

SUMMARY OF SCIENTIFIC WORK

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Nikolina Radeva's scientific work is related to the main directions of Disaster Medicine, Medical Disaster Relief and Catastrophic Medicine in which she teaches students.

Her scientific works are mainly in the field of Disaster Medicine:

- Analyzes of definitions and basic terms used in disaster medicine and other related disciplines. Classifications. Key features of disaster situations.
- Chemical accidents and consequences for Varna region, causing health and environmental problems.
- Management, Planning and Organization of Population Protection in Disaster Situation.
- Medico-geographic characteristics of ecosystems and impacts – in-depth studies of floods, fires, earthquakes, etc. disaster situations.
- Psychological problems (stress) in emergency situations.
- Surveys on the assessment of the awareness and training of medical staff and the population for disaster situations.
- Studies on groups at risk and specifically for the group of people with disabilities
- Analyzes of the medical consequences of disaster situations and recommendations for improving the health of the population.
- Biological problems of marine water pollution.
- Experiments with experimental animals and other studies.

I. Definitions of basic terms used in Disaster Medicine and other related disciplines. Classifications. Key features of disaster situations:

1. Bilingual Glossary of terms (in English and Bulgarian)

The proposed glossary is semantic. Contains over 1200 terms, their definitions and abbreviations.

The proposed terminology in the Glossary can be used by scientists, lecturers, specialists from the Bulgarian Academy of Sciences, BRC, post-graduate students, PhD students and students from senior medical universities and medical colleges.

2. Use of basic terms in Epidemiology of infectious and non-communicable diseases in the anti-epidemic activity of hospitals and Regional Inspectorate for the Protection and Control of Public Health

Anonymous survey of 86 people from two healthcare establishments – hospitals (61 specialists) and Regional Inspectorate for the Protection and Control of Public Health - Dobrich (25 specialists) was conducted, for the terminology used and the basic knowledge of the specialists in the epidemiology of infectious and non-communicable diseases.

The assessment is that the basic terms of epidemiology and their use during internal hospital infections are insufficiently used by the specialists of both healthcare facilities.

The knowledge of the internal hospital infections' sources is good, but they are mixed with the infection transmission factors.

The self-assessment of good knowledge of terminology is low in more than half of surveyed professionals – 53.5%.

Training on internal hospital infections' issues involves a high percentage of participants in the hospitals (60%) due to their participation in an international project.

3. *Civil Protection Current Aspects in Disasters (Monograph)*

The definitions of the basic terms used in disaster medicine and other related disciplines are assembled and analyzed. Descriptions of Disaster Situations from different authors and databases are presented.

There is an analysis of the organizational structure and management of the population protection activity during disasters, which is based on the Disaster Protection Act (as amended) and other regulations.

The analysis of the data shows that a number of problems and difficulties arose in the health care system during disaster situations. The ways to overcome them are highlighted.

The tasks and activities in mass disasters have been elaborated in detail – medical sorting and evacuation, compared with the opinions of other authors and the experience of French, Belgian, German and experts from other countries.

4. *The Counterterrorism training in Medical University of Varna - Good Practice for the Community-Academic Partnership*

In response to the terrorist attack at Sarafovo airport in 2012 the Medical University of Varna initiated the international workshop in counter-terrorism. The training of policy-makers, various community and professional groups to act in mass casualty situations is held with experts from leading international universities, primarily from Israel.

The workshops unite the efforts of the academic community to help communities, which can potentially be affected by mass casualty situations and their response in emergency situations.

The annual training, organized by the Medical University of Varna jointly with foreign universities and institutions presents an example of academic-community partnership in the interest of society, internationalization of training, innovation and sustainability.

5. *Civil protection modern aspects in case of disasters – Bulgaria*

Used are descriptive analysis and summary of scientific publications and state documents concerning the nature, goals, objectives, principles and remedies available to the population in disasters aiming to prove the modern aspects of Civil Protection in Bulgaria

In Bulgaria the organization of the civil protection in disasters includes actions on prevention, emergency rescue, relief and recovery. The structure of the main Integrated Rescue System components was built throughout the country in accordance with the administrative - territorial division, each of which supports 24-hour readiness to respond.

All citizens should be aware of the basic principles for protection and prevention as they determine the right of defense of each person and state the priority of human life rescue.

The Bulgarian Civil Protection aspects are up to date and correspond to the modern principles of protection, applied in other European Union Member states.

II. Surveys on possible Accidents and Ecological disasters specific for Varna's Black Sea Region

1. Potential risk of poisonous substances in the region of Varna

The territory of the Varna District is heavily exposed to the anthropogenic impact of industry and chemicals. Obsolete infrastructure, unfit buildings, ownership problems (90% of the productions are private), and poor spatial planning pose a potential risk to the population.

There are conditions for a potential risk of poisoning the population after pollution of water and soil with industrial waste – mainly waste oil products and illegal disposal of such products.

Surveys for Varna District show as potentially dangerous 17 companies located mainly in the municipality of Varna and Devnya. Major poisonous substances are chlorine and chlorine compounds, dichloroethane, trichloroethane, calcined soda, nitrogen and phosphorous fertilizers and others.

In a predicted accident with chlorine or ammonia in Devnya, the time of reaching the outbreak of chemical contamination to Varna is 6 hours and it is possible to contaminate area of 2-3 km² in the western part of the city, which includes, besides the industrial sites and urban areas of "VI. Varnenchik", "Vazrazhdane", "Mladost" and Varna airport.

The greatest anthropogenic risk of mass poisoning in the territory of Varna is in emergency situations in companies storing large amounts of ammonia (hypermarkets Metro, Kaufland, Billa and CBA), cyanide salts, petroleum products, acetylene and natural gas.

2. Possible accidents and consequences for Varna

The potential risk to the life and health of the population following the accident of an industrial site storing and producing poisonous substances is identified.

In terms of their chemical structure, the poisonous substances are: chlorine, ammonia, CO, hydrogen cyanide, sulfur, hydrogen sulphide, nitrogen and others gases.

The potential risk for the life and health of the population after the gas pipeline accident – contaminating of areas 2-3 km² in the western part of the city, including in addition to the industrial sites and urban areas "VI. Varnenchik", "Vazrazhdane", "Mladost" and Varna airport.

3. Study on the preparation for medical assistance after an accident at work

An anonymous survey of 108 employees in Devnya cement factory was carried out through an individual questionnaire of 21 questions. Participants are aged 24 to 59.

We appreciate the preparation of the first-time medical practitioners for good, but only 1/3 of the respondents have confidence that they will handle a real situation.

A high percentage (48%) want to increase their knowledge. Extremely high is the percentage of those willing to be actively involved in rescue operations in the event of an emergency situation – 90%.

III. Management, Planning and Organization of the Population Protection in Disasters

1. Planning and managing disaster situations

After studying national and international legislative and regulatory documents, various plans for the protection of the population in case of disaster situations and models of management of the mitigation measures in the European Union and in particular the Republic of Bulgaria have been analyzed and systematized.

The assessment of risk factors from disaster situations is the basis for predicting the consequences, clarifying ways to combat them, taking the necessary preventive measures to mitigate the consequences, organizing urgent actions and eliminating the negative effects.

2. *The risk of disaster situations – a challenge to public health*

Disaster risk assessment has a significant impact on public health and is an indicator of the ability of society to protect itself from disaster situations.

For the Republic of Bulgaria the main risks are related to meteorological accidents, the main risks being the temperature anomalies, floods, earthquakes, fires, etc. Risk management is an essential part of the overall disaster protection strategy.

3. *Medical sorting and necessary organization in emergency situations*

Medical sorting (triage) is a part and indivisible process of first aid in disaster situations. Delaying of organized first aid medical groups and triage in mass incidents before arrival of ambulances from Emergency Medical Service may be impossible.

It is necessary to carry out a wider training of the population and members of the rescue teams to identify and rescue firstly the severely injured (emergency) within the first 30 minutes until arrival of the ambulance from the Emergency Medical Service.

4. *Organization of the Emergency Situation System in the Federal Republic of Germany*

The leading element of the rescue activities in the FRG is voluntary. The activities priority of the German Federation, are only those related to military situations.

Rescue activities in the Federal Republic of Germany are carried out by: fire protection units, the German Red Cross and the Bavarian Red Cross, the Maltese Assistance Service, the Samaritan Workers' Union, the German Life Saving Society and the Technical Assistance Service.

5. *Medical support for a large number of injured in the Golden Sands resort*

In the present scientific study, the available resources from medical establishments (mainly for active treatment) and health specialists both in the territory of Golden Sands resort and in the neighboring settlements are summarized and analyzed. An assessment has been made of whether their number is sufficient to respond adequately to an accident involving a large number of injured. It is estimated what kind of plan to prepare for the medical support and the corresponding actions to achieve high efficiency in a complicated situation, and for work of the rescue teams in the lack of personnel.

Recommendations were made for organizing and conducting periodic practical trainings by the managers together with the territorial structures for disaster and accident protection for proper behavior and effective actions in case of incidents with a large number of injured.

IV. Medical-geographic characteristics and impacts of various disaster situations. In-depth studies of floods, fires, landslides, earthquakes, and other disasters have been made.

1. *Fires – a prime risk and anthropogenic danger for Bulgaria*

The number and consequences of fires in the country for the period 2010-2016 were followed, a risk assessment was carried out, the measures for limiting and eliminating the consequences were summarized.

An analysis of preventive measures against fires in Bulgaria and in other countries was carried out. In Bulgaria there have been achieved results in the construction of fire towers and automated prevention systems in the most risky places.

It is necessary to enhance the fire knowledge and competences of all people through different forms of training for the right behavioral models.

2. *Floods – the most common disaster. Reasons, consequences, organizational measures*

Floods are the most common disaster in the world (40%) and in Bulgaria. Rainforest-type floods are the most common. A brief historical overview of Bulgaria's major floods has been made for the past 14 years, with 2005 ranked first – 75% of the country's territory has suffered.

Following the serious consequences of the floods in Bulgaria in recent years, following preventive organizational activities are included – the adoption of new laws and intrusions, the establishment of the role of the Common Rescue System and the operational communication and information centers in the territory of each region.

3. *Haiti earthquake and Disaster Medicine training*

The research was conducted among 100 students from Medical University of Varna with a questionnaire of 10 questions. Half of the questions are with pre-formulated answers, and the rest with an opportunity for personal opinion.

52% of questioners consider that the 2010 earthquake in Haiti is the most serious disaster, 39.5% – the floods in Pakistan, and 5% – other disasters and 4% – they can not determine.

The majority of respondents (95%) want to help those suffering from disaster situations, but only 41% have actually participated in donation campaigns organized by various TV shows.

V. Surveys on psychological problems (stress) in disaster situations:

1. *Prevention of stress as a significant problem for groups at risk in disaster situations (dissertation work)*

The risks of disaster situations for groups at risk in the territory of Bulgaria (and in particular the North-Eastern Region) are identified.

Two studies have been carried out on stress at groups at risk – people with disabilities until December 2010, before the amendment to the Civil Protection Disaster Protection Act, and then in the period 2016-2017. The preparation of people disabled for disaster situations has been studied.

Training strategies for prevention and stress management of groups at risk in disaster situations have been prepared. Relevant recommendations have been made to provide effective assistance and support to risk groups during disasters, and guidance has been given to optimize disaster management and planning activities with emphasis on disability.

2. *Survey on the level of stress and effects – somatic and psycho-emotional in a social group.*

A study was conducted in students – 160 people from Medical University – Varna to determine the level of stress with an anonymous questionnaire with 26 questions.

Serious stress is happens even in young people, with more than a third of respondents, whose average age is 24 years

The major causes of significant stress, according to the majority, are the disasters – 36.2% (transport crashes predominate – 90.23%, earthquakes and fires – 9.77%) or disease or death of a relative – 25.8%.

Symptoms and complaints reported because of stress are prevalent in favor of post-traumatic stress disorder syndrome and adaptation disorder, more pronounced in survivors and some signs of acute stress reaction.

3. *Level of stress and effects on some behavioral attitudes in a social group*

The study is among the same group of 160 students at the Medical University of Varna.

We have found that the type of stress is not decisive for the decision to use medication. In the group that experienced death of a relative, their use is slightly more pronounced – 28.6% of the respondents, compared to the survivors of a catastrophe or other disaster – 24% of them used medications. The use of alcohol over the usual amounts is clearly more pronounced in this group – 14%, comparing to the group that lost a relative, where only 6.7% have changed this behavioral attitude towards increased use of alcohol. Another attitude – a desire for suicide – was only seen in the group that lost a relative – 6.7% of it, unlike the other group.

4. *Exploring stressful manifestations in elderly people*

160 people over the age of 50 were interviewed with a 32-question questionnaire. About 100% of the respondents are experiencing significant stress. The causes are: disaster situations – 55% (road accidents, fires, floods, earthquakes, etc.), death of a relative – 30%, diseases – 25%, unemployed – 13.12%

The echo of stress passes by slowly in half of the respondents and quickly – in 10% of them. According to respondents, the ways of overcoming stress are: working – 57.5%, relatives' support – 25.6%, medications – 25%, psychologist – 7.5%, and 1.9% others.

The psycho-emotional reactions of significant stress are: irritability – 51.25%, fear and anxiety – 42.5%, depression and weeping – 40.26%, obsessive reminders – 33.13%, alienation – 25.26% and suicidal intentions – 25%.

5. *Research of the stress manifestations among students from Medical University of Varna*

A survey was conducted among 160 students from Medical University - Varna, specialty „Medicine“, through a questionnaire with 14 questions.

A serious stress is common in even young people - more than 1/3 of the respondents. The knowledge of health and medical culture are insufficient to properly identify the significance of the experienced stress and its manifestations.

The shared underlying cause of stress are disasters (with the highest percentage) followed by death of a relative or illness.

Overcoming the stress is a slow process, mainly supported by taking medications or having consultations with a psychologist.

The most common stress consequences are the sleep disorders or the phobias.

VI. Survey on assessing the awareness and training of healthcare professionals and population for disaster situations

1. *Exploring students' knowledge about environmental disasters*

153 Bulgarian students from the Medical University of Varna were interviewed before training on Disaster Medicine.

A high percentage of respondents – 75.82%, know about global environmental problems. Students are not convinced that the impact of global environmental problems on the life and health of the population can be reduced.

2. *Exploring the knowledge of medical students about the consequences of anthropogenic action*

155 students were interviewed. An anonymous questionnaire of 20 questions pertaining to post-disaster issues, including the use of biological weapons, bioterrorism, or the occurrence of an epidemic, has been used.

There is lack of self-esteem and readiness to protect against bioterrorism. Half of the responders recognize that they are not ready to, 43.22% are unsure, and only 8.39% are considered prepared.

On the question of the protection means, 40% will prepare cotton-gauze masks, 48.39% – cleansing and disinfecting agents, 50.87% – sedatives and 52.26% – antibiotics.

3. *Preliminary preparation of students from Medical University of Varna on issues related to disaster protection*

A study was carried out to determine the medical knowledge and the degree of preliminary training of 90 students from the Medical University of Varna on issues related to the protection from disasters.

We used a questionnaire with 33 questions. The study was conducted at the beginning of the school year, before the training on Disaster medicine. There are no significant differences in the responses to the records by sex, age and previous education.

Preliminary preparation, retention for protection against radioactive and poisonous substances is assessed as very low and insufficient. Knowledge about protection against epidemics is better.

The percentage (91.11%) is high in the report on medical assistance and population for disaster protection.

4. *Preparation of students from Medical University–Varna to render assistance in case of transport accident*

The purpose of the research is determination of the level of knowledge and preparation of students fifth year in Medical University of Varna about the rendering first medical aid of casualties in transport accidents.

The used method is a questionnaire with 16 questions.

The preparedness of the researched group to render medical assistance in case of transport accident is sufficient in almost 1/3 of the respondents. They have abilities – according their answers and self-assessment, to successfully cope in real accident.

The students do not devote enough attention to some considered as easy questions (e.g. the right behavior on the road in case of storm).

The students' knowledge could be increase by the preparation for the “Disaster medicine” subject exam.

VII. Studies for groups at risk and especially for the group of people with disabilities

1. Strategic and operational solutions to protect groups at risk in case of disaster situations

It is suggested to identify groups at risk and to determine their functional difficulties in emergency situations and in population protection activities as well as inclusion of the Individual Approach to the Group approach on the Protection of Disabled People in Planning and Management of Disaster Response Activities.

It is proposed to include "contact persons" to support and overcome the constraints of people with disabilities. When developing a common framework for disaster protection, the focus has to be on disabled people.

2. Awareness and health knowledge of people with disabilities to protect against a disaster situation

The health knowledge of 200 people with disabilities has been studied.

The knowledge of the study group on protection against contamination with radioactive and poisonous substances is insufficient. Quite wrong half of all respondents will leave the contaminated area. Subjective disaster preparedness assessment is rather negative, only 10% have self-confidence for good preparedness for protection.

3. Preparing people with disabilities for disaster situations

It has been studied the preparation of 200 people from Varna with disabilities with over 90% reduced ability to work on a questionnaire of 25 questions.

We believe that people with disabilities from Varna have no necessary preparation for disaster situations because:

- 69% of them respond that the bed is in danger of falling objects in earthquakes;
- 89.5% have no evacuation card and 91% do not have an evacuation bag;
- 96.5% have no self-assessment for their condition and for their needs in emergency situations and 83% have no signal devices;
- 96% want to receive additional information on disaster situations.

4. Risk factors for cardiovascular disease in people with over 90% reduced working capacity and in need of attendant

A standardized interview was conducted on 218 people with over 90% reduced working capacity and in need of attendance. 22 questions have been asked. The overwhelming number of respondents (56%) have cardiovascular disease. The conventional anti-smoking measures and health problems of the study group have positive result, because less than 25% recognize that they smoke cigarettes. Those who refuse cigarettes for health reasons are 43.93% and for financial reasons – 56.08%.

Of the surveyed group, only 10.09% regularly drink alcohol, 26.60% – rarely, and more than half (60.55%) do not consume at all. Almost all respondents (91.25%) reported daily consumption of sugar and confectionery products. Only 1/3 of respondents think they have a proper and balanced diet, 60.55% saying that the reasons for lack of good nutrition are financial. The eating habits of the study group pose a risk of developing cardiovascular disease.

5. *Nutritional status and nutritional behavior of disabled people from Varna*

A sociological survey of 100 randomly selected disabled people was conducted. A direct anonymous survey looked at the frequency of consumption of major food groups, diet, and eating habits. An index of body mass was used to assess the nutritional and anthropometric status.

The study shows unhealthy nutrition in the study group, due to insufficient food diversity, high consumption of sugar and confectionery products and low intake of fish, milk, dairy products, eggs, fresh vegetables and fruits. The trend in nutrition is favorable – high intake of cereals, pulses and poultry meat. There is no abuse of coffee, salt and alcohol.

Only 19% of the study population have normal body weight, with overweight – 30% and 51% – with a different degree of obesity.

VIII. Analyzes of medical implications of disaster situations and recommendations for improving the health of the population

1. *Refugee flow in the maritime environment – challenges and health threats*

There is an analysis of the refugee crisis in the Balkans and the European Union.

The reasons for the deterioration of migrants' health status are examined and systematized. Major injuries are drowning, dehydration, hypo- and hypertension, burns, malnutrition, infectious diseases and violence.

There is also a danger to the health of marine professionals and crews because they reside with migrants in the limited space of vessels. To overcome these unfavorable circumstances, special medical training for seafarers is recommended.

2. *Characteristics of the coastal marine environment and bioterrorism – bio-factors (micro-organisms)*

Infectious outbreaks usually focus on coastal areas during the summer and early autumn when higher water temperatures favor higher bacterial levels. Wound infections from incisions and traumas are also often recorded.

Swimming in contaminated water can cause eye and ear infections. Ensuring adequate control and countermeasures against bioplastics are needed to ensure the health and safety of the population and tourists in these areas.

3. *Diagnostic and therapeutic approach for casualties with mental health problems after disaster situations*

Disaster situations create conditions for severe general and medical conditions in the disaster area. The working factors are changed environment, biological and mental. The percentage of people with mental health problems is significant and it arises immediately after the accident or after a latency period.

It is necessary to inform a wider range of specialists (mostly general practitioners) that after a disaster situation will increase the number of people with mental disorders – neurotic stress-related, disorders associated with misuse of psychically active substances and personality disorders.

IX. Environmental problems caused by marine water pollution

1. Marine environmental pollution threaten the biodiversity of the world's ocean

An analysis and forecast of the anthropogenic catastrophes threatening the biodiversity of the world ocean has been made.

Tanker accidents and the sudden discharge of oil from seas into the seas are considered to have a relatively small share of total pollution but the consequences are particularly severe because large quantities are poured in a short time and this threatens the lives and existence of hundreds of bird and marine inhabitants. There are suggestions for significant measures to mitigate them.

2. Environmental risks of chemical pollution in the sea

Water pollution has been studied, which is a problem on a global scale. Studies of chemical substances in water are the main causes of changes in many organs and tissues. The main methods for detecting marine water pollution are analyzed.

For the deterioration of the ecological situation in the Black Sea area, the main part plays the anthropogenic activity. In Varna region there is a risk of contamination with balst water from the ships as well as incidents with ships accompanied by a spill of oil and petroleum products.

The risk of water pollution in the Black Sea is analyzed in detail. Anthropogenic eutrophication have been observed, phytoplankton and biomass increase, degradation of bottom algae communities, oxygen deficiency in bottom water layers and reduced biodiversity, etc. have been observed as well.

3. Industrial pollution of seawater – the Minamata case

Minamata disease is a methyl-mercury poisoning with neurological symptoms due to the consumption of fish, seafood and seaweed caught from a highly toxic area in Japan. Two outbreaks of the disease were observed in the mid-20th century.

Identification of the disease leads to the adoption of serious measures in Japan to protect the environment and the health of the population.

4. Basic methods for detecting marine water pollution

Best results are obtained from the use of passive and active remote detection methods for oil pollution.

Active methods are measurement and registration of reflected laser radiation for radiolocation. Mechanical pollution of seawater is recorded by the turbidity of the water. This is best seen on color photographs. For biological contamination, remote monitoring of photosynthetic organisms is most important.

X. Tests with experimental animals

1. Distribution of Rubidium 86 and Methionine 75 Selenium in rat organs after physical exercise and treatment with protein hydrolyzate and vitamin C

The study was done with 30 white rats, divided into 5 groups – 1 control and 4 experimental.

The aim of the study is to track blood flow and metabolism in 15 organs of 30 white rats weighing 120-140 g per animal subjected to severe physical stress treated with protein hydrolyzate and vitamin C.

Animals are divided into 5 groups – 1 control and 4 experimental. After 30 minutes of swimming, they are treated with products already used, Meningine 75 Selenium and after another 2 hours swimming with 86 Rubidium. Following euthanasia with thiopental and autopsy, the following organs are taken from rats: pancreas, spleen, testes, duodenum, part of the small intestine and colon, adrenal gland, kidney, liver, lung, heart, aorta, part of the brain stomach. The percentage of chest tissue activity is determined and compared by the total activity of the two isotopes for each organ.

Physical workload worsens blood flow and reduces the accumulation of Methionine 75 Selenium, whereas hydrolyzate and vitamin C treatment has a beneficial effect in almost all organs.

XI. Other studies

1. Relationship between reaction time and amplitude changes of H-reflex in performing a simple motor task in patients with thyrotoxicosis

The relationship between reaction time as a marker of brain cerebral change and the change in H-reflex amplitude, a relative index of the level of excitability in the spinal cord during the preparation of a simple volitional movement in patients with thyrotoxicosis was investigated.

The RT / Xp dependence curve for thyrotoxicosis is radically different from the same curve obtained in a healthy study in similar experimental conditions. These results can serve as an early diagnostic method for identifying the disease in the early stages.

2. Analysis of the success rate of students from Medical University of Varna, III course through a cardiovascular test

The study includes students of Medicine III course for the period 2006-2012 and covers 20-30% of students from each course of 3 to 5 groups. Questions are on the cardiovascular system. Considering that the incidence of cardiovascular morbidity and mortality is significant, the results obtained by the students are considered very good.

3. The right to work – the right to a decent life, 2012 – Joint research of the Association of Disabled People in Varna and expert from Varna Medical University (N. Radeva)

The problem of social integration of disabled groups is relatively new in both theoretical and practical terms. The main concepts and the National Program for Improvement of the Qualification and Employment of People with Disabilities, the Symbol of positive attitude towards people with disabilities and social integration and the professional realization of people with disabilities are analyzed.

Special attention is paid to the National Program for Employment and Training of Persons with Lasting Disabilities, the European Disability Strategy for the period 2010-2020, Preference for People with Disabilities-Protection upon dismissal, the latest amendments to the Employment Promotion Act, Labor law, Bulgarian legislation on disability issues, the Protection against Discrimination Act, the Integration of People with Disabilities Act. Labor Code, etc.