

STUDY OF STRESS IN NUCLEAR AREA WORKERS: SILENT ENEMY

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ABSTRACT

The nuclear accidents occurred in Three Mile Island, Chernobyl and Fukushima were influenced by human factors. The objective of this paper is to study about the factors that influence the level of stress of the nuclear area workers. The paper is based on theoretical assumptions on occupational stress and its manifestations. The methodology used is based on questionnaires and interviews, obtained from Martins' work published in 2008 about the study of human factors focused on research reactor operators IEA-R1, of the *Instituto de Pesquisas Energéticas e Nucleares* (IPEN). In that study were analyzed the accidents occurred by human failure. The results presented in this paper showed some improvements in the reactors operators' work, and health. Operational reliability and facilities safety also improved.

1. INTRODUCTION

In March of 2011 the world received the news of a new natural tragedy again, an earthquake of 9 ranks in the Richter scale that reached the province of Fukushima (Japan), followed by a tsunami that devastated the whole city and caused a nuclear accident. The word stress earned great importance faced with this disaster.

With the occurrence of the nuclear accidents of Three-Mile Island, Chernobyl and now Fukushima, it can be observed that the human failure contributed for the occurrence of these incidents. This work has the objective to give continuity in the studies carried out by Martins [1], who researched about possible human failure that would be able to occur for the research reactor operators IEA-R1 [2], focusing now in the theory about stress and its manifestations. The word stress is defined as a "joint of organism reactions and aggressions: of the psychological and physical order, and other capable to disturb the balance", which is the priority in the operators' lives.

Faced with these accidents, one can say that they do not have just a cause, but they have several causes, where the accumulation of these causes can make an accident happen. These causes can be: human, materials and of other different possibilities. The first among them, the human, comes from a risky action due to several factors: physical capacity, knowledge of

rules, experience, motivation, stress and etc. The material causes are related to physical and technical questions, where the random causes, are unexpected and different from the other ones. When the last one occurs, it demands a great emotional and physical mobilization, like terrorist attacks, kidnapping, accidents with multiple victims and etc, according to Geller [3].

One can say that what causes stress it is a mental factor, an internal state of a individual who realizes threats to his emotional or physical welfare. A condition for something to be stressful, it is the presumption of the incapacity of self-defense faced with something harmful, Singer 1984 [4]. The way people realize their situation before an event should be considered like the determining factor in the evaluation of the effects of the accidents.

Regardless of all the social, technical, and scientific achievements, the individual has not obtained to conquer "balance" for a healthy development of his/her organism. The individual's habits are inadequate to live with the air and water pollution, with the visual and noise aggression of the environment, with the social and work insecurity, the urban violence, the economic crises and so many others sources of stress that end up exhausting the adaptive capacity of this individual in the society [5].

One of the "harmful" stress, it is determined by the way the society is organized, that is, by the industrialization, by the consumption and by the competition, where some of these conditions are maintained by the imposition of the society, creating bigger or smaller stress, while others will be able to be changed, interfering somehow in the work, family and social areas of the individual.

The modern human being, when confronting himself with stress motives from the normal routine, work, and social life, forces himself to present an emotional behavior or politically correct motor, incompatible with the biological state, which will be able to lead or to expose this individual to psychosomatic illnesses [6].

2. METHODOLOGY

Works that approach cognitive aspects directed to accidents are based in qualitative and quantitative studies, where it is evaluated psychological aspects that are capable to realize the stress level of the individual.

Questionnaires and interviews were structured and utilized to evaluate individual and situational factors that can interfere in the behavior and perform of the operator and supply conditions of stress under the following aspects: Environmental Factors, Work Relations, Work Factors, External Factors, Familiar Conflict, Individual Behavior, and Model of Work [5].

Each one of these aspects listed previously, accompanied three correlated questions, in order to help the goals of this work.

It was also utilized a bibliographical research to give theoretical base and it was studied some cases of literature about the occurrence of the levels and consequences of the stress.

2.1 Stress Phases

In an initial state, the stress is considered normal and even beneficial when it arises for the defense of the organism named as “*eustress*”, after this phase, the organism suffers alterations in its balance becoming chronic, leading to a greater attention and even worry regarding the individual, who is named of distress.

The stress phases happen when the stressed agent continues acting in an uninterrupted way, which are the following:

Acute phase – Where the motives are initiated, and the organism begins to react when realizes its damage, but does not have the capacity to notice its silent effects of the chronic stress.

Resistance phase – The persistence of the stress is the phase where the first mental, emotional, and physic consequences begin to appear as: loss of concentration, emotional instability, muscular pains, frequent headaches, depression, and it is in this phase where many people cannot relate these symptoms to stress.

Exhaustion phase– In this phase the organism begins to suffer the consequences by the fact of not observing in advance the gravity that the stress causes, originating physical or psychological illnesses.

2.2 Stress Consequences

The stress can cause several illnesses, as disturbances in several organs, for example: immunological, allergic, dermatological and gastrointestinal illnesses, etc.

There are also disturbances called "neuro-vegetative". For example: tremors, tensional headache, asthenia (sensation of fatigue), arterial hypertension, palpitations, and etc. Laboratory exams can also show alteration in the results caused by stress.

Stress leads the mental and physical illnesses, or even the dissatisfaction and demotivation at work, causing the occupational stress, consequently interfering in the quality of the affective/social life. In the practical, the presence of stress can induce errors in the activities that must take necessary decisions.

3. RESULTS

The questionnaires were submitted to 24 of the operators of the IEA-R1 research reactor, located in the IPEN. For this work, two factors were submitted to the analysis, the emotional aspects and the stress, therefore as already said previously, they are intimate related.

Regarding the emotional factors where the objective is to know which the aspect more affect emotionally the reactor operators, it was obtained the following result as seen in the Figure 1.

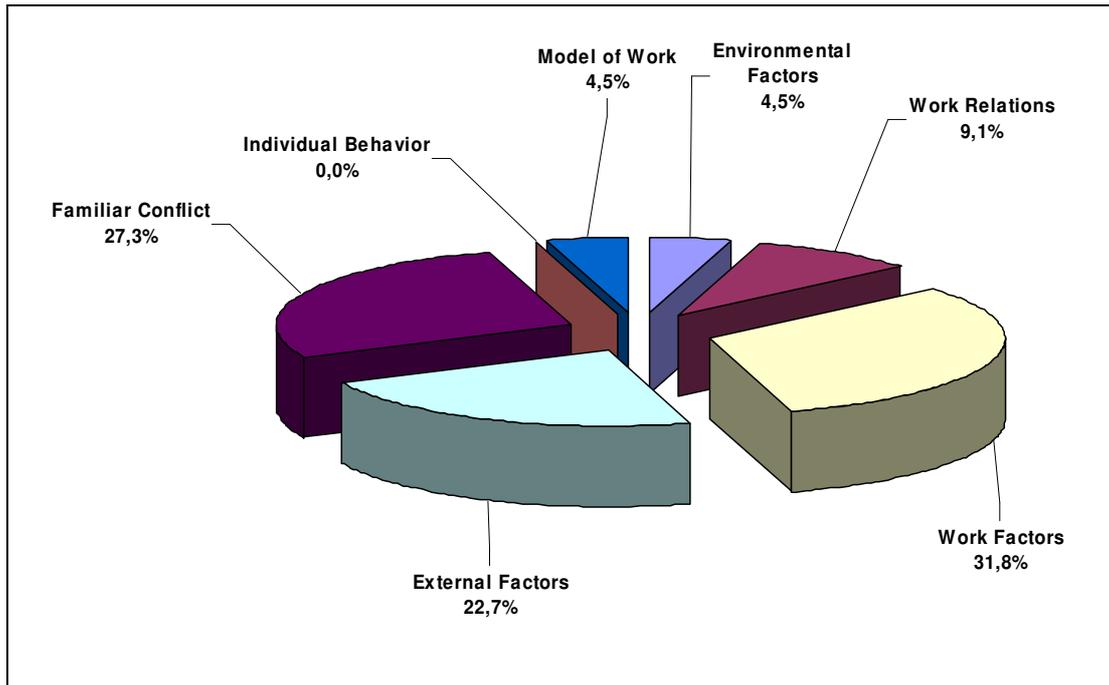


Figure 1. The aspect that more affect the operators emotionally

The results obtained for this group of operators, regarding the emotional aspect, were the following: the greatest among them, 31.8%, relating to Work Factors, where the aspects raised, giving emphasis to the workday, salary, and to the post or function that is being exercised. In this case to suggest some action it is difficult, therefore, it is about a public company with well established functional and wage rules. A more viable alternative would be motivating the own activity, that is, the execution of the function with a greater utilization of the potential of the operator. This situation is reinforced once again with 22,7% in the External Factors, which are related to several politics aspects such as; the government, security in the city and, even displacement to work.

Another important factor that presents a significant percentage with 27,3% is the Family Conflict, dealing with relatives, children and spouse. This factor has the characteristic of not being externalized by the people, but it has important consequence in another factors, and consequently, in the general context of the individual.

Regarding the stressors causes, it was obtained under the same aspects the following results as seen in the Figure 2.

The most stressful factors are the External Factors with 34,8%, and the Work Factors with 17,4%. As already mentioned before, the factor Family Conflict appears with the smaller index of 4,3%, opposing in a certain way the previous question.

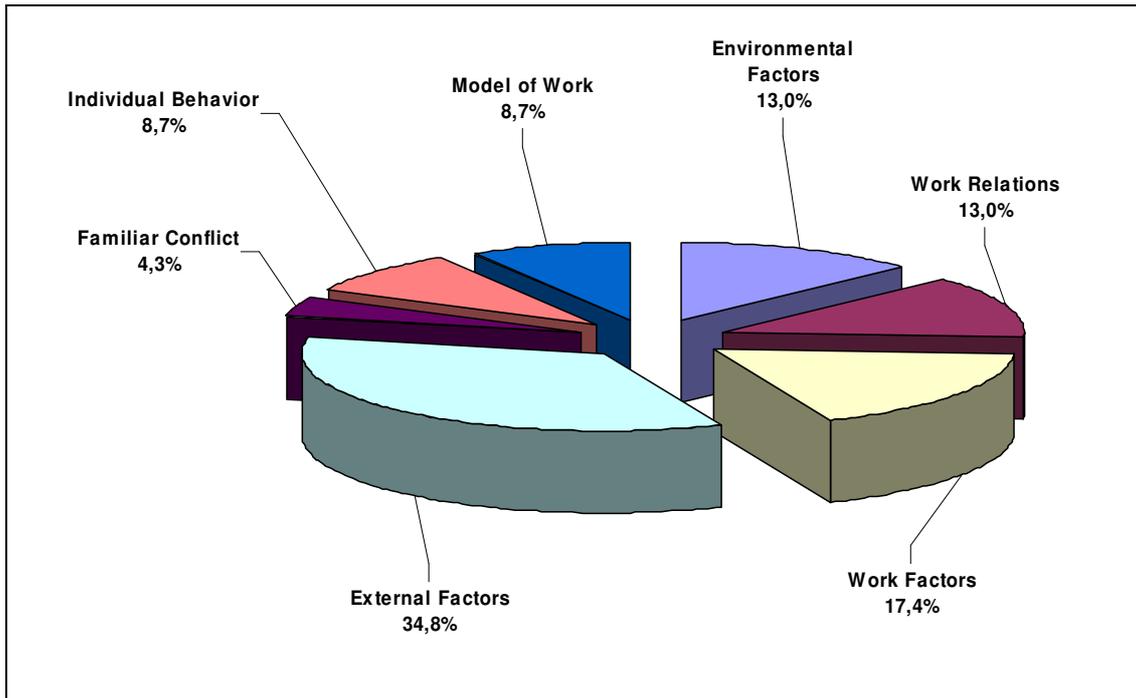


Figure 2. Aspects that provide more stress

4. CONCLUSIONS

This study takes into consideration the human behavior information, whether of literature or of achieved interview, raising important points related to the operator's behavior and performance, and having the objective to collaborate positively with the group that participated of this research.

It concludes by being a matter of an essentially subjective theme, the analysis of stress involves several other aspects of human behavior and regarding the institution these operators are set in. Through of the methodology utilized in this work, people are able to understand the culture, observe and analyze the fragility of its operators, study cognitive aspects of the operators and plan changes that lead the institution to be more productive. As a result of this work, some prevention actions can be taken with the purpose of collaborating with the institution.

Finally, this work has the intention to unify the planning and the organization for health questions, either physic or psychological from the reactor operators IEA-R1.

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