A STUDY OF EFFECTIVENSS OF IMPLEMENTATION OF NUCLEAR EMERGENCY PREPAREDNESS PLAN

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ABSTRACT

Nuclear disaster is the most dangerous hazard in the present scenario. It is important to launch the safety education campaign to the residents of the surrounding areas of any nuclear establishment in India to save their lives and to mitigate the effect of potential radiation exposures in case of any nuclear emergency. Keeping in view of nuclear emergency condition, which could arise in this area of Rajasthan, the Government of Rajasthan and nuclear power plant administrators had prepared and implemented a "Nuclear emergency preparedness plan" to safeguard the health and safety of the surrounding population of nuclear affected areas of Rajasthan and to protect the livelihood and public properties in the event of a nuclear emergency. The nuclear emergency preparedness plan of the Government of Rajasthan for Rajasthan Atomic Power Station was developed in pursuance of the directions received from Ministry of Science and Technology, Government of India. The above plan is a mass awareness campaign to educate the surrounding population of nuclear affected areas of Rajasthan that provides the basis for planning, preparation and implementation of the various activities to achieve the above objectives. This plan is a conduct of education campaigns, trainings and mock drills at scheduled intervals to educate public about emergency preparedness and radiation effects. Need of study of is to review that arrangements are in place for a timely, managed, controlled, coordinated and effective response to any nuclear emergency at Rawatbhata Rajasthan site and to know about the myths of surrounding population of nuclear affected area about nuclear power plants and emergency preparedness plan.The proposed research is to study the effectiveness of implementation of "Nuclear emergency preparedness plan" on surrounding population of nuclear affected areas. The hypothesis established against the study was as "There is no effectiveness of implementation of the "Nuclear Emergency Preparedness plan" on the surrounding population of nuclear affected area.In the present study the researcher has chosen quantitative method to indicate the systematic way of procedures and to obtain fruitful results. The qualitative research which emphasis on the findings of effectiveness of awareness on nuclear emergency preparedness plan. The researcher has evaluated the effectiveness by using a self prepared observation checklist during conduction of mock drill nuclear emergency exercises in the nuclear affected areas of Rajasthan. During the observation in mock drill nuclear emergency exercises held, 28 numbers of observations were checked on overall effectiveness of nuclear emergency preparedness plan.. The above Table shows that 91% of people were following the activities related to all dimensions hence the effectiveness is observed as satisfactory, 9% of people were not followed the related activities during the conduction of mock drill nuclear emergency exercises. Hence the null sub hypothesis *"There is no effectiveness of implementation of the "Nuclear emergency preparedness and response plan" on the surrounding population of nuclear affected area"* is rejected.

Key words

Nuclear emergency - is any event or incident due to nuclear accident which may cause serious hazard to life and property of an individual or a group of people.
Emergency plan - plan formulated for responding to radiation or toxic gas accidents to mitigate consequences of the event.
Emergency preparedness - is to ensure that arrangement are in place for a timely, managed, controlled, coordinated and effective response at the site to any emergency.
Nuclear effected area - is the surrounding 16 km radius area from the centre of nuclear power establishment at RAPS, Rawatbhata which is prone to get affected in case of any nuclear emergencies at RAPS.
Awareness program - the training program conducted to literate the population of the 16 KM radius area zone of RAPS, explaining them about the nature of off -site emergency, which could arise in these areas.
Emergency exercise/Mock drill - An emergency exercise is a test of the emergency plan with particular emphasis on the co-ordination of the many interplaying component of the emergency response procedure and personnel/agencies.
Emergency Plan - Plan formulated for responding to radiation or toxic gas accidents to mitigate consequences of the event.
Stakeholder:A stakeholder is anyone who can affect or is affected by the actions of a corporation, organization or company. Here stakeholders means various people who lives in nuclear affected areas of Rajasthan

Introduction:

The Rawatbhata nuclear power station, Department of Atomic Energy (DAE) centre commonly known as Rawatbhata Rajasthan Site (RR Site) is situated in Kherli block under the tehsil of Rawatbhata in the district of Chittorgarh, Rajasthan State. The

Rawatbhata Rajasthan Site comprises of the six operating units of nuclear power plant. These nuclear power plants are for generation of electricity by nuclear fission. Nuclear disaster is the most dangerous hazard in the present scenario. It is important to launch the safety education campaign to the residents of the surrounding areas of any nuclear establishment in India to save their lives and to mitigate the effect of potential radiation exposures in case of any nuclear emergency.

Nuclear emergency preparedness

Keeping in view of nuclear emergency condition, which could arise in this area of Rajasthan, the Government of Rajasthan and nuclear power plant administrators had prepared and implemented a "Nuclear emergency preparedness plan" to safeguard the health and safety of the surrounding population of nuclear affected areas of Rajasthan and to protect the livelihood and public properties in the event of a nuclear emergency. The nuclear emergency preparedness plan of the Government of Rajasthan for Rajasthan Atomic Power Station was developed in pursuance of the directions received from Ministry of Science and Technology, Government of India.The above plan is a mass awareness campaign to educate the surrounding population of nuclear affected areas of Rajasthan that provides the basis for planning, preparation and implementation of the various activities to achieve the above objectives. This plan is a conduct of education campaigns, trainings and mock drills at scheduled intervals to educate public about emergency preparedness and radiation effects.

Need of and Importance of the Study

The researcher is a resident of a very special town, which is called the biggest nuclear city of Asia. This town named Rawatbhata Rajasthan Site has eight nuclear reactors out of which six are generating 1140 MW(e) nuclear power and two are under construction. The population of this town and surrounding areas of nuclear power plants is about 75000. Since extra safety features are being adopted during the operation of nuclear reactors here. However, a very remote possibility of some equipment failure or operational error cannot be entirely ruled out which may result in an accident leading to an emergency situation. Such emergency situation may involve unacceptable release of radioactive material or radiation exposure, having adverse effects on persons and property at the site and surrounding population of these nuclear establishments.Fukushima Daichi accident in Japan, Three Mile Island accident in USA and Chernobyl accident in the USSR have put a big question mark on the safety of nuclear power stations. What is the probability of such accidents in Indian nuclear power plants? General public has every right to ask this question. It is a prime responsibility of nuclear operating organizations to launch a safety education campaign for the public on nuclear emergency preparedness.

Following basic questions may be raised:

- Whether surrounding population of nuclear affected area of Rajasthan is well aware to handle the nuclear emergency situation?
- Whether all safety measures required during nuclear emergency are available at place?
- Whether frequency of awareness training programmes is sufficient to educate and update the surrounding population?
- Whether the emergency preparedness plan is being effectively implemented in the nuclear affected area of Rajasthan?
- Whether the general public of the surrounding population harbors many myths on nuclear power and emergency preparedness plan?

What is the present condition in surrounding population of nuclear affected area in reference to the above questions and how effectively the emergency preparedness plan is being implemented in surrounding population of nuclear affected area? In order to investigate the above, the researcher has selected this topic. Need of study of is to review that arrangements are in place for a timely, managed, controlled, coordinated and effective response to any nuclear emergency at Rawatbhata Rajasthan site and to know about the myths of surrounding population of nuclear affected area about nuclear power plants and emergency preparedness plan. Prior to starting the work on this research, all the related literatures were reviewed. It is also known by reviewing the related literature that the research work done in emergency preparedness is only on different natural disasters. There has been less work done on nuclear emergency preparedness in India. The researcher is a resident of the biggest nuclear city if the Asia, and she feels that it is imperative for her to undertake a study on this sensitive topic.

Objective of Study:

Hence the proposed research is to study:-

- the effectiveness of implementation of "Nuclear emergency preparedness plan" on surrounding population of nuclear affected areas.

Variables used in study

- Independent variable - Nuclear emergency preparedness plan
- Dependent variable - Surrounding population of nuclear affected area of Rajasthan

Hypothesis

The hypothesis established against the study was as :–

- "There is no effectiveness of implementation of the "Nuclear Emergency Preparedness plan" on the surrounding population of nuclear affected area.

Design/Methodology:
In the present study the researcher has chosen quantitative method to indicate the systematic way of procedures and to obtain fruitful results.The qualitative research which emphasis on the findings of effectiveness of awareness on nuclear emergency preparedness plan. The researcher has evaluated the effectiveness by using a self prepared observation checklist during conduction of mock drill nuclear emergency exercises in the nuclear affected areas of Rajasthan.

Tools
Following tool has been used in present study:–

- Observation Checklist

Reports on observation checklists to determine the effectiveness of implementation of "nuclear emergency preparedness plan":

The hypothesis no.-1.0 *"There is no effectiveness of implementation of the Nuclear emergency preparedness plan on the surrounding population of nuclear affected area"* is tested by an observation checklist. The purpose of these observations was to check the effectiveness of implementation of nuclear emergency preparedness plan during nuclear emergency mock drills. As per state authority and nuclear power plant officials these mock drills are being carried out with a frequency of once in two year. The researcher has actively witnessed two different mock drills of nuclear emergency exercises conducted by nuclear plant officials along with state government officials. The researcher has visited the areas defined by state authorities during these mock drills along with the nuclear plant officials and noted down the observation throughout the conduction of nuclear emergency mock drills. The results of these observations are as under. Following standards have been set up to categorise the effectiveness on the basis of percentage obtained on the dimensions during collection of data through observation checklists:-

Above 68 - 100 %	:	Satisfactory
Above 34 - 68 %	:	Normal
0 - 34 %	:	Less

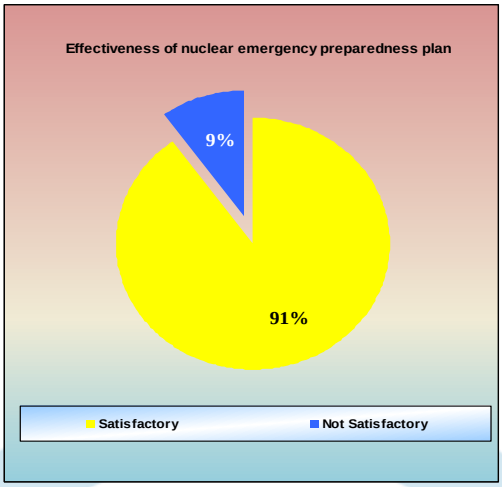
Table – 1: Observation data through checklist

S. No.	Dimensions	Statements	Observations in (%)	
			Yes	No
1.	Public followed counter measures	7	95	5
2.	Followed the instructions given by different modes for termination and declaration of nuclear emergency	5	90	10
3.	Coordination of individual during evacuation, transportation and sheltering is up to mark	5	80	20
4.	Availability of facilities and resources during the mock drill nuclear emergency exercise and its awareness to public	6	90	10
5.	Safety and rescue services are there as defined	5	100	0
Overall effectiveness of nuclear emergency preparedness plan		**28**	**91**	**9**

Hypothesis no.-1.0

During the observation in mock drill nuclear emergency exercises held, 28 numbers of observations were checked on overall effectiveness of nuclear emergency preparedness plan.. The above Table shows that 91% of people were following the activities related to all dimensions hence the effectiveness is observed as satisfactory, 9% of people were not followed the related activities during the conduction of mock drill nuclear emergency exercises. Hence the null sub hypothesis no.1.0 *"There is no effectiveness of implementation of the "Nuclear emergency preparedness and response plan" on the surrounding population of nuclear affected area"* is rejected.

Graph-1: Status of effectiveness of nuclear emergency preparedness plan on the basis of data collected through observation checklist



In order to analysis the hypothesis deeply the main hypothesis is further divided into five sub-hypothesis on the basis of dimensions observed during the observations. The analysis of obtained results for each sub-hypothesis is presented along with its interference as under:-

Sub Hypothesis no.-1.1

During the observation in mock drill nuclear emergency exercises held, seven numbers of observations were checked on counter measures. The above Table shows that 5% of people were not following the activities related to counter measures, 95% of people was actively followed the activities related to counter measures and following activities were mainly carried out by them during the mock drill exercise in their area –

- People put handkerchiefs on their mouth.
- They closed the windows of their houses.
- They listened carefully the instruction being given to them.
- They did not eat food kept in open area and did not drunk water from well, pond or any other open atmosphere water sources.
- They ate iodine tablets given to them by medical teams.
- They remained inside their houses.
- They stopped to take food and water kept in open area.
- They did not allow their cattle to graze in open area.

It can be concluded from the above that satisfactory percentage level of population were following the activities related to awareness of counter measures. Hence the null sub hypothesis no.1.1 *"The people have not followed the precautions and counter measures during the mock drills of nuclear emergency"* is rejected.

Sub Hypothesis no.-1.2

Five numbers of observations were carried out on the communication for declaration and termination of nuclear emergency. The above table shows that 10% of people were not following the activities related to modes of information, 90% of people was actively followed the activities of information and instruction during declaration and termination of nuclear emergency. Following activities were mainly carried out by them during the mock drill exercise in their area –

- They followed the instruction given by announcements carefully.
- They did the same as instructions delivered to them.
- The rescue teams performed their duties w.r.t declaration and termination of nuclear emergency mock drill.
- The announcements of declaration and termination of nuclear emergency were clear and easily understandable.

It can be concluded from the above that most of the people were following the activities of information and instruction during declaration and termination of nuclear emergency. Hence the null sub hypothesis no.1.2 *"The communication of declaration and termination of nuclear emergency were not proper and effective during the mock drills"* is rejected.

Sub Hypothesis no.-1.3

Four numbers of observations were checked about the process of evacuation, sheltering and transportation water during nuclear emergency. The above table shows that 20% of people were not following the activities related to evacuation and transportation, 80% of people was actively followed the activities related evacuation, sheltering and transportation during nuclear emergency mock drill and following activities were mainly carried out by them during the mock drill exercise in their area –

- The public member were cooperating the evacuation and transportation process
- The people were aware that sheltering will be provided by state authorities in case of nuclear emergency.
- The people coordinated the cattle evacuation process
- The children and women are preferably allowed to board in the vehicles during evacuation process.

It can be concluded from the above that most of the people were following the activities related to supply and control of food and water during mock drill of nuclear emergency. Hence the null sub hypothesis no.1.3 *"The people have not followed the instruction evacuation, sheltering and transportation during the nuclear emergency mock drills"* is rejected.

Sub Hypothesis no.-1.4

Seven numbers of observations were checked about resources and facilities during nuclear emergency mock drill. The above table shows that 10% of people were not aware about the facilities to be provided to them, 90% of people was having the relevant information and they were confidently using the resources and facilities given to them during the mock drill exercises. Following activities were mainly carried out by them during the mock drill exercise in their area –

- They followed the instruction given by state authorities time to time.
- They gathered in a disciplined manner to get the medical check ups by medical team like contamination testing.
- They used the transportation facility for evacuation purpose.
- The people were kept calm in the sheltering area and used the resources provide to them.
- The people were cooperated with the teams during shifting of their cattles in a safe area.

It can be concluded from the above that most of the people are following the activities related to evacuation, transportation and sheltering during mock drill of nuclear emergency. Hence the null sub hypothesis no.1.4 *"The resources and facilities were not effectively provided to affected public during the nuclear emergency mock drills"* is rejected.

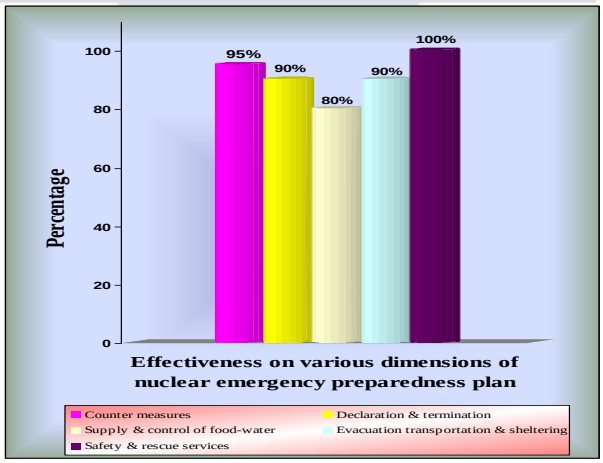
Sub Hypothesis no.-1.5

Five numbers of observations were checked related to safety and rescue services during nuclear emergency mock drill. The above table shows that 100% of people and officials were following the activities related to safety and rescue services. Following activities were mainly carried out by them during the mock drill exercise in their area –

- All the rescue teams were available at time at right and identified locations.
- All the safety measures like iodine tables, fire brigade, medical teams were made available throughout the mock drill of nuclear emergency.
- The people were responding well to various safety and rescue team members.

It can be concluded from the above that all types of people are following the activities related to safety and rescue services during mock drill of nuclear emergency. Hence the null sub hypothesis no.1.5 *"The safety and rescue teams have not performed their duties and responsibilities to help the people during the nuclear emergency mock drills"* is rejected.

Graph-2: Status of effectiveness of the nuclear emergency preparedness plan on the basis of data collected for different dimensions through observation checklist during mock drill nuclear emergency exercises



Conclusion

The usefulness of every research depends upon its practical uses. The administrators of the emergency preparedness plan, different government bodies i.e. State Level Emergency Response Committee (SLERC) and National Level Emergency Response Committee (NLERC), which are responsible for conducting the mock drill emergency exercise, should study this research thesis.

The teachers and students of surrounding educational institutions should be the target for effective, speedy and unbiased communication. According to the `New Education Policy 2020`, the study of disaster management is compulsory in UG-PG which would be implemented from the academic session 2022-23 itself. The researcher wishes that the nuclear emergency preparedness should be the part of the syllabus in school education and higher education also. This will help to save the lives and to protect the humanity from potential exposure of radiation in case of any nuclear accident.

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