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"A STUDY TO EVALUATE THE EFFECTIVENESS OF STRUCTURED TEACHING PROGRAMME ON KNOWLEDGE REGARDING THE EFFECTS OF AIR POLLUTION AND PREVENTION AMONG SCHOOL GOING CHILDREN AT SELECTED SCHOOL, BANGALORE."

By

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ABSTRACT

BACKGROUND OF THE STUDY:

Air Pollution is one of the most worrying problems of our time. This problem surfaced during the industrial revolution. The great industrial revolution brought about many positive changes to the world; better transportation, cheaper products, and a better life. However, with its riches came the price, pollution. At the beginning of the industrial revolution, no one paid any attention to the problem of pollution. As the science, progressed people started to realize this problem. The study was aimed to assess the effectiveness of STP on knowledge regarding effect of air pollution and its prevention among school going children at selected school, Bangalore

AIM:

"A study to evaluate the effectiveness of structured teaching programme on knowledge regarding effect of air pollution and its prevention among school going children at selected school, Bangalore."

OBJECTIVES OF THE STUDY:

1. To assess the existing knowledge and practice regarding air pollution and its prevention among school children.
2. To assess the knowledge and practice of school going children regarding air pollution and its prevention after the administration of structured teaching program.
3. To evaluate the effectiveness of structured teaching program by comparing pre and post-test knowledge scores regarding air pollution and its prevention among the school children.
4. To find out the association between the pre-test scores and the selected socio demographic variables.

METHODS:

The Pre-experimental one group pre-test post-test design was used for the study. The study was conducted at selected school, Bangalore. Sample of 60 school going children based on inclusion criteria were chosen by means of simple random sampling technique. The data collection tool were validated by experts, the reliability and feasibility were determined by the pilot study. The data for the study was collected by structured knowledge questionnaire following which samples were subjected to STP for the duration of 45 minutes. Post-test was done on 7th day following intervention. The same tool used to conduct the post-test. The data was analyzed by using descriptive and inferential statistics.

RESULTS:

A total of 60 school going children were recruited as a sample. The findings showed that the mean post-test knowledge score of the subjects was 35.58±7.54, higher than the mean pre-test score of 16.18±5.29. The 't' value obtained from paired 't' test was 24.84, which was higher than the critical value of 2.6 at $p< 0.05$ level showing that the improvement in knowledge score was significant. The chi-square test was applied to determine the association of demographic variables with knowledge scores of school going children. Results showed that the age, class of study, type of family and source of information on effect of air pollution. It

means there is significant difference between pre-test and post-test level of knowledge on effect of air pollution and its prevention among school going children.

CONCLUSION:

The result of the study showed there was a significant improvement obtained following STP on effect of air pollution and its prevention. This study enlightens that there is an immense need for educational programme in hospital or community to improve the knowledge on effect of air pollution and also this study motivates other researchers to conduct further studies to evaluate the attitudes and practices of other children to prevent the effect of air pollution

Key words: STP, school going children, air pollution and its prevention

I. INTRODUCTION

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"Children are the world's most valuable resource and its best hope for the future"

-John Fitzgerald Kennedy

Air Pollution is one of the most worrying problems of our time. This problem surfaced during the industrial revolution. The great industrial revolution brought about many positive changes to the world; better transportation, cheaper products, and a better life. However, with its riches came the price, pollution. At the beginning of the industrial revolution, no one paid any attention to the problem of pollution. As the science, progressed people started to realize this problem[1].

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere[2].

Sources of Air Pollution are the combustion of gasoline and other hydrocarbon fuels in automobiles, trucks, and jet airplanes produce several primary pollutants: nitrogen oxides, gaseous hydrocarbons, and carbon monoxide, as well as large quantities of particulates, chiefly lead. In the presence of sunlight, nitrogen oxides combine with hydrocarbons to form a secondary class of pollutants, the photochemical oxidants, among them ozone and the eye-stinging peroxyacetylnitrate (PAN). Nitrogen oxides also react with oxygen in the air to form nitrogen dioxide, a foul-smelling brown gas. In urban areas like Los Angeles where transportation is the main cause of air pollution, nitrogen dioxide tints the air, blending with other contaminants and the atmospheric water vapour to produce brown smog. Although the use of catalytic converters has reduced smog-producing compounds in motor vehicle exhaust emissions, recent studies have shown that in so doing the converters produce nitrous oxide, which contributes substantially to global warming In cities, air may be severely polluted not only by transportation but also by the burning of fossil fuels (oil and coal) in generating stations, factories, office buildings, and homes and by the incineration of garbage. The massive combustion produces tons of ash, soot, and other particulates responsible for the gray smog of cities like New York and Chicago, along with enormous quantities of sulphur oxides (which also may be result from burning coal and oil). These oxides rust iron, damage building stone, decompose nylon, tarnish silver, and kill plants. Air pollution from cities also affects rural areas for many miles downwind[3].

Cities around the world with high exposure to air pollutants have the possibility of children living within them to develop asthma, pneumonia and other lower respiratory infections as well as a low initial birth rate. Protective measures to ensure the youths' health are being taken in cities such as New Delhi, India where buses now use compressed natural gas to help eliminate the "pea-soup" smog[4].

Research by the World Health Organization shows there is the greatest concentration of particulate matter particles in countries with low economic world power and high poverty and population rates. Examples of these countries include Egypt, Sudan, Mongolia, and Indonesia. In the United States, the Clean Air Act was passed in 1970; however, in 2002 at least 146 million Americans were living in non-attainment areas regions in which the concentration of certain air pollutants exceeded federal standards3. Those pollutants are known as the criteria pollutants, and include ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Because children are outdoors more and have higher minute ventilation they are more susceptible to the dangers of air pollution. Children are more vulnerable to the adverse effects of air pollution than are adults. Eighty percent of alveoli are formed postnatal, and changes in the lung continue through adolescence. During the early post neonatal period, the developing lung is highly susceptible to damage after exposure to environmental toxicants[5]. Children have increased exposure to many air pollutants compared with adults because of higher minute ventilation and higher levels of physical activity. Because children spend more time outdoors than do adults, they have increased exposure to outdoor air pollution[6].

Children in communities with higher levels of urban air pollution (acid vapour, nitrogen dioxide, particulate matter with a median aerodynamic diameter less than 2.5 μm [$PM_{2.5}$], and elemental carbon [a component of diesel exhaust]) had decreased lung function growth, and children who spent more time outdoors had larger deficits in the growth rate of lung function. Ambient air pollution (especially particulate matter with a median aerodynamic diameter less than 10 μm [PM_{10}]) has also been associated with several adverse birth outcomes[7].

NEED FOR THE STUDY

"We call a child's mind "small" simply by habit; perhaps it is larger than ours is, for it can take in almost anything without effort"'

Christopher Morley

Air pollution is a significant risk factor for multiple health conditions including respiratory infections, heart disease, and lung cancer, according to the WHO. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more hospital admissions and premature death. The human health effects of poor air quality are far reaching, but principally affect the body's respiratory system and the cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health status and genetic[8].

The most common sources of air pollution include particulate matter, ozone, nitrogen dioxide, and sulfur dioxide. Both indoor and outdoor air pollution have caused approximately 3.3 million deaths worldwide. Children aged less than five years that live in developing countries are the most vulnerable population in terms of total deaths attributable to indoor and outdoor air pollution[9].

Every industrial process exhibits its own pattern of air pollution. Petroleum refineries are responsible for extensive hydrocarbon and particulate pollution. Iron and steel mills, metal smelters, pulp and paper mills, chemical plants, cement and asphalt plants all discharge vast amounts of various particulates. Uninsulated high-voltage power lines ionize the adjacent air, forming ozone and other hazardous pollutants[10].

The World Health Organization states that 2.4 million people die each year from causes directly attributable to air pollution, with 1.5 million of these deaths attributable to indoor air pollution. "Epidemiological studies suggest that more than 500,000 Americans die each year from cardiopulmonary disease linked to breathing fine particle air pollution. A study by the University of Birmingham has shown a strong correlation between pneumonia related deaths and air pollution from motor vehicles. Worldwide more deaths per year are linked to air pollution than to automobile accidents. Published in 2005 suggests that 310,000 Europeans die from air pollution annually. Causes of deaths include aggravated asthma, emphysema, lung and heart diseases, and respiratory allergies. The US EPA estimates that a proposed set of changes in diesel engine technology could result in 12,000 less premature mortality, 15,000 fewer heart attacks, 6,000 fewer emergency room visits by children with asthma, and 8,900 fewer respiratory-related hospital admissions each year in the United States[11].

The worst short term civilian pollution crisis in India was the 1984 Bhopal Disaster. Leaked industrial vapors from the Union Carbide factory, belonging to Union Carbide, Inc., U.S.A., killed more than 25,000 people outright and injured anywhere from 150,000 to 600,000. The United Kingdom suffered its worst air pollution event when the December 4 Great Smog of 1952 formed over London. In six days more than 4,000 died, and 8,000 more died within the following months. An accidental leak of anthrax spores from a biological warfare laboratory in the former USSR in 1979 near Sverdlovsk is believed to have been the cause of hundreds of civilian deaths. The worst single incident of air pollution to occur in the United States of America occurred in Donora, Pennsylvania in late October, 1948, when 20 people died and over 7,000 were injured[12].

A new economic study of the health impacts and associated costs of air pollution in the Los Angeles Basin and San Joaquin Valley of Southern California shows that more than 3800 people die prematurely (approximately 14 years earlier than normal) each year because air pollution levels violate federal standards. The number of annual premature deaths is considerably higher than the fatalities related to auto collisions in the same area, which average fewer than 2,000 per year[13].

Diesel exhaust (DE) is a major contributor to combustion derived particulate matter air pollution. In several human experimental studies, using a well validated exposure chamber setup, DE has been linked to acute vascular dysfunction and increased thrombus formation. This serves as a plausible mechanistic link between the previously described association between particulate matter air pollution and increased cardiovascular morbidity and mortality[14]. Cities around the world with high exposure to air pollutants have the possibility of children living within them to develop asthma, pneumonia and other lower respiratory infections as well as a low initial

birth rate. Protective measures to ensure the youths' health are being taken in cities such as New Delhi, India where buses now use compressed natural gas to help eliminate the “pea-soup” smog. Research by the World Health Organization shows there is the greatest concentration of particulate matter particles in countries with low economic world power and high poverty and population rates. Examples of these countries include Egypt, Sudan, Mongolia, and Indonesia. In the United States, the Clean Air Act was passed in 1970; however, in 2002 at least 146 million Americans were living in non-attainment areas regions in which the concentration of certain air pollutants exceeded federal standards. Those pollutants are known as the criteria pollutants, and include ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Because children are outdoors more and have higher minute ventilation they are more susceptible to the dangers of air pollution[15].

The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing comprehensive evaluation of air toxics in the U.S. EPA developed the NATA as a state-of-the-science screening tool for State/Local/Tribal Agencies to prioritize pollutants, emission sources and locations of interest for further study in order to gain a better understanding of risks. NATA assessments do not incorporate refined information about emission sources, but rather, use general information about sources to develop estimates of risks which are more likely to overestimate impacts than underestimate them. NATA provides estimates of the risk of cancer and other serious health effects from breathing (inhaling) air toxics in order to inform both national and more localized efforts to identify and prioritize air toxics, emission source types and locations which are of greatest potential concern in terms of contributing to population risk. This in turn helps air pollution experts focus limited analytical resources on areas and or populations where the potential for health risks are highest. Assessments include estimates of cancer and non-cancer health effects based on chronic exposure from outdoor sources, including assessments of non-cancer health effects for Diesel Particulate Matter (PM). Assessments provide a snapshot of the outdoor air quality and the risks to human health that would result if air toxic emissions levels remained unchanged[16].

Air pollution is a growing problem in our state primarily because of the amount of driving that takes place. Motor vehicles are the source of most of our air pollution. On the average, for every 25 miles driven, a pound of pollution is emitted into the air. Thus, through our daily transportation choices, each of us can be a part of the pollution problem or solution. Most adults are aware that driving causes air pollution and some are even beginning to explore alternative modes of transportation. Nevertheless, many of us are entrenched in our driving habits, and rarely consider carpooling, taking the bus, or riding a bike. Because breathing clean air is one of our most basic needs, and because the cause and effect relationship between transportation and pollution is so closely linked to our everyday lives, the topic of air quality is especially relevant to Delaware citizens of all ages. Understanding these connections can empower you to make a contribution toward solving this important environmental problem and make a difference in improving your own future.

OPERATIONAL DEFINITIONS OF THE TERMS

In this study it refers to

1. **Effectiveness:** It is the outcome of the teaching programme that has been identified interms of gain in knowledge regarding air pollution and prevention.
2. **Structured Teaching programme:** It refers to the systematically developed instructional method and teaching aids designed for children to provide informationon air pollution and prevention.

3. **Knowledge:** In this study knowledge refers to the correct response from the school children regarding the "Air pollution. It will be measured by knowledge assessment.

4. **Air pollution:** Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere.

5. **School children:** They are both male and female students who are studying in school children in selected schools at Bangalore.

ASSUMPTIONS

The study is based on the following assumptions:

- School children may have some knowledge regarding air pollution and its prevention.
- Education may increase the knowledge of school children regarding air pollution andits prevention.
- School children would act according to the information they receive and perceive.

DELIMITATIONS

- The study is limited to the school children who are studying at selected school atBangalore.
- Study period is limited to 4-6 weeks of duration.
- Sample size is limited to 60 school children.
- The study design is limited to Pre-experimental (Single group pre-test post- test) design

CONCEPTUAL FRAMEWORK OF THE STUDY

Polit and Hungler (2013) state that "the conceptual frame work is inter-related concepts or abstractions that are assembled together in some rationale scheme by virtue relevance to a common thing". This is the device that helps to stimulate research knowledge.

A conceptual frame work is a network of interrelated concepts that provide structure for organizing and describing the phenomena of interest. Research studies are passed on a theory on conceptual frame work that facilitates its visualization of the problem and places the variables in a logical content. The conceptual framework facilitates communication and provides systematic approach to nursing research, education and administration.[17]

The present study aims at evaluate the effectiveness of structured teaching programme onknowledge regarding the effects of air pollution and its prevention among school going children at selected school, Bangalore. For this study, Imogene M. King's goal attainmenttheory was adopted. The theory is based on the assumption that humans are open systemsand are having constant interaction with their environment. The major concepts in this theory of goal attainment are interaction, perception, communication, transaction, role, stress, growth and development, time and space.[18]

1. **Interaction:**

According to Imogene M. King, each individual brings to an interaction with different setof values, ideas, attitude and perception to exchange. In this study, both the investigator and the school going children come together for a purpose of improving knowledge regarding the effects of air pollution and its prevention.

2. **Perception:**

According to Imogene M. King, it is the primary features of the personal system because it influence all the other behaviors, refers to a person's representation of reality. In this study, it means that the school going children are consistent with different demographic variables such age, gender, class of study, type of family, residential area, family monthlyincome, type of food, occupation of father, occupation of mother, source of information regarding air pollution and its prevention.

3. **Communication:**

According to Imogene M. King, a person provides information directly or indirectly to another person. The person receives the information and processes it. In this study, the investigator provides information regarding air pollution and its prevention directly with the help of AV aids (power point presentation) to the receiver (school going children).

4. **Transaction:**

According to Imogene M. King, two individuals mutually identify goals and the means toachieve it. They reach an agreement about how to attain these goals and then set about to realize them. In this study, the investigator will get the consent sign from the participants by explaining the goals and pre-test will be conducted to identify the goals by means of structured knowledge questionnaire regarding air pollution and its prevention in school going children.

5. **Role:**

According to Imogene M. King, each person occupies in a social system that has specific rules and obligations. In this study, role means investigator occupies health educator role and school going children occupy recipient's role.

6. **Mutual goal setting:**

The investigator and the school going children have to make a mutual goal to improve theknowledge of school going children regarding air pollution and its prevention by giving information through structured teaching programme.

7. **Reaction:**

In this study the reaction means effectiveness of STP regarding air pollution and its prevention among school going children and it would be assess through post-test.

8. **Feedback:**

The system continuously monitors itself and the environment for information to guide its operation. This feedback information of environmental responses to the system output is utilized by the individual in adjustments, correction and accommodation to the interactionwith the environment- "Feedback" may be positive, negative or neutral.

In this study, feedback can be measured by the output, which could be adequate, moderate and inadequate knowledge level. If the school going children gain adequate knowledge after administration of STP on air pollution and its prevention in school going children considered STP is useful to update the school going children's knowledge. Further investigation should be done to school

going children who have moderate and inadequate level of knowledge, which is not included in this study

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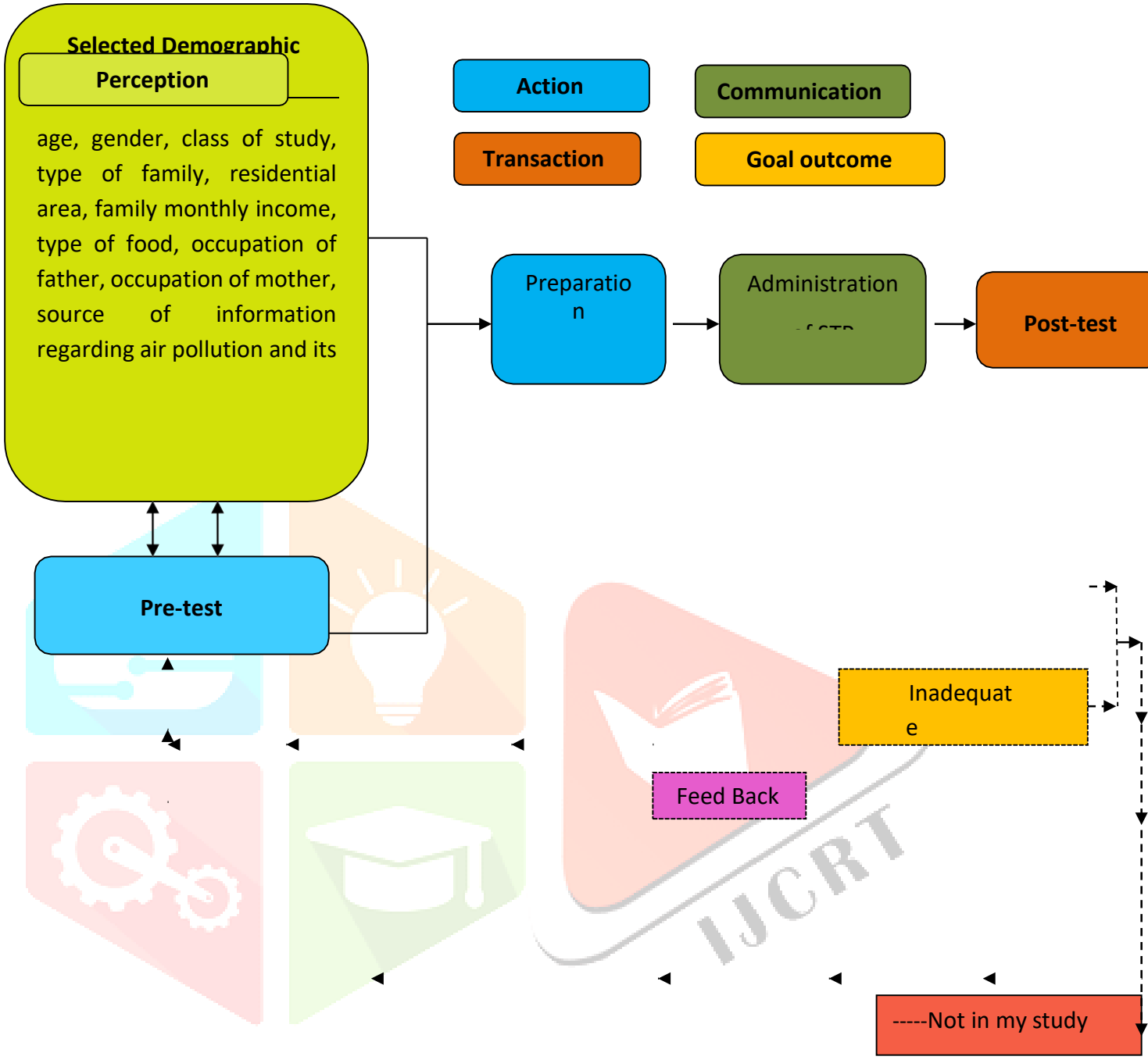


Figure 1: Schematic representation of the Conceptual frame work - Application of modified King's

RESEARCH APPROACH

The selection of research approach is the basic procedure for conducting a research enquiry. It tells the researcher what data to collect and how to analyse it and also suggests possible conclusions to be drawn from the data.[44]

An experimental research approach was adopted for this study in order to accomplish the objectives. Experimental research is centrally concerned with constructing research that ishigh in causal validity. The primary objective of the experimental research was to determine the existence of a cause to effect relationship between two variables. Hence the experimental research approach was considered most appropriate.

In the present study the investigator aimed at evaluating the effectiveness of structured teaching programme regarding effect of air pollution and prevention among schoolgoing children at selected school, Bangalore.

RESEARCH DESIGN

The research design refers to the researcher's overall plan for obtaining answer to the research questions and it spells out strategies that the researcher adopted to develop information that is accurate, objective and interpretable.[45] The research design provides an overall or blue print to carry out the study.

In the view of the nature of the problem and to accomplish the objectives of the study pre-experimental one group pre-test and post-test design was used to evaluate the effectiveness of STP regarding effect of air pollution and prevention among school going children at selected school, Bangalore.

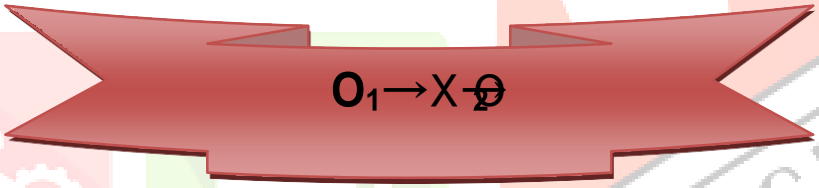


Figure: 2 Schematic Representation of Research Design

KEYS

O_1: Pre-test assessment of knowledge regarding effect of air pollution and prevention amongschool going children.

X: Intervention (planned teaching programme) PTP.

O_2: Post-test assessment of knowledge regarding effect of air pollution and preventionamong school going children.

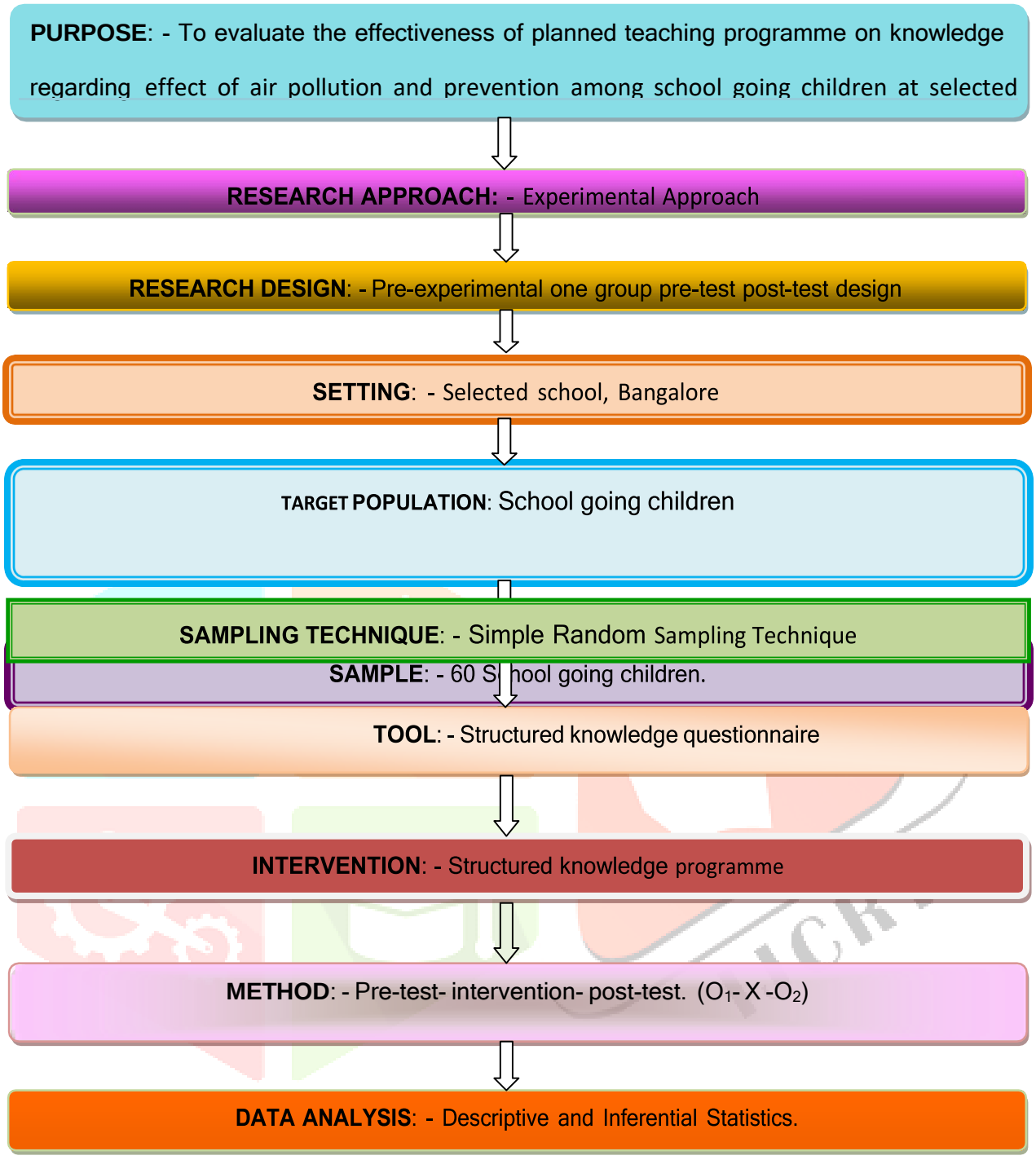


Figure 3: Schematic representation of research methodology

VARIABLES UNDER STUDY

Variables are concepts at various levels of abstraction that are measured, manipulated or controlled in the study. The variables mainly included in this study are independent variable, dependent variable and attribute variables.[46]

Independent variable:

An independent variable is that which is believed to cause or influence the dependent variable, in experimental research by the manipulated (treatment) variable.

In the present study the independent variable refers to Structured knowledge regarding

effect of air pollution and prevention among school going children.

Dependent Variable:

Dependent Variable is a response, behaviour or outcome that the researcher wants to predict. Changes in the dependent variable are presumed to be caused by the independent variable. It is otherwise called as effect variable or a criterion measure.[47]

In the present study it refers to knowledge regarding effect of air pollution andprevention among school going children.

Attribute Variables:

An uncontrolled variable that greatly influences the result of the study is called asattributed variable.[48]

The attribute variables in this study were selected socio-demographic variables suchas age, gender, class of study, type of family, residential area, family monthly income, type offood, occupation of father, occupation of mother, source of information regarding air pollution and its prevention among school going children.

SETTING OF THE STUDY

Setting refers to the area where the study is conducted. It is the physical location and condition in which data collection takes place in a study.[49] Based on the geographical proximity, feasibility and familiarity with the setting, the investigator selected school at Bangalore.

POPULATION

The population referred to as the target population, which represents the entire group or all the elements like individuals or objects that meet certain criteria for inclusion in the study.[48] The target population of the present study comprises of school going children at selected areas at Bangalore.

SAMPLE

Sample refers to the subset of a population that is selected to participate in a particularstudy. Sample size of the present study consists of 60 school going children on selectedschool at Bangalore.

SAMPLING TECHNIQUE

Sampling defines the process of selecting a group of people or other elements with which to conduct a study. Simple Random Sampling Technique is adopted to select the samples for the present study based on inclusion criteria.

SAMPLING CRITERIA

Inclusion criteria

1. Selected Schools in Bangalore.
2. Students who are studying school.
3. Students, both boys and girls.

Exclusion criteria

1. Students who are studying other than school children.
2. Students are not willing to participate.

DESCRIPTION OF THE TOOL AND PLANNED TEACHING PROGRAMMETOOL FOR DATA COLLECTION

Tool is the instrument or device used to collect data. It should be a vehicle for obtaining data and drawing conclusion.

The tool used to collect the data was a structured knowledge questionnaire in order to assess the knowledge regarding effect of air pollution and prevention among school going children. It consists of two parts. Part I and Part II.

Part I: Socio demographic data.

It consists of demographic variables of school going children such age, gender, class of study, type of family, residential area, family monthly income, type of food, occupation of father, occupation of mother, source of information regarding air pollution and its prevention among school going children.

Part II: Structured knowledge questionnaire to assess the knowledge regarding effectof air pollution and prevention among school going children.

It consists of items on knowledge related to regarding effect of air pollution and prevention among school going children. It consists of 40 multiple choice questions having 4

responses with one right answer. Structured knowledge questionnaire schedule includes three aspects of air pollution:

- A General Information about air pollution.
- Causes and risk factor of air pollution.
- Coping and Management of air pollution.

SCORING AND INTERPRETATION

The knowledge regarding effect of air pollution and prevention among school going children would be measured in terms of knowledge score. Structured knowledge questionnaire would be prepared to assess the knowledge of school going children. It consistsof four responses each with one right answer. Each correct answer was given a score of one and a wrong answer was given score of zero. The total attainable score in the knowledge questionnaire is 40.

The total score is converted in to percentage and the resulting score is ranged as follows;

Level of knowledge	Scores	Percentage (%)
Inadequate	<20	< 50
Moderate	21-30	51-75
Adequate	31-41	76-100

PREPARATION OF PTP

The process of developing STP include following steps

- Reviews of literature regarding effect of air pollution and prevention among school goingchildren.
- Preparation and organization of the content of lesson plan.
- Preparation of final draft of the lesson plan.
- Editing the lesson plan and preparation of STP.

VALIDITY OF THE TOOL AND LESSON PLAN

Validity refers to whether a measuring instrument accurately measures what it is intended to measure.[50] The prepared content (PTP) and the tool along with the problem statement, objectives, blue print and criteria check list were submitted to 2 experts in the fieldof Pediatrics and 7 child health nursing and 1 statician for establishing content validity. After validation from experts corrections were made.

Ten experts validated the tool used for the study. The tool was evaluated for appropriateness, adequacy, relevance, and completeness. Comments and suggestions were invited and appropriate modifications were made accordingly. The tool was refined and finalized after establishing validity.

The STP regarding effect of air pollution and prevention among school going childrenwas assessed by experts for its appropriateness, organization of content and language. The final draft of the tool contained 10 socio-demographic characteristics and 40 knowledge questionnaire regarding effect of air pollution and prevention among school going children.

RELIABILITY

Reliability of the research instrument is defined as the extent to which the instrument yields the same results on repeated measures. It is then concerned with consistency, accuracy,precision, stability, equivalence and homogeneity.[51]

The reliability of the tool was elicited by split half method. The tool was administeredto 6 school going children who fulfilled the inclusion criteria. These samples were excluded from the main study. The Karl Pearson's coefficient of correlation was computed and the reliability was found to be r=0.95, which indicates the structured knowledge questionnaire was positively correlated. The tool was found to be reliable.

DEVELOPMENT OF LESSON PLAN

STP was developed regarding effect of air pollution and prevention among school going children. The content was prepared by the investigator on the basis of review of literature and with the guidance of the experts in the field of medicine and nursing. The lesson plan included a brief introduction, definition, risk factors, causes, symptoms, diagnosis, treatment, management of effect of air pollution and prevention among school going children.

PILOT STUDY

The pilot study is a smaller version of the proposed study conducted to refine the methodology. It is developed similar to the proposed study, using similar subjects, settings treatment, method of data collection and analysis technique as it would be used in the main study. Pilot study was done to check the clarity of items in tool and the feasibility in conducting the study.[52]

The pilot study was conducted among 6 school going children selected from various areas at Bangalore after obtaining formal permission from the authorities. After obtaining permission, 6 samples who fulfilled the inclusion criteria were selected by Simple Random Sampling Technique. The investigator gave self-introduction and explained purpose of study. The respondent's willingness to participate in the study was ascertained. The respondents were assured anonymity and confidentiality of the information provided by them and written consent was obtained from them. Pre-test was conducted using Structured Knowledge Questionnaire to assess the knowledge of effect of air pollution and prevention among school going children. STP was given the day of pre-test. After 7th day of administering of STP, post-test was conducted using the same tool evaluated for the same samples. The

effectiveness of STP was evaluated on the basis of their answer to the knowledge questionnaire. The pilot study samples were excluded from the main study.

The collected data was analysed by using descriptive and inferential statistics. The significance of difference between pre-test and post-test scores were found by paired 't' test, the difference was found to be significant at $p \leq 0.05$ level.

The objectives of the pilot study were to:

1. Find out the required time for completing the structured knowledge questionnaire.
2. Identify the ambiguity in the wording of the questionnaire.
3. Find out the feasibility of the study.
4. Identify any major flaws in the study design.

The following were the findings of the pilot study

- It was observed that, among 6 school going children, 3(50%) of them were 12 years of age and rural residents, 4(66.67%) of them were from 7th Standard, 5(83.33%) were

belongs to Nuclear family, 3(50%) of them had monthly family income of Less than Rs. 10,000 and 4(66.67%) of them were non vegetarian and had no previous knowledge regarding air pollution and 3(50%) got information about air pollution from health personnel.

The overall pre-test knowledge scores of information about air pollution among school going children, majority 5(83.33%) of them had inadequate level of knowledge and 1(16.67%) of them had moderate level of knowledge whereas in post-test, 4(66.67%) of themhad adequate level of knowledge and 2(33.33%) had moderate level of knowledge on effectof air pollution.

Paired 't' test was preformed to evaluate the effectiveness of STP on effect of air pollution and prevention among school going children. It was observed that, in pre-test, the overall mean score was 19.63±1.25 whereas the mean post-test score was 37.13±2.21. The

obtained 't' value was 31.42, which was higher than the table value 2.6, therefore it is highlysignificant at $P \leq 0.05$ level. Hence the STP was effective in enhancing the regarding airpollution and prevention among school going children. Hence H_1 is accepted for pilot study. **DATA COLLECTION PROCEDURE**

The data was collected from school going children from selected school at Bangalore. Written permission was sought and obtained from the authorities concerned. The period of data collection was 4 weeks. About 60 school going children were selected as per the above mentioned criteria with prior informed consent were taken to participate in the study. Initiallyclose/special relationship was maintained with the school going children and the purpose of the study was explained to them. School going children were made comfortable and the privacy was maintained. Instructions to answer the questionnaire were given. Pre-test was conducted through structured knowledge questionnaire to assess the school going children' regarding effect of air pollution and prevention among children. Then STP was administered to the young women. The post-test of the study was carried out after seven days of administering the Planned Teaching Programme, using the same tool as in the pre-test. Finally, data collected was then tabulated and analysed. All the subjects were very cooperative and investigator expressed the gratitude for their cooperation.

DATA ANALYSIS PLAN

Statistical analysis helps researchers make sense of quantitative information statistical procedures enable researchers to summarize, organize, evaluate, interpret, and communicate numeric information.

The data obtained is analyzed in terms of the objectives of the study using descriptive and inferential statistics. The plan of the data analysis is developed under the excellent direction of the experts in the field of Nursing and Statistics.

- Socio demographic data of samples is analyzed by using frequencies and percentage.
- The knowledge scores before and after the administration of the STP is calculated by usingmean and standard deviation.
- The significant difference between the mean pre-test and post test score is analysed by paired 't' test.

Associations between pre-test levels of knowledge regarding air pollution and prevention among school going children with

their selected socio demographic variables is analysed by using chi square (χ^2) test.

- The level of significance is set at $p \leq 0.05$ levels for paired 't' test and chi square test.

I. RESULTS

==========

Statistical analysis is a method of rendering quantitative information meaningfully and intelligently. Statistical procedures enable the researcher to reduce, summarize, organize, evaluate, interpret and communicate the obtained data into numeric information.[53]

This chapter deals with analysis and interpretation of data collected from both male and female students who are studying in school children in selected schools at Bangalore.The data was collected from the respondents before and after the administration of STP. The collected information was organized, tabulated, analyzed, and interpreted using descriptive and inferential statistics. Analysis was done based on the objectives and hypotheses of the study.

OBJECTIVES OF THE STUDY

The objectives of the study are to:

1. assess the existing knowledge and practice regarding air pollution and its prevention amongschool children.
2. assess the knowledge and practice of school going children regarding air pollution and itsprevention after the administration of structured teaching program.
3. evaluate the effectiveness of structured teaching program by comparing pre and post-testknowledge scores regarding air pollution and its prevention among the school children.
4. find out the association between the pre-test scores and the selected socio demographicvariables

RESEARCH HYPOTHESIS

H1:- The mean post-test will be significantly higher than the mean pre-test score regarding theknowledge and practice on air pollution and its prevention.

H2:- There will be a significant association between the knowledge on air pollution and itsprevention and selected demographic variables

PART-I

Description of socio-demographic profile of the sample

This section deals with distribution of participants according to the socio demographic characteristics. The obtained data on socio- demographic variables such age, gender, class of study, type of family, residential area, family monthly income, type of food, occupation of father, occupation of mother, source of information regarding air pollution and its prevention.. The data was analyzed by using descriptive statistics and are summarized in terms of frequency and percentage distribution.

.

SOCIO-DEMOGRAPHIC PROFILE OF SAMPLES

Table 1: Classification of sample by socio-demographic characteristics

N=60

Characteristics	Category	Respondents	
		Frequency (N)	Percentage (%)
Age in year	9 years	12	20
	10 years	14	23
	11 years	16	27
	12 years	18	30
Gender	Male	39	65
	Female	21	35
Class of study	4th standard	12	20
	5th standard	14	23
	6th standard	16	27
	7th standard	18	30
Type of family	Nuclear family	41	68
	Joint family	11	18
	Extended family	8	13
Family monthly income (in rupees)	Less than 10,000	5	8
	10,001-15,000	13	22
	15,001-20,000	24	40
	Above 20,000	18	30
Area of residence	Urban	45	75
	Semi urban	12	20
	Rural	3	5
Type of food	Vegetarian	18	30
	Non-vegetarian	42	70
Occupation of Father	Private employee	16	27
	Government employee	21	35
	Daily wage work	5	8
	Self-employed	18	30
Occupation of Mother	Private employee	12	20
	Government employee	14	23
	House maker	29	48
	Self-employed	5	8
Source of informationabout air pollution and its prevention	Health workers	39	65
	Books	10	17
	Friends	4	7
	Mass media	7	12

Table 1 shows that, among 60 school going children, 12(20%) of them were 9 years of age and 14(23%) of them were 10 years of age, 16(27%) of them were 11 years of age and 18(30%) of them were 12 years of age.

In relation to the gender of school going children, 39(65%) of them were male and 21(35%) of them were female.

According to class of study, 12(20%) of them were at 4th standard, 14(23%) of them were at 5th standard, 16(27%) of them studied were at 6th standard and 18(30%) of them were at 7th standard.

In concern to family type, among 60 children, 41(68%) of them belongs to nuclear family, 11(18%) of them belongs to joint family and 8(13%) of them belongs to extended family.

In relation to the area of residence of children, 45(75%) of them belongs to urban areaand 12(20%) of them belongs to semi-urban area and 3(5%) belongs to rural area.

With regards to family monthly income, 5(8%) of them had below 10,000, 13(22%) had 10,001-15,000, 24(40%) had 15,001-20,000 and 18(30%) of them had above 20,000 monthly income.

The socio demographic history of source of information shows that, among 60 children, 39(65%) of them got information from health worker, 10(17%) of them got information from books, 4(7%) of them got information from friends and 7(12%) of them got information frommass media.

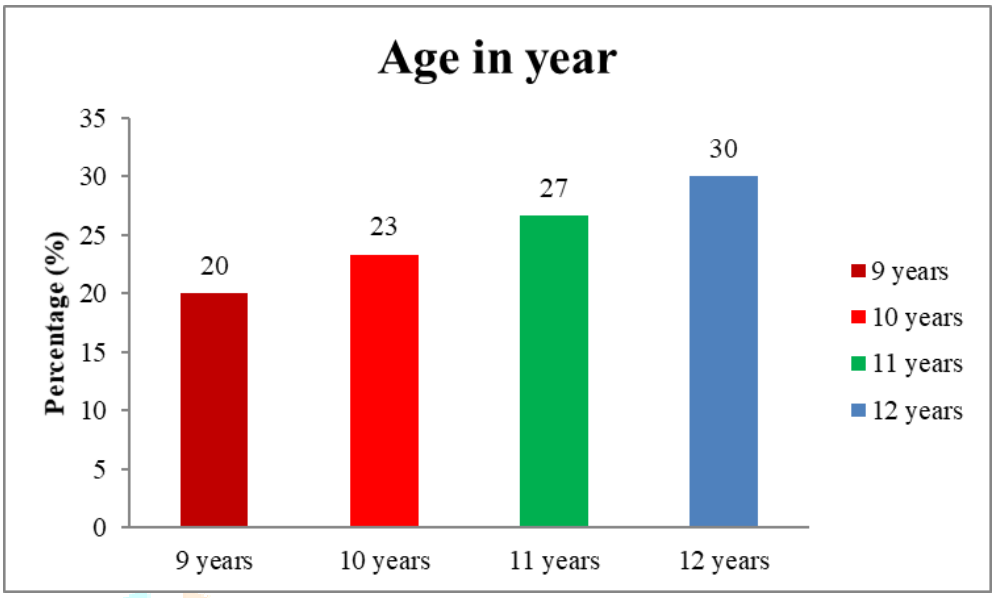
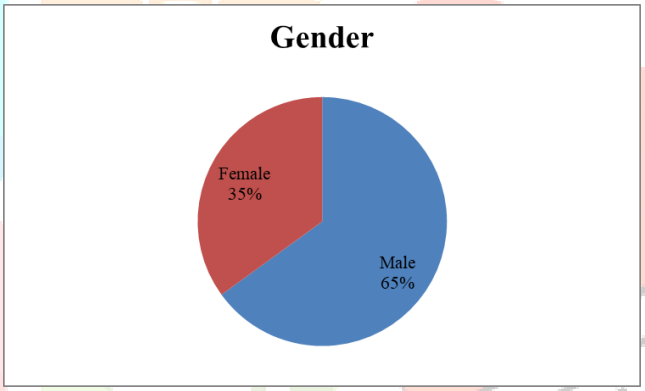


Figure 4: Classification of samples by age

Figure 5: Classification of samples by gender



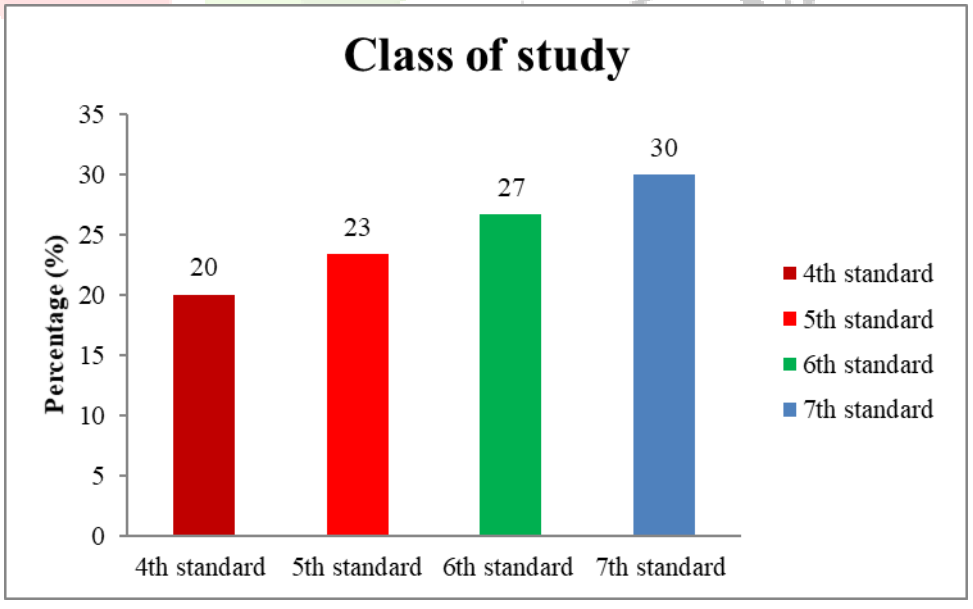


Figure 6: Classification of samples by class of study

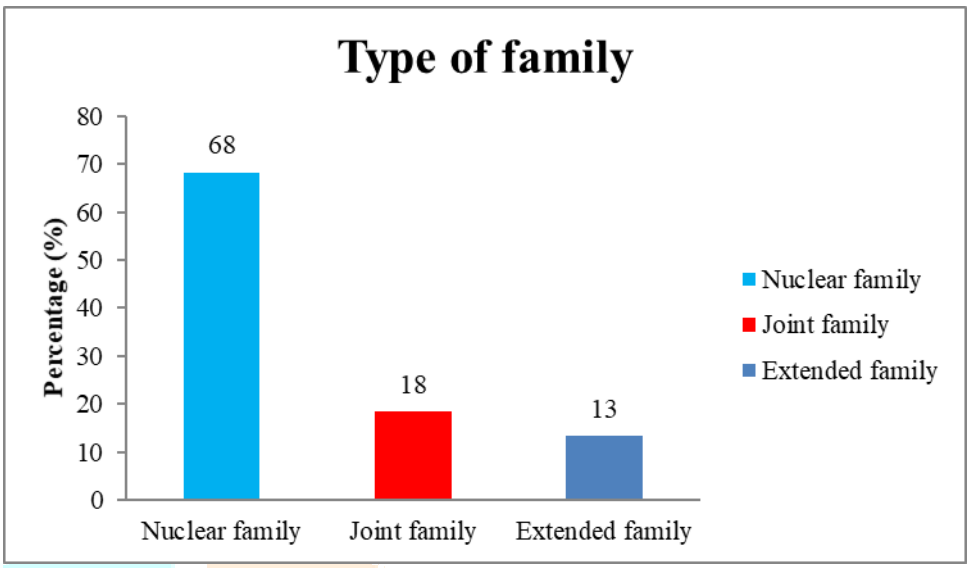


Figure 7: Classification of samples by type of family

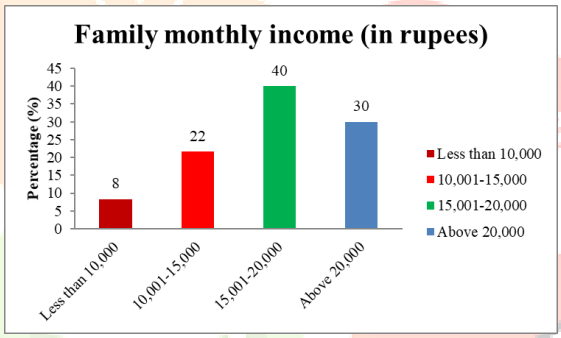


Figure 8: Classification of samples by type of family

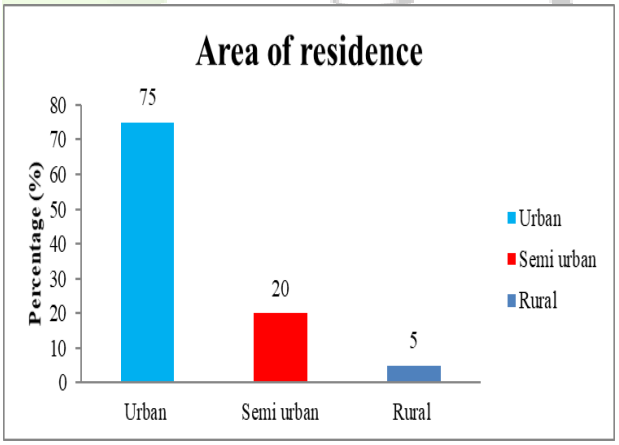


Figure 9: Classification of samples by area of residence

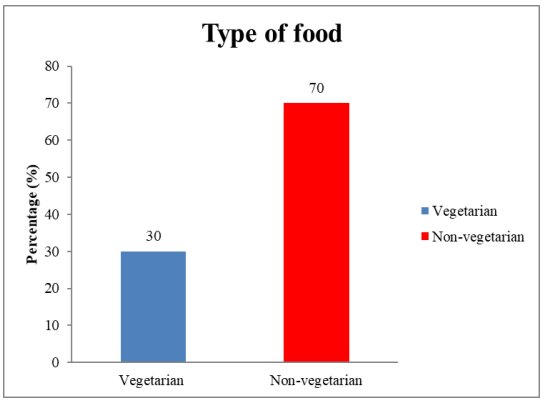


Figure 10: Classification of samples by type of food

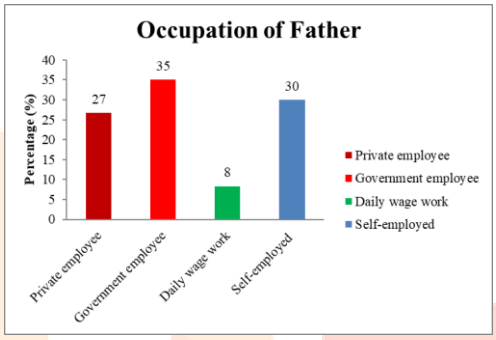


Figure 11: Classification of samples by father occupation

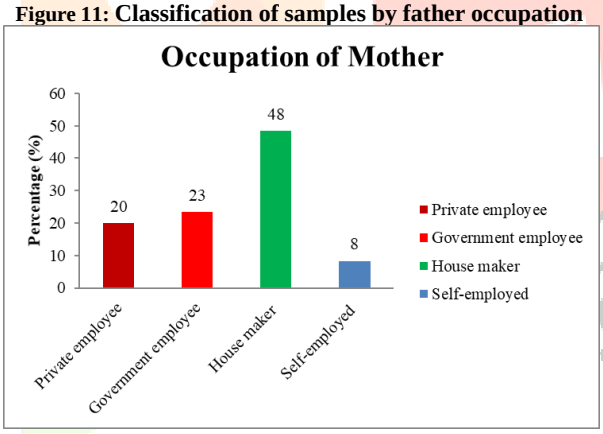


Figure 12: Classification of samples by mother's occupation

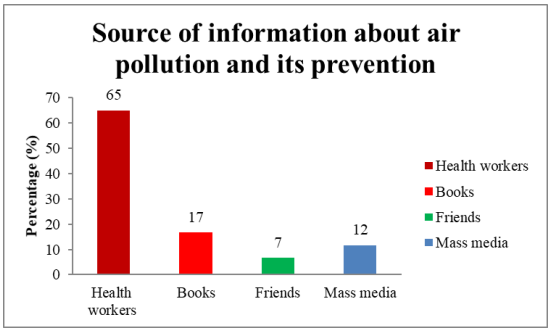


Figure 13: Classification of samples by source of information

PART-II (A)

Overall and aspects wise knowledge scores of school children on air pollution and itsprevention

Table 2: Classification of pre-test knowledge scores on air pollution and its preventionamong school children

N=60

Level of Knowledge	Score	No of Respondents	
		Frequency (N)	Percentage (%)
Inadequate	< 50%	48	80
Moderate	51-75%	12	20
Adequate	>75%	0	0
Total		60	100

The above table-2 shows the classification of school children on pre-test level of knowledge and practice regarding air pollution and its prevention among school children. Among 60 school children, 48(80%) of them had inadequate level of knowledge and 12(18%)of them had moderate level of knowledge and none of them had adequate level of knowledge regarding air pollution and its prevention.

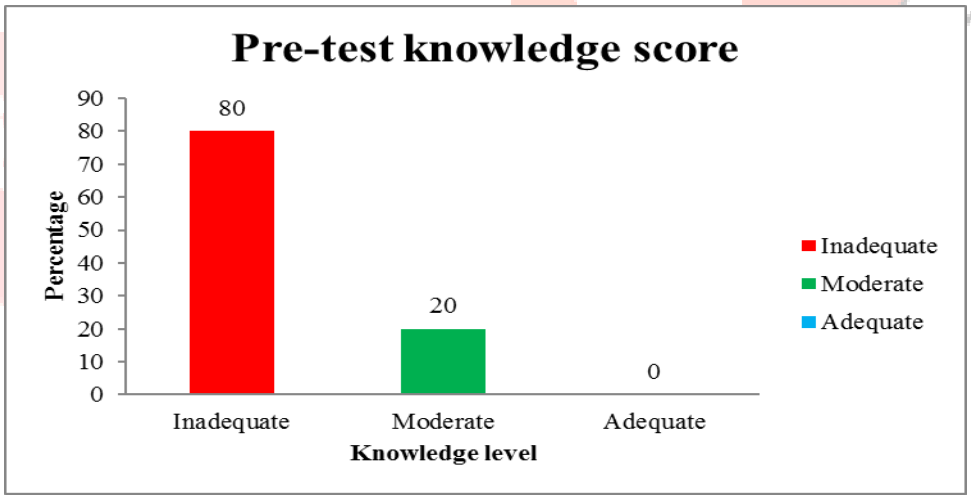


Figure 14: Classification of samples on pre-test level of knowledge

5. Table 3: Aspect wise pre-test mean knowledge scores of school children on air pollutionand its prevention

N=60

Aspects wise knowledge	Max Statement	Max Score	Range	Mean	Standard deviation (±SD)
General information of air pollution and its prevention	15	15	3-11	7.95	2.57
Cause, risk factor, complication of air pollution	14	14	4-7	5.62	1.82
Management and prevention of air pollution	11	11	2-6	5.09	1.65
Overall	40	40	9-24	18.66	6.04

The above table-3 showed that, aspect wise pre-test mean knowledge scores of air pollution and its prevention among school children. In general information of air pollution,the mean knowledge score was 7.95±2.57. In the area of knowledge on cause, risk factor, complications of air pollution, the mean knowledge score was 5.62±1.82. In concern with management and prevention of air pollution among school children, the mean knowledge score was 5.09±1.65. The overall mean score in pre-test study was 18.66±6.04.

6. Table 4: Aspect wise post-test mean knowledge scores of school children on air pollutionand its prevention

N=60

Level of Knowledge	Score	No of Respondents	
		Frequency (N)	Percentage (%)
Inadequate	< 50%	0	0.00
Moderate	50-75%	8	13
Adequate	>75%	52	87
Total		60	100

The above table-4 shows the classification of school children on post-test level of knowledge regarding air pollution and its prevention. Among 60 school children, 52(87%) of them had adequate level of knowledge and 8(13%) of them had moderate level of knowledge and none of them had inadequate level of knowledge regarding air pollution and its prevention.

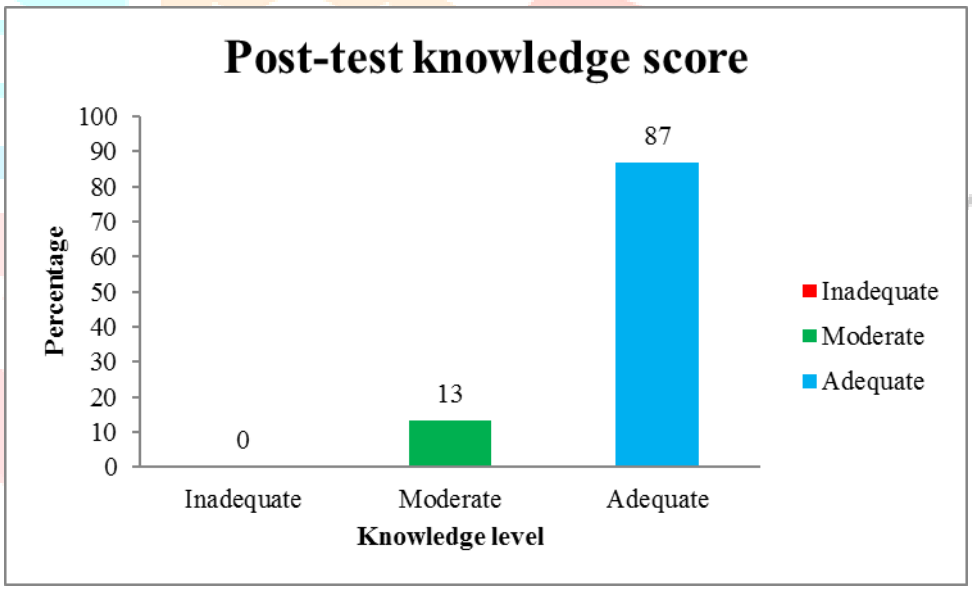


Figure 15: Classification of samples on post-test level of knowledge

Table 5: Aspect wise post-test mean knowledge scores of school children on air pollutionand its prevention

N=60

Aspects wise knowledge	Max Statement	Max Score	Range	Mean	Standard deviation (±SD)
General information of air pollution and its prevention	15	15	11-14	12.61	2.69
Cause, risk factor, complications of air pollution	14	14	8-14	13.43	2.76
Management and prevention of air pollution	11	11	6-10	9.24	2.39
Overall	40	40	25-38	35.46	7.84

The above table-5 showed that, aspect wise pre-test mean knowledge scores of school student regarding air pollution and its prevention. In general information of air pollution, the mean knowledge score was 12.61±2.69. In the area of knowledge on cause, risk factor, complications of air pollution the mean knowledge score was 13.43±2.76. In concern with management and prevention of air pollution among school children, the mean knowledge score was 9.24±2.39. The overall mean score in pre-test study was 35.46±7.84.

PART-II (B)

Comparison of mean pre-test and post-test knowledge scores to evaluate theeffectiveness of structured teaching programme.

Table 6: Overall mean pre-test and post-test knowledge of school children regarding airpollution and its prevention

N=60

Aspect	Maximum Score	Knowledge of Respondents		Paired 't' test
		Mean	SD	
Pre-test	40	18.66	6.04	**23.74***
Post-test	40	35.76	7.84	
Enhancement	40	17.10	1.80	

***Significant at P<0.05 level, df 59, table-value 2.6*

Table 6 depicts that, the difference of pre-test and post-test knowledge scores of school children regarding air pollution and its prevention. In pre-test, the overall mean score was 18.66±6.04, whereas the mean post-test knowledge score was 35.76±7.84. The enhancements mean score was 17.10±1.80. The obtained 't' value was 23.74, which was higher than the table value 2.6, it is highly significant at P≤0.05 level.

Inference

The above table shows that, the mean post-test knowledge scores were significantly higher than the mean pre-test knowledge scores at P≤0.05 level of significance. Hence, the research hypothesis H_1 is accepted.

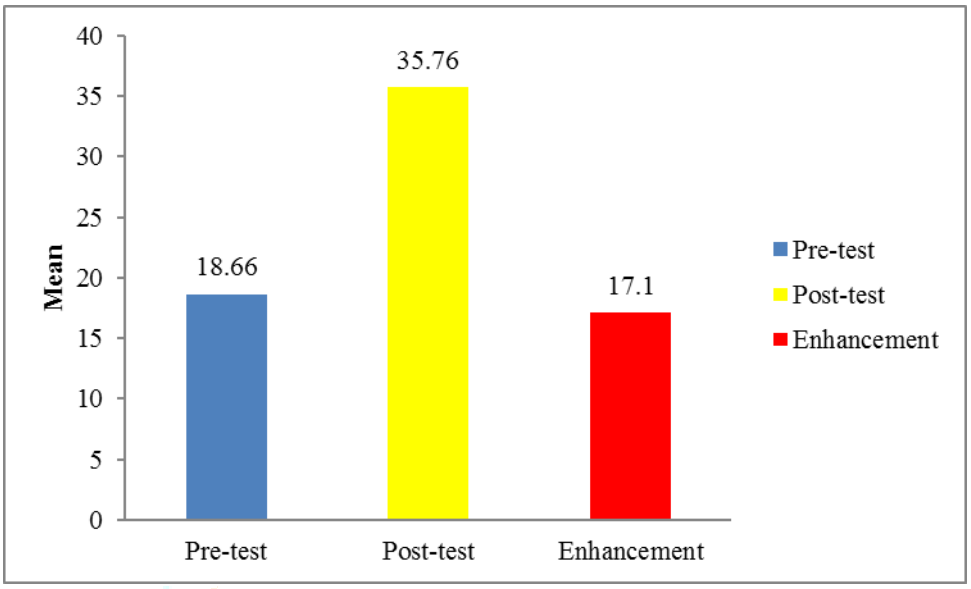


Figure 16: Overall mean pre-test and post-test knowledge scores of school children

Table 7: Aspect wise mean pre-test and post-test knowledge scores of school children regarding air pollution and its prevention

N=60

Sl. No	Aspect wise knowledge	Knowledge of respondents				Paired't' test
		Pre-test		Post-test		
		Mean	SD	Mean	SD	
I	General information of air pollution and its prevention	7.95	2.57	12.61	2.69	11.57*
II	Cause, risk factor, complications of air pollution	5.62	1.82	13.43	2.76	18.54*
III	Management and prevention of air pollution	5.09	1.65	9.24	2.39	14.60*
Overall		16.81	5.29	35.58	7.54	23.74*

***Significant at P<0.05 level, df 59, table-value 2.6*

The above table 7 shows that, the aspect wise mean pre-test and post-test knowledge scores of 60 school children regarding air pollution and its prevention. With regard to generalinformation of air pollution, the mean scores in pre-test and post-test were 7.95±2.57 and 12.61±2.69, respectively. The obtained 't' value was 11.57. In the area of cause, risk factor, complications of air pollution, mean scores in pre-test was 5.62±1.82 and post-test score was 13.43±2.76. The obtained 't' value was 18.54. In concern with management and preventionof air pollution, the mean scores in pre-test and post-test were 5.09±1.65 and 9.24±2.39 respectively. The obtained 't' value was 14.60. The overall 't' value was 23.74 which was above the table value 2.6 at P≤0.05 level of significance.

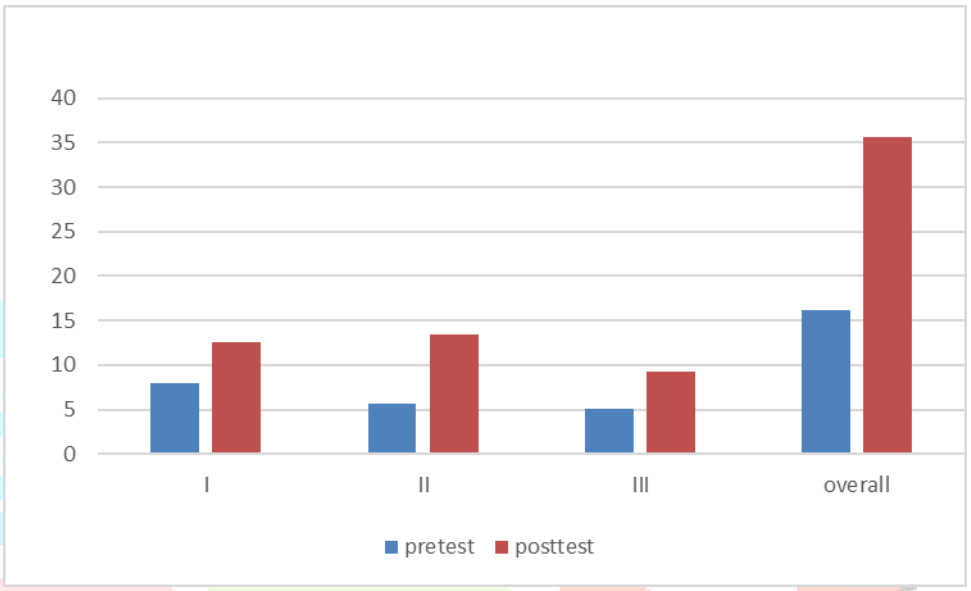


Figure 17: Aspect wise mean pre-test and post-test knowledge scores of school childrenregarding air pollution and its prevention

PART-III (B)

Table 8: Association between pre-test level of knowledge of school children and theirselected socio demographic variables

N=60

Characteristics	Category	Level of knowledge			
		Frequency(N)	Inadequate knowledge	Moderate knowledge	Chi square
Age in year	9 years	12	10	2	12.60
	10 years	14	11	3	
	11 years	16	13	3	
	12 years	18	14	4	
Gender	Male	39	32	7	1.15
	Female	21	16	5	
Class of study	4th standard	12	10	2	17.34
	5th standard	14	11	3	
	6th standard	16	13	3	
	7th standard	18	14	4	
Type of family	Nuclear family	41	33	8	25.12
	Joint family	11	8	3	
	Extended family	8	7	1	
Family monthly income (in rupees)	Less than 10,000	5	4	1	1.30
	10,001-15,000	13	10	3	
	15,001-20,000	24	20	4	
	Above 20,000	18	14	4	
Area of residence	Urban	45	37	8	1.32
	Semi urban	12	9	3	
	Rural	3	2	1	
Type of food	Vegetarian	18	15	3	1.74
	Non-vegetarian	42	33	9	
Occupation of Father	Private employee	16	13	3	0.97
	Government employee	21	17	4	
	Daily wage work	5	4	1	
	Self-employed	18	14	4	
Occupation of Mother	Private employee	12	9	3	1.64
	Government employee	14	11	3	
	House maker	29	24	5	

	Self-employed	5	4	1	
Source of information about air pollution and itsprevention	Health workers	39	32	7	18.63
	Books	10	8	2	
	Friends	4	6	1	
	Mass media	7	5	2	

***Significant at P≤0.05 level, S: Significant, NS; Non significant*

The above table-8 depicts the association of pre-test level of knowledge of school children with their selected socio-demographic variables. The obtained chi square value for age, class, type of family and source of information about air pollution were higher values (12.60, 17.34, 25.12 and 18.63 respectively) when compared to the table value 2.6 at P≤0.05 level of significance. There was no significant association between socio demographic variables of school children such as gender, family income, area of residence, type of food, father occupation and mother occupation (1.15, 0.97, 1.30, 1.32, 1.74 and 1.64, respectively) with pre-test level of knowledge.

Inference

In this study the obtained chi square value **(χ^2)** for age, class, type of family and source of information regarding air pollution were higher when compared to the table value 2.6 at P≤0.05 level of significance, hence the research hypothesis H_2 is accepted.

There was no significant association between demographic variables of school children such as gender, family income, area of residence, type of food, father occupation andmother occupation with pre-test level of knowledge hence the hypothesis H_2 is rejected.

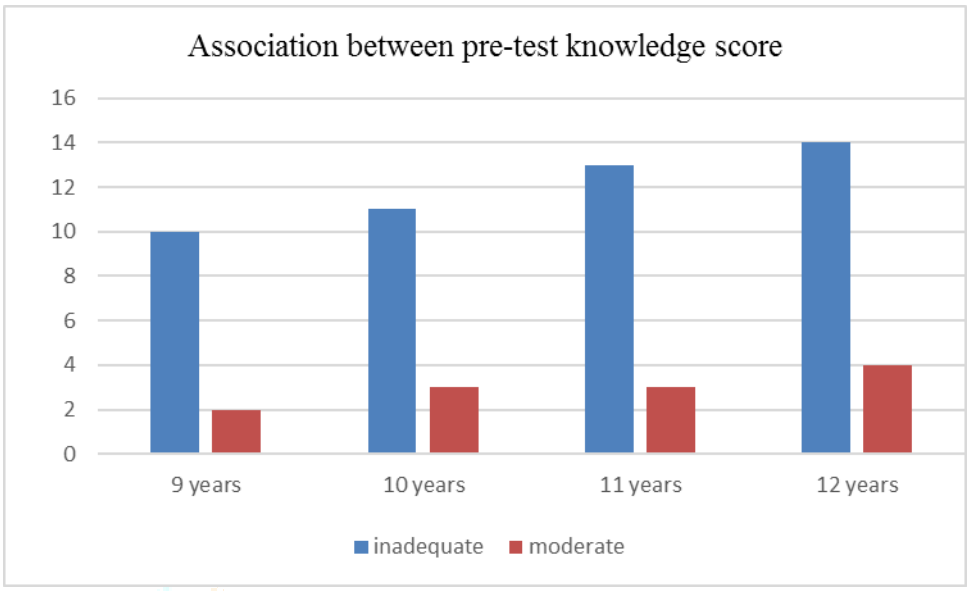


Figure 18: Association between pre-test knowledge score and age

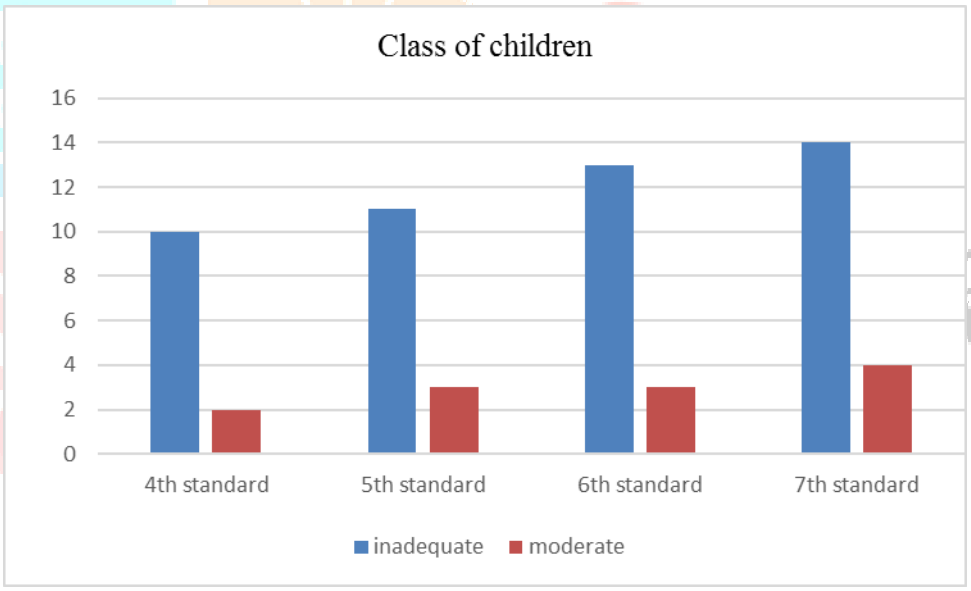


Figure 19: Association between pre-test knowledge scores and class

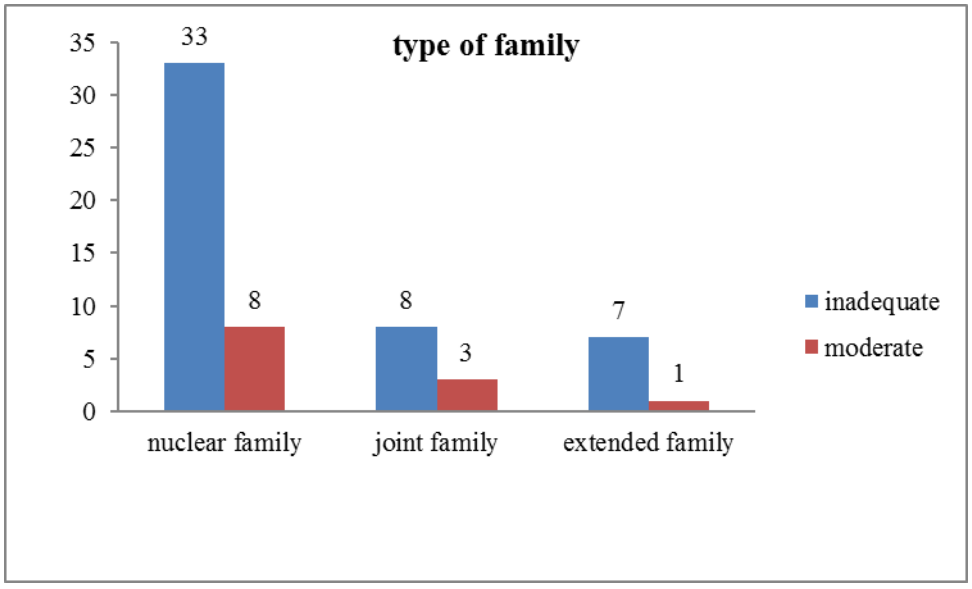


Figure 20: Association between pre-test knowledge scores and types of family

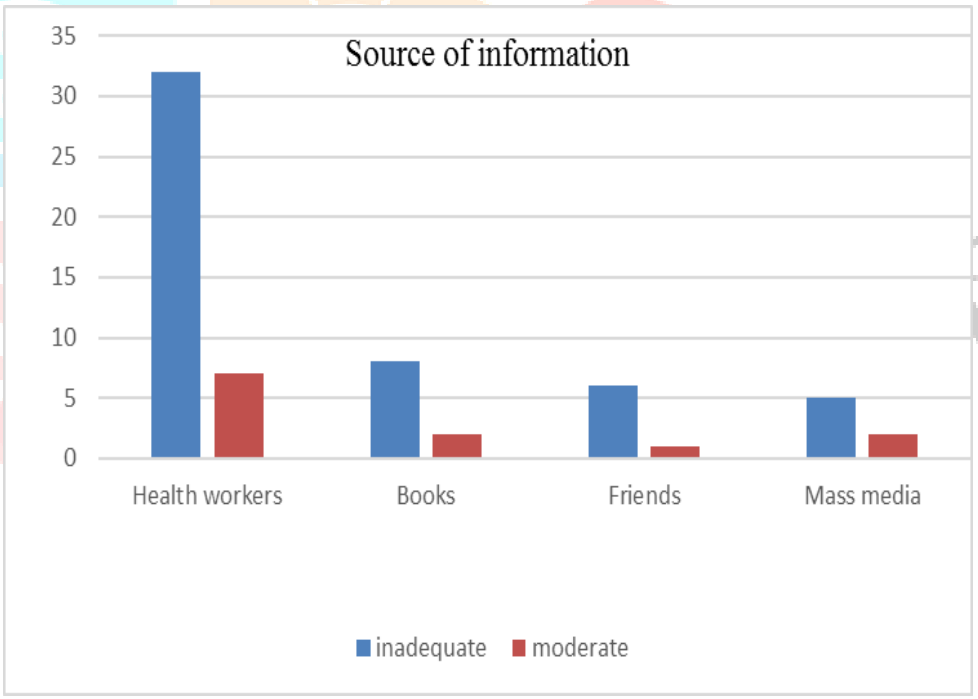


Figure 21: Association between pre-test knowledge scores and source of information

II. CONCLUSION

==========

This chapter deals with the finding of the study and their nursing implications. This study was conducted to evaluate the effectiveness of STP on knowledge regarding the effect of air pollution and prevention among school going children at selected school, Bangalore. In the present study 60 school children were selected by simple random sampling technique.

The research approach adopted for this study was evaluation approach with preexperimental one group pre-test post-test research design with a view to measure the pre-test knowledge level and the effectiveness associated with the post-test knowledge level following administration of STP regarding the effect of air pollution and prevention among school going children. A structured knowledge questionnaire was used to assess the knowledge of children. The data was interpreted by using appropriate statistical methods.

The following findings were drawn from the study:

- Among 60 school going children, 12(20%) of them were 9 years of age and 14(23%) of them were 10 years of age, 16(27%) of them were 11 years of age and 18(30%) of them were 12 years of age.
- In relation to the gender of school going children, 39(65%) of them were male and 21(35%) of them were female.
- According to class of study, 12(20%) of them were at 4th standard, 14(23%) of them were at 5th standard, 16(27%) of them studied were at 6th standard and 18(30%) of them wereat 7th standard.
- In concern to family type, among 60 children, 41(68%) of them belongs to nuclear family, 11(18%) of them belongs to joint family and 8(13%) of them belongs to extended family.
- In relation to the area of residence of children, 45(75%) of them belongs to urban area and 12(20%) of them belongs to semi-urban area and 3(5%) belongs to rural area.
- With regards to family monthly income, 5(8%) of them had below 10,000, 13(22%) had 10,001-15,000, 24(40%) had 15,001-20,000 and 18(30%) of them had above 20,000 monthly income.
- The socio demographic history of source of information shows that, among 60 children, 39(65%) of them got information from health worker, 10(17%) of them got information from books, 4(7%) of them got information from friends and 7(12%) of them got information from mass media.
- With regard to overall pre-test knowledge scores on air pollution and its prevention among school children, 48(80%) of them had inadequate level of knowledge and 12(18%)of them had moderate level of knowledge and none of them had adequate level of knowledge regarding air pollution and its prevention whereas in post-test, 52(87%) of them had adequate level of knowledge and 8(13%) of them had moderate level of knowledge and none of them had inadequate level of knowledge regarding air pollution and its prevention.
- In the mean scores in pre-test and post-test were 7.95±2.57 and 12.61±2.69, respectively.

  The obtained 't' value was 11.57. In the area of cause, risk factor, complications of air pollution, mean scores in pre-test was 5.62±1.82 and post-test score was 13,43±2.76. The obtained 't' value was 18.54. In concern with management and prevention of air pollution, the mean scores in pre-test and post-test were 5.09±1.65 and 9.24±2.39

respectively. The obtained 't' value was 14.60. The overall 't' value was 24.84 which wasabove the table value 2.6 at P≤0.05 level of significance.

- In In this study, the obtained chi square value for age, class, type of family and source of information about air pollution were higher values (12.60, 17.34, 25.12 and 18.63 respectively) when compared to the table value 2.6 at P≤0.05 level of significance. Hence the research hypothesis H_2 was accepted.

NURSING IMPLICATION

The implications of the findings had been discussed in relation to nursing service, nursingeducation, nursing administration and nursing research.

Implications of study in nursing service

1. Nurses have great responsibility for giving information regarding the effect of airpollution and its prevention for preventing the occurrence of complications.
2. Nursing personnel must know regarding available preventive measures of air pollution.

Implications of study in nursing education

3. Nursing personnel working in various health setting should be given in service educationto update their knowledge regarding effect of air pollution and its prevention.
4. There should be more emphasis on the nursing curriculum about current concepts of airpollution and its prevention.
5. The nursing students should be motivated to give health education at hospital andcommunity level in aspects of effect of air pollution.
6. Pamphlets, handouts and booklets should be kept in the hospital ward and outpatientsdepartment regarding harmful effects of air pollution.

Implications of study in nursing administration

Nurse administrator can organize staff development programme for nurses to update their knowledge. The concept of extended role of nurse offers many opportunities for a nurse administrator to improve the quality of life of the public. Nurses as administrators are in key position to organize in service education programme, refresher courses and workshops for nurses and encourage them to participate in these activities.

Implications of nursing research

1. This study will be valuable reference and pathway to further researchers.
2. The findings of the study would help to expand the scientific body of professionalknowledge upon which further researchers can be conducted.
3. The learning module developed by the researcher can be used as a blue print for furtherinvestigations to develop more effective instructional materials.

7. Extensive research can be conducted to create awareness to the school children regardingeffect of air pollution.

4. DELIMITATIONS

This study is delimited to:

- The assessment of knowledge will be based only on the correct responses given to theitems in the structured knowledge questionnaire.
- Collection of data is only from school going children from selected school of Bangalore.

Suggestions

The finding of the study suggest

- The nurse educator should give information to school going children in the communityabout effect of air pollution and its prevention.
- Community health program should be initiated as to impart knowledge of effect of airpollution its effects to the public.

Recommendations for further studies

In the light of the finding of the present study, the researcher puts forward thefollowing recommendation for conducting further research.

- A study can be done on a larger scale in different setting.
- Similar study can be replicated on caregivers in hospital setting.
- A cross sectional study can be conducted on knowledge, practice and attitude onknowledge of effect of air pollution among school going children.
- A comparative study can be done to assess the knowledge level of nursing studentsregarding effect of air pollution and its prevention.

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