CHAPTER III

METHODOLOGY

Waste poses a serious threat to public health and sanitation. Even while the waste generated in India, particularly in rural areas, is primarily organic and biodegradable, it poses a significant role in ecological balance. Solid waste management is an outcome of rapid industrialization, growth in population, growth in consumerism, and changing life styles.

The present research entitled **"Disseminating Knowledge on solid waste management" is** described under the following headings.

PHASE I-Preparatory Stage

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3.1.3. Selection of the sample and size

3.1.4. Selection of sampling method and Tools

3.1.5. Framing a Research tool and validation

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PHASE II- Implementation Stage

3.2.1. Pre orientation on Educational intervention on solid waste management

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PHASE III- Impact assessment stage

3.3.1. Post assessment of Educational intervention programme

3.3.2. Analysis and interpretation of data

PHASE I-Preparatory Stage

3.1.1. Research Design

Research design is the design and arrangement of the investigation, so apprehended as to attain responses to enquiries of investigation and control variance (Kerlinger, 1986). It is also denoted as a proposal that offers the researcher with a thorough framework or proposal for the assortment and investigation of data (Rosenthal and Rosnow).

The study of quantitative investigation accepts that, survey design aids in understanding the purposes of the research. It results in the gathering of documents over a number of variables at the sole interval. In the sense of conservative stage, this survey exploration approves the descriptive design.

Correlational field inquiry based on survey data gathered in the field, (that is, in a non-contrived setting such as an organization) in which the association amid one or more independent variables and one or more dependent variables are examined (Tharenou, Dononlue, and Cooper, 2007). Thus, this study approves the descriptive, correlational field survey design as the motivation was to inquire the connection among variables.

3.1.1.1.Theoretical framework of the study

In this research, the study has considered the intervention type of the theories. Theories that give acknowledgment in a discipline that shape the field, help describe the space of practice, and impact of training and socialization of its professionals. Nowadays, no particular theory or conceptual framework governs research or practice in waste management and education. This training strategy followed that provides awareness on the waste management. In the global perspective of resource awareness and education in waste management theory provides a maximum benefit. The Tailors Declaration is a declaration for sustainability concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources. Also as per the Environment Ministry has revised Solid Waste Management Rules address the specified objectives. This rule is established in addressing a press conference to announce the revised Rules here today, Minister of State (Independent Charge) of Environment, Forest and Climate Change, Shri Prakash Javadekar said that the Rules are now applicable

beyond municipal areas and will extend to urban agglomerations, census towns, notified industrial townships, areas under the control of Indian Railways, airports, defence establishments, special economic zones, State and Central government organizations, places of pilgrims, religious and historical importance.

Figure 6 Schematic representation of the methodology

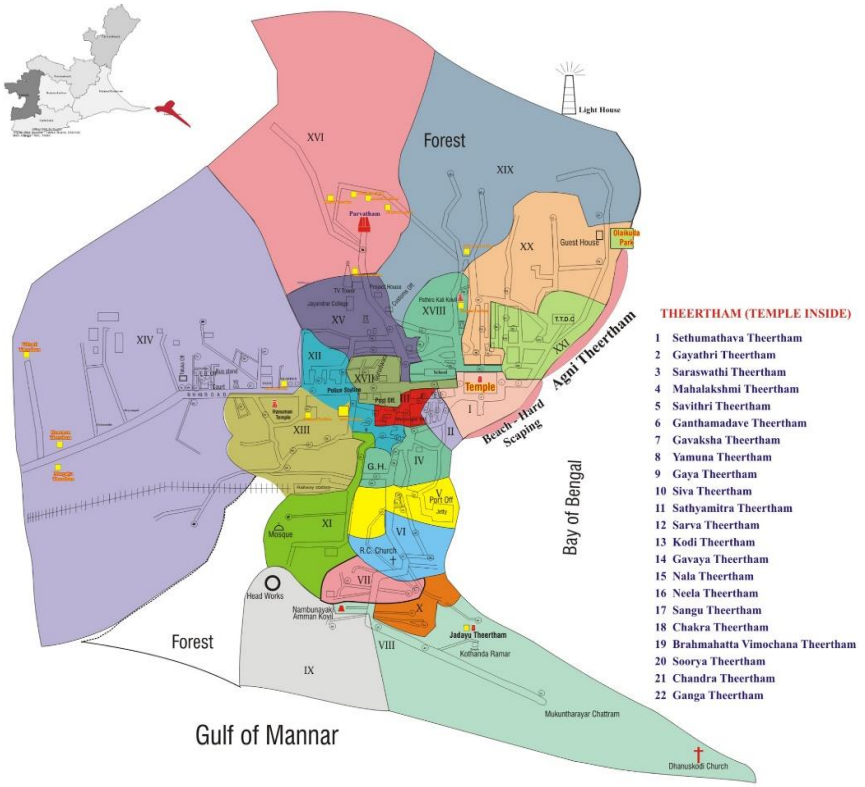
3.1.2. Selection of the study area

Rameswaram is a temple town, a Hindu pilgrimage holy destination, and a second grade municipality in the Ramanathapuram District of Tamilnadu, India. It is about 40 kilometres from Mannar Island, Sri Lanka, and is located on Pamban Island, which is separated from mainland India by the Pamban strait. The railway line connecting Chennai and Madurai terminates in Rameswaram. It is the closest place from which one can go to Sri Lanka by water from India.

The average elevation of Rameswaram Island is 33 feet above sea level. The island is in the shape of a conch and covers an area of 61.8km2 (23.9sq.m). Due to the presence of the sea, 74% of the territory has sandy soil, and there are also several islands surrounding it. The Ramanathaswamy Temple takes up a large chunk of Rameswaram's territory. The beach in Rameswaram has no waves at all; the sea waves reach a maximum height of 3 cm (0.10 ft), and the sea resembles a large river. The climate of Rameswaram is dry tropical with little humidity. From October to January, the average monthly rainfall is 75.73 mm (2.981 in). The highest temperature ever recorded at Pamban station was 37℃, and the lowest was 17℃.

As of 2004, Rameswaram Municipality is part of the Madurai area. With a land size of 53 square kilometres, Rameswaram is a component of the Madurai region. Rameswaram had a population of 44856 people in 2011, with a sex ratio of 969 females to 1000 males, according to the 2011 census. There were 5,022 children under the age of six, with 2,544 boys and 2,478 girls. Scheduled castes and Scheduled tribes made up 6.8% and 0.3 percent of the total population, respectively. The current population is 50,594, according to municipal records. Rameswaram is divided into 21 wards and numerous hamlets, each of which is the size of a town or sub division with a tiny human habitation. The town's average literacy rate is 73.4 percent, compared to 72.99 percent nationally. There are 12,813 dwellings in the town. According to the 2011 religious census, Rameswaram had 87.4 percent Hindus, 4.36 percent Muslims, 8.13 percent Christians, 0.03 percent Sikhs, and 0.01 percent Buddhists.

TAMILNADU STATE **RAMANATHAPURAM DISTRICT**



RAMESWARAM

Figure 7Locale of the Research area

Table VI shows the details of wards and households in Rameswaram

Table VI

Details of Wards and Households in Rameswaram

Ward No	No of Household	Ward No	No of Household
1	98	12	755
2	225	13	736
3	170	14	1084
4	409	15	661
5	487	16	260
6	630	17	612
7	773	18	627
8	654	19	589
9	346	20	527
10	654	21	577
11	459		

Source: Municipality Record, Rameswaram

3.1.3. Selection of the Sample and size

The success of any study depends on the careful selection of samples. The sample size must be determined depending on considerations such as the study's nature, the universe's size, the sample's size, the level of precision sought, and the availability of resources. **(Saravanavel, 2010)**. A sample consists a limited number of individuals of the population living in the selected area. It is used to obtain information through surveys. The elements of a sample represent a subset of the population in the study units.

Stratified Random Sampling technique is adopted for this research. For analysing the randomly collected data collected from the women of Rameswaram the total sample is separated into groups randomly. The random sampling is a sampling technique that considers the essential needs present in respondents and, therefore, all of the components in the sample have similar possibility of being considered for analysis.

Table VII gives information related to ward wise distribution of selected women.

Distribution of women among the selected wards for pre assessment stage

Table VII

Ward wise distribution of selected women

Name of the ward	No of Household	Name of the ward	No of Household
Kariyur	50	**Annanagar**	50
Sambhai	50	**Ramartheertham**	50
Maruthupandinagar	50	**Murugaivadi**	50
Cherankottai	50	**Sallimalai**	50

Source:Rameswaram Municipality-Annual report, Census Record, 2011& current record

Sample size determination

The size of Sample is determined by Taro Yamane formula from the population 44,586 as per census 2011, but the current population is 50,594 (as per record).

Sample size calculation: n =N/1+N (e) 2

N=population size (Population of Rameswaram 50,594 (as per current record)

n = required sample size

e =level of precision (considering 50%)

n= 50594/1+50594$(0.5)^2$ = 399.54≈ 400, Hence 400 women are selected for the research.

3.1.4. Selection of method

Survey is the method adopted for collection of data. The survey approach entails the creation and dissemination of a structured questionnaire intended to elicit specific information from respondents. Respondents are asked a series of questions about their actions, objectives, attitudes, awareness, motivations, and demographic and lifestyle factors.

3.1.4.1. Source of data and unit of analysis

The Data denotes the source or sources of relevant information to be tapped to fulfill the objectives of the survey (Ramchandran, 1993). There are two analysis methods following in data analysis primary or secondary. Primary data corresponds to the

information collected for the first time and are original in character (Kothari, 2004). The data for this study were collected from primary sources.

Unit of investigation refers to social entities whose social characteristics are the emphasis of the study (Baker, 1999), the unit of analysis may be individuals, groups, programs, organizations or institutions depending on the research questions developed for the study. In this research study, the individual respondents constitute the components of analysis.

Data can be collected through two main resources, which are primary and secondary data. It is believed that the finest combination of information was obtained by combining both categories of data. The primary source of data is obtained from the questionnaire,and the secondary data sources are from books, journals, e-journals, databanks and the Internet.

Secondary Data

Secondary data denotes the information or facts already collected. In the first explorative phase of the study, the ancillary information was gathered in the custom of a review of the literature to acquaint the investigator with the various characteristics of the research from different sources like journals, magazines, books, research papers, internet, newspapers, and reports.

Primary Data

Primary data discusses the first-hand information collected for the research by a researcher with own personal effort. This information is the specific data which the researchers collect or observe by themselves such as conducting a questionnaire and interview. This specific statistic can be seen as important data since the records are unique, and it is collected and observed based on the specific purpose draw by researches. In this investigation, the authors conducted a questionnaire for gathering all concrete information to analyze and answer all the issues in this research question. Primary data is seen as valuable and essential data in the research regarding an exclusive result that the authors obtained directly from the survey.

3.1.5. Framing a research tool

Interview schedule is a structured instrument for collecting primary data from the sample. A well-designed questionnaire facilitates the respondents to provide complete and accurate information. As a result, data is collected using an interview schedule. The purpose of the questionnaire is to determine the level of solid waste management knowledge in the chosen location. The following are the subgroups of the questionnaire: Profile socioeconomic, Household waste generation and disposal, Challenges faced by homes owing to the accumulation of household garbage, Current environmental conditions in selected areas, Garbage collection service, KAP on solid waste management After a solid waste management educational intervention, a KAP assessment is conducted to evaluate the intervention programme. The Annexure contains questionnaire and it is attached in Appendix I

Variables of the study

The study is to assess the knowledge, attitude and practices on solid waste management and evaluate the impact level of educational intervention programme. Hence the dependent variables are outcome of the intervention programme among women in their Knowledge, attitude and practice and independent variables are the mode of intervention study given by the researcher.

S. No	Variables	Measurement
A. Independent variable		
X_1	Age	The scoring procedure followed by Jayanthi (2016)
X_2	Caste	Followed by Belli, R. B., 2008,
X_3	Religion	Followed Durkheim 1915; Fasching and deChant 2001
X_4	Marital status	The procedure followed by Mansingh (1993)
X_5	Education qualification	Developed by Mansingh(1993)
X_6	Types of family	Developed by Trivedi(1963)
X_7	Family income	Followed by Krishnakumar(2002)

S. No	Variables	Measurement
A. Dependent varaiable		
Y_1	Awareness on solid waste management	Developed for the study
Y_2	Problems faced by the people due to accumulation of the study	Developed for the study using Likert (1967)
Y_3	Knowledge level on solid waste management among selected women	Developed for the study
Y_4	Attitude level on solid waste management among selected women	Developed for the study, Likert scale (1967) was used
Y_5	Practices on solid waste management among selected women	Developed for the study

3.1.6. Conduct of Pilot study

The programme is meticulously planned in order to collect the necessary data and to ensure the questionnaire's validity and reliability. Pilot study is done with 50 women. The pilot study helps in improving data collections, scoring techniques, revising locally developed measures and checking the appropriateness of standard measures. (Hadjithoma 2007). Based on the experience gained during pretesting, the schedule is modified to avoid ambiguity and complexity. The schedule is finalized and presented.

3.1.7. Obtaining ethical clearance for the study

Theinstitutional Human Ethics Committee Institute of Avinashilingam Institute for Home science and Higher Education for Women has approved to carry out the study (proposal no. IHEC/18-19/HSEE/04) based on the topic "**Disseminating Knowledge on Solid Waste Management"** submitted by the investigator. The approval number for the same is AUW/IHEC/HSEE-18-19/XPD/04. The clearance certificate is enclosed.

3.1.8. Creating Rapport Building with selected women

Rapport building is the process of creating trust and cordial relationship between two or more people. A friendly relationship is created between the respondents and the investigator. Hence before conducting the study rapport building is vital and it paves way for eliciting valid data.

In the present study good rapport was created between the selected women and the investigator. With permission of the municipal commissioner of Rameswaram and help from SHG leader, the investigator visited the wards and conducted the study in the selected areas.

3.1.9. Pre assessment survey of the study

There were 21 wards in Rameswaram. Among them eight wards were selected, for the study. Based on certain criteria such as solid waste generation, disposal behaviour of waste and enormity of other activities near waste collection points in the area, women were drawn from 400 households, and 50 representing each ward were chosen as samples to carry out the study. A survey was conducted to selected 400 women. The survey focused on the socioeconomic profile of the women in these families, as well as their concerns with solid waste disposal and their level of solid waste management awareness. The survey results are analysed and interpreted and presented in the following chapter IV.

Plate 1 Data collection

3.1.10. Preparation of the plan of work

Table VIII denotes the plan of work to conduct the education intervention programme

TABLE VIII

PLAN OF WORK TO DISSEMINATING THE KNOWLEDGE ON SOLID WASTE MANAGEMENT

Date&Time	Topic	Objective	Content	Training materials	Venue	Resource person
10.02.19& 11.02.19 10.00am-12.00pm	Solid waste management	To know the meaning and types of wastes. To comprehend the significance of solid waste management To learn about the negative consequences of poor solid waste management on people and the environment.	Solid waste management concept, solid waste kinds. The significance of solid waste management, as well as the consequences of poor solid waste management on people and the environment.	IEC materials, posters Power point presentation	Anganwadi Hall	Ms.Saraswathi Project coordinator Vivekananda Kendra Rameswaram.
24.02.19& 25.02.19 10.00am-12.00pm	Pollution	To know the meaning and aspects of pollution. To know about its types and its harmful effects on people's health.	Meaning of pollution. Types and its causes of pollution. Health hazards due to pollution.	IEC materials, posters Power point presentation	Anganwadi Hall	Mr.Iyyappan Sanitary Inspector Municipality Rameswaram

Date&Time	Topic	Objective	Content	Training materials	Venue	Resource person
12.03.19& 13.03.19 10.00am-12.00pm	Waste management techniques	To know the different types of techniques available for waste management.	Meaning of solid waste management, types of waste management techniques-composting vermicomposting, Biogas, Recycle	Posters, power point presentations, field visits	Composting unit	Mr.N.Gopisankar Project Head, Hand-In-Hand India Rameswaram
22.03.19& 23.03.19 10.00am-1.00pm	Waste management techniques	To know about terrace and kitchen gardening	Process involved in Terrace gardening, and kitchen gardening	Field visits, posters	Composting unit	Mr.Muthu Supervisor Hand-In-Hand India Rameswaram
10.04.19& 11.04.19 10.00am-1.00pm	Solid waste management	To know the importance of solid waste management.	Effects of solid waste management on environment.	Short films	Anganwadi Hall	-
21.04.19& 11.04.19 10.00am-1.00pm	Pollution	To give awareness on pollution to public.	Effects of pollution	Rally	Dhanushkodi	Rameswaram municipality and Hand-In-Hand India Rameswaram
11.05.19& 12.05.19 10.00am-1.00pm	Solid waste management	To give awareness on environment.		Mass cleaning	Rameswaram	Hand-In-Hand India Rameswaram

3.1.11. Preparation of IEC materials

Booklets

Booklets are small, pocket size booklets containing information regarding solid waste management are made and distributed. The booklet contain details on waste, types of wastes, methods of segregation and disposal of wastes. Types of composting and its uses are discussed in the booklets. In order to reach the masses the details are presented in the vernacular language (Tamil). It is enclosed in the annexure.

Pamphlets

Pamphlets are small leaflet containing information related to one content. Eg.Pollution and its effects.

Lecture cum Demonstration

Lecture is a way of communication that brings changes in the behaviour of the selected respondents. The subject experts explain the areas related to solid waste management. Demonstration helps the respondents to gain knowledge on methods involved in composting and its various benefits. In the composting yard the wastes are segregated, decomposed by worms. After a period of time it is used as manure in agriculture. The IEC materials are prepared by the researcher and it given in Appendix III

PHASE II- Implementation stage

3.2.1. Pre orientation on intervention through education

Orientation programme is very important and plays a vital role in explaining the purpose of meetings or programmes. The researcher orients the educational intervention programme, objectives of the programme, its schedule and importance of the programme and how it brings about social change. The target respondents are identified based on their interest and volunteering nature in attending the programmes. Researcher selected 100 women drawn out from 400 total samples based on their interest for the educational intervention programme.

3.2.2. Conducting educational intervention programme on solid waste management

At a convenient moment for the attendants, an education intervention programme on solid waste management is conducted to select women according to the work plan. The programme is organised with the help of materials prepared by the investigator. The IEC materials are distributed during the intervention programme. The resource persons related

to the field of solid waste management are arranged for the programme. The programme includes lectures by experts with videos, demonstration in composting yard, Field visits, pamphlets and booklets. The resource person list is enclosed in Appendix II.

Plate 2: Imparting educational Intervention on Solid waste management

Plate 3: Giving Awareness on solid waste management

Plate 4: Field visits to the Composting yard

3.2.3. Distribution of IEC materials

IEC is a learning process that allows people to make decisions, change their behaviours, and improve their social situations. It can create the awareness on solid waste management, increase knowledge, and effect change in attitudes of the respondents. The pamphlets are distributed during the education programme. During the intervention the women households attend the lectures by subject expert on solid waste management. Demonstration done in front of respondents regarding composting, how to segregate the wastes helps the learners, videos and short films are arranged to create awareness among the selected women households.

IEC materials for the intervention programme are prepared and it is enclosed in annexure I

The IEC materials are prepared based on wastes, types, and sources. The segregation of waste and their benefits, composting, vermicomposting and effects of pollution due to environmental degradation are explained as follows,

Waste is unwanted materials and it is a substance of no use. And waste seen around the environment also called garbage. Garbage mainly composed of waste and it includes waste from houses, institutions, commercial, buildings, factories and industries.

Sources of waste can be differentiated into major aspects as industrial, commercial, agricultural and domestic waste. The wastes from industries, factories and this wastes are dumped in river and sea and leads to pollution. The commercial wastes from schools, institutes, and complex buildings.

The wastes like leaves, kitchen wastes, food debris and waste collected during the household activities are domestic wastes. Various wastes from agricultural land may include cattle waste, weeds and husks. Biodegradable and non-biodegradable waste are the other two categories of waste.

Biodegradable wastes are the waste that comes from plants, animals and living organisms and it includes remnants of food, vegetables and fruits peels, weeds and dead plants, animals waste, flowers, paper etc. The non-biodegradable wastes include plastics, polythene covers, containers, glass items, iron pieces, broken instruments and so on.

E-waste includes CDs, TV, computer and its accessories, mobile phones, electronic items, cable wires, calculators, digital cameras etc and these wastes should be recycled. Some of the toxic materials present in certain electronic items cause environmental hazards and cause health issues to humans and animals.

Reject waste includes sanitary waste, diapers, tablets, expired tablets, condoms, nails, hair and this waste should be wrapped in papers and disposed.

SEGREGATION OF WASTE

Segregation of garbage is an important criterion since the volume of waste generated nowadays poses a significant environmental threat. Although certain products are not biodegradable, they can still be reused or recycled. It is estimated that a larger fraction of the garbage could be recycled, a portion of it could be composted, and only a small portion of the waste is true waste that must be dumped. Daily, household garbage should be sorted into several bins for different types of waste, such as wet and dry waste, and disposed of separately.

Biodegradable garbage, which includes organic waste such as kitchen waste, vegetables, fruits, flowers, garden leaves, and paper, can be separated. Non-biodegradables are further divided into the following categories:

A – Recyclable Waste - Paper, Plastics, Glass, Metal Etc.

B- Toxic Waste – Old Medicine, chemicals, paints, spray cans, bulbs, Spray Cans, fertilizer and pesticide containers, batteries, shoe polish.

C- Soiled – Cloth contaminated with blood and bodily fluids are examples of hospital waste. Toxic and dirty waste must be handled with extreme caution.

The color coding of waste bins

Green- Organic waste, Blue- Recyclable waste, Red- Reject waste or hazardous waste

Importance of segregation

It is easier to divide garbage into organic and recyclable wastes, waste segregation is considered a legal need. Effective waste segregation ensures that less garbage is disposed of in landfills, which is beneficial for both people and the environment. It is also

critical to separate the trash for human health reasons. Hazardous trash causes numerous health issues; hence it is critical to properly segregate the waste.

Composting

It is the biological decomposition of organic waste, such as food or plant material, carried out under controlled aerobic (occurring in the presence of oxygen) conditions by bacteria, fungi, worms and other organisms, and composting is a natural process of recycling and decomposition of solid waste in organic material, which is broken down by microorganisms in the presence of oxygen and helps avoid open dumping and reduce household wastes.

Procedure: -

Make a container for the edible kitchen trash, then make a smaller container for the dry organic waste, such as sawdust or dried leaves. Use a large pot or a bucket and make 5 to 6 holes around the container at various levels to allow air to circulate through it. Soil the bottom of the container to prevent leakage. Put the organic waste in layers everyday alternating wet and dry waste, cover the container with plastic cover or sheet. Using wooden cover is best to retain moisture and heat. Everyday turn the content in order to provide aeration if it is dry, sprinkle some water. Within 3 months the pile starts to compost and it turns into dry, dark brown crumbles with the smell of earth.

PHASE III- Impact assessment stage

3.3.1. Post assessment of educational intervention programme

Post assessment for educational intervention programme is done for 100 women drawn from the 400 women, on their willingness to participate in educational intervention programme. The 100 samples are considered as experimental group. The KAP (Knowledge, Attitude, and Practise) survey was taken from the sub samples and educational intervention is given to experimental group. The data collected and interpreted are presented in the following chapters.

3.3.1.1.Participations feedback about the planning of intervention programme

To know the effectiveness of the intervention programme organised on solid waste management, feedback forms are provided to the women households and collected. Feedbacks are gathered in the aspects of clarity in subjects delivered by the resource

person, punctuality of conduct of programme, overall coordination of the programme, and about IEC materials.

3.3.1.2. Assessing KAP on solid waste management

Knowledge gained on solid waste management

After an educational intervention, knowledge gained is assessed using a knowledge check based on various aspects on waste recycling process, bio degradable waste, diseases due to pollution, impacts of human health, impact of using plastic bags,3R's process, composting, vermicomposting. Knowledge check using pre and post assessment which comprises of questions present in Appendix.

Attitude developed by selected respondents

The attitude test involves gauging how a person reacts to a series of social cues or events (Devadas, 1987). The attitude toward solid waste management has been created using a Likert scale. These questions were answered on a five-point scale. With the following scores: 5,4,3,2,1, and strongly disagree with scores 5,4,3,2,1: strongly agree and neutral.. They are summarized in order to get attitude scores and they are recorded and present in following chapters using statistical tools.

Plate 5: Assessing KAP for the selected women

Effect of improper disposal of waste

Plate 6. Mass Cleaning

Outcome of the intervention

Plate 7.Feed back of the Women on Educational Intervention Program

3.3.2. Analysis and Interpretation of data

Analyzing the data is the most critical activity, and it necessitates persistence and expertise throughout the entire study process. The investigator analyses the filled interview schedules for its completeness, accuracy and reliability. The data obtained are consolidated, tabulated, and presented in chapter IV. The tests used in this study as follows.

- Percentage Analysis
- Chi-square test
- One way ANOVA test
- Paired ‘t’test

Both descriptive and inferential statistics were used to analyse the acquired data.

3.3.2.1. Descriptive Statistics

Frequency and percentage distributions are used to analyse or examine women's socioeconomic characteristics, such as education, age, religion, caste or community, income, and family size, as well as existing solid waste management procedures in the chosen location.

The mean, median, and mode are used to determine the level of solid waste management awareness and to assess the KAP (Knowledge, Attitude, and Practices) on solid waste management.

3.3.2.2. Inferential Statistics

The correlation coefficient is used to determine the relationship between knowledge, attitude, and practice levels prior to and after educational intervention.

Chi-square test is used to analyze the association between the problems faced by the people due to accumulation of solid waste and the socio-economic variables.

Anova and t-test is used to analyze the difference between the score level of knowledge, attitude and practice before and after the educational intervention. The tools for the analysis of data is given in Appendix IV.