats were written with child's name in such way that when kept in rack names should be visible. From 2nd-week children were asked to take out mats from the rack and spread in designated places next to the side of their parent, sit on the mat and wait for the instructions. Some children could do this were helped by

parents. Children were asked to follow instruction from a *Yoga* teacher. Again, parents were helping wherever necessary. Before each and every asana parent were asked to show the picture of asana shown in the *Yoga* module to give them a visual idea about posture. End of the session children was asked to roll the mat and keep in designated places in the rack.

During the second-week parents were advised to try to avoid physical help wherever possible gradually. Children age of above 12 years less physical help others continued with physical help. In 2nd week parents and children made to stand facing each other to induce imitating action in children by looking at their parent's movements as well as to improve eye to eye contact. Yoga instructor started with verbal instructions followed by parents and children adopting postures. It was a slow process as children required to adjust to an environment in the session as well as to get familiarized with a Yoga teacher. This week also Yoga instructor gave a demonstration with verbal instructions along with other teachers. Parents helped children with physical touch. Yoga teaching as per the list is shown in the list in sequence starting from breathing practices, wind releasing postures, preparatory loosening / dynamic practices, Sun salutations, Yoga posture (standing, sitting, prone and supine), regulated breathing (Pranayama) and corpse posture (relaxation) followed by sloka chanting. End of the $2^{\scriptsize{nd}}$ week more children started imitating but with the less physical prompt. Children started performing Pranayama with caretakers help. Parents were instructed to practice äsana at home, which was not practiced in the Yoga session in the evening time so that to cover all the äsana every day. We received feedback that children were very cooperative in practicing at home in the evening. End of the 2 week we have observed marked improvements in all aspects of children's physiological problems as well as behavior. Children started having a good sleep in the night at a stretch for a long period, which helped parents also to have a good sleep.

Stage 3 - Third Week

In the third week, few children were expecting physical help from parents during intervention particularly younger ones. Children were calm during the session and they were showing eager to come to a *Yoga* session. *Yoga* session was conducted all the days of the week on a request from parents at the school works for only five days in a week and whole two days children idling at home without any activity. After the start of intervention, parents were happy that they could keep the Children busy with this activity. In the 3rd week, it was a more successful week as more children started following verbal instructions as well as following all the steps with the minimum physical prompt.

Stage-4 Fourth Week

In 4th-week parents were advised to avoid physical prompt and allow children to follow either instruction or imitate parents to follow steps perform *äsana*. Children who were able to follow instruction made to stand facing teachers and others facing their mother. End of the 4th week all the children learned to imitate steps and follow instruction with enhanced speed and perfection. Parents were also practicing side by side.

Regular discussions were held with parents and teachers every weekend to find difficulties if any, and improvements in children's all the three areas of problems. Parents were made to write dairy every day without fail and note down information given by *Yoga* instructor and researcher for future use. Parents were very co-operative following all the instructions with a positive mind. As instructed by *Yoga* instructor it was assumed that parents along with their children practicing at home also. At the end of the sessions, it was advised to parents to continue to practice without fail to see further improvement in children and overall development also to enhance the quality of life of the entire family.

5.4.4 Yoga Interventions

5.4.4.1 Pilot study

A pilot study was conducted to familiarize the above package and to test the feasibility of conducting a *Yoga* intervention involving seven ASD children at Assessment Training and Guidance (ATG) center, Mahalakshmi Layout, Bengaluru. This was a pilot study with pre and post-test single group design. A group of 7 children between 5-16 years of age, of mean value 11.14 and standard deviation of 3.76 was selected from ATG Centre Bengaluru. We briefed parents and staff of the ATG center about the intervention. The intervention was conducted during the 2nd and 3rd week of January 2016. The session was held every evening between 5.45 pm to 7.00 pm for 75 minutes. We included children whose parents were willing to participate with their children in the intervention. The interview schedule was used to collect data pre and post structured *Yoga* intervention module prepared by the researcher based on the three problematic areas of ASD children sleep gastrointestinal and behavior problems. The interview schedule was used by teachers to collect data from parents about the children pre and post *Yoga* intervention.

A Yoga instructor with post-graduation in Yoga with several years of teaching experience conducted Yoga intervention. Most of the children were physically helped by their parents during the intervention at the initial stage. We understood that it was not possible to practice entire Yoga module in 75 minutes. It was divided into two groups, assigning number 1 and 2. According to the number indicated in the module, asana (postures) was practiced on alternative days and some asana (postures) marked both numbers indicating those to be practiced in every day. This was made easy for both children and parents to practice Yoga. We requested parents to practice at home in the mornings whichever asana (postures) not practiced at the center with their children during the intervention period. Earlier studies have shown improvements in eye to eye, sitting tolerance, communication skills, body posture and awareness, receptive skills and selfstimulatory behavior etc. of ASD children over a longer period of intervention. In this study due to a short period, not many changes were seen in behavior problems through the severities changed from higher levels of the problem to the lower level. In one of the studies involving Yoga as integrated movement therapy encouraging results have found in physical stimulation, social interaction, language stimulation, self-calming etc. With this pilot study, we collected some useful inputs for our main study planned for a large group of ASD children. It was concluded that parental based Yoga intervention can be conducted for a large group of ASD children. Teachers' involvement in such studies will have disciplined children during the intervention. We need to conduct Yoga intervention for a longer period to see significant changes. This was a single group study with small sample size without a control group. For data collection, we have to totally depend on parents and teachers. The study conducted for short periods, hence not saw many changes in behavior problems.

5.5 Data Collection

All the data were collected between the last week of January 2016 and last week of April 2016. After the final recruitment of the sixty-four children and caretakers, the participants were requested to be present on a particular day for data collection during weekdays. Teachers thoroughly explained about data collection, particularly about the interview schedule to the parents. Parents were called by teachers one by one and made them tick mark each of the items after explaining to them. It was pre-intervention data collection at the end of January 2016. All the 64 parents from *Yoga* group and the control group were attended on the day. Data were collected by teachers under the observation of researcher. The process was carried out as mentioned below.

- a. Socio-demographic of children.
- b. Socio-demographic of parents.
- c. Interview schedule based on sleep disorder, gastrointestinal disorder, and behavior problems

There was a total of sixty-one items in interview schedule based on three domains of the problems of ASD children. Fifteen items on sleep-related problems, sixteen items on gastrointestinal (food habits and digestion related) problems and thirty items on behavior related problems. Interview schedules were in the tabular form in three different sheets and administered to the caretaker of the children by teachers under the supervision of a researcher. Pre-*Yoga* intervention data were collected from both intervention and control group. After three months *Yoga* intervention post data were collected.

After three months of Yoga intervention, all the parents and children of both groups were

requested to be present for post data collection. All the intervention group children and parents were a parent, but three parents from control group absent citing reason out of the station. In post data collection only interview schedule was presented to parents and asked them to tick mark the items as per their observation of the children. After post data collection school summer vacation started hence the data of three children from control group could not be collected and considered as a dropout.

5.6 Statistical Analysis

Statistical analysis was done using RStudio Version 1.0.153. All the data were tested for normality and found to be not normal. The analysis was done within the group under Wilcoxon Signed-rank Test and between the groups using Mann-Whitney test. Item analysis was done for each of the items of the interview schedule. In within the group analysis, there was significant change seen in the case of the *Yoga* intervention group using pre and post data. In case of a control group within the group, no significant changes were seen.

In between, the group analysis difference between *Yoga* and control group, there was no much difference in baseline data whereas post-intervention significant changes seen between *Yoga* and control group. All the analysis like within the group, between the group and item analysis rests were presented in result section with the numerical and graphical presentation as explained below.

Raw data of a total of sixty-four subjects collected during pre-*Yoga* intervention with thirty-two (n=32) subjects each batch. But in post-*Yoga* intervention out of sixty-four subjects, only

sixty-one attended. Three subjects from control group did not attend for post data collection due to families were out of the station due to some urgency as per the information received from school authorities. All the pre and post data collected were put into tabular form separately as *Yoga* group and a control group. A code number was given to the *Yoga* group subject as YG-1, YG-2 etc. till YG-32 for total thirty-two subjects. For control group CG-1, CG-2 etc. was given as code number for twenty-nine subjects.

After checking for normality it was found data were not normally distributed, hence, the data considered as non-parametric values. The frequencies of the data were found comparing pre-intervention data with post-intervention. All the frequencies put into tabular form separately for both the groups. Descriptive analysis was done to find different values like mean value, standard deviations, variances, confidence level, etc. and all the results kept in a separate tabular form. Since it was a non-parametric data Man Whitney and Wilcoxon analysis test was done to find z-scoring and significance in the post data.

Fig-5.1 Material and Methods Flow Chart

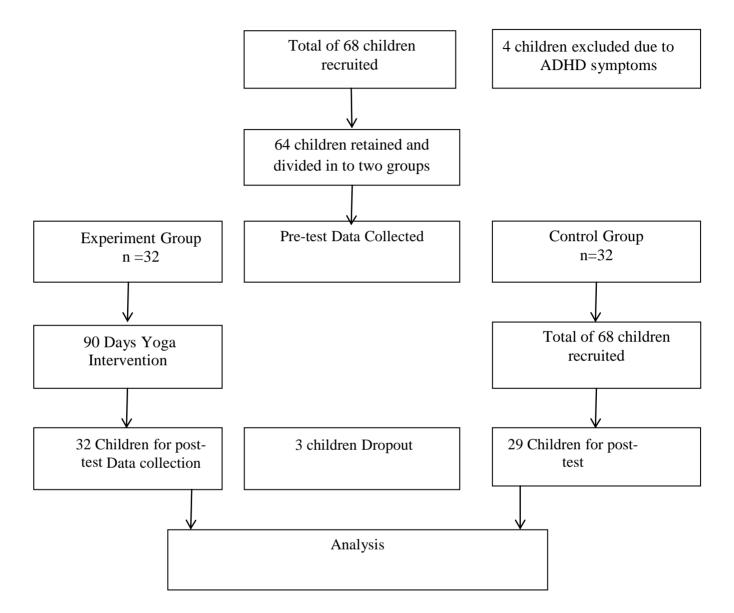


Figure 5.2 YOGA PROGRAM WITH DURATION

S.N	Item	Time
	Starting prayer	
1	Breathing Exercises	2 min
2	Preparatory/Dynamic Practice	8 min
3	Wind Releasing Practices (Pavana Mukthasana)	7 min
4	Sun Salutation (Surya Namaskara)	6 min
	Relaxation	1 min
5	Standing asana (postures)	8 min
6	Sitting asana (postures)	11 min
7	Prone Posture	2 min
8	Supine Posture	5 min
9	Pranayama (Regulated Breathing Practices)	8 min
	Relaxation	8 min
10	Chanting Slokā (Mantras)	9 min
	Ending Prayer	