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**DEPARTMENT OF MEDICINE OF THE DISASTER
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**THE FLOODS – MEDICAL AND ECOLOGICAL
PROBLEMS FOR THE DANUBE REGION**

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Abstract

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List of abbreviations used

NPP	Nuclear power plant
ASC	Auto Sanitary Columns
DAC	Disasters, accidents and catastrophes
BAS	Bulgarian academy of sciences
GDP	Gross domestic product
BD	Basin Directorate
BD „DR“	Basin Directorate Danube region
DS	Disaster situation
BRC	Bulgarian Red Cross
HPS	Hydroelectric power station
MMA	Military Medical Academy
MMERT	Military Medical Emergency Response Team
CD "FSCP"	Chief Directorate "Fire Safety and Civil Protection"
GIP	Geographic information protection
CP	Civil protection
DDD	Disinfection, disinsection, deratization
DCC	Diagnostic consultative center
EC	European commission
IDD	International disaster database
EU	European union
URS	Unified rescue system
WL	Water law
DPA	Disaster Protection Act
EPL	Environmental Protection law
EEA	Executive Environment Agency
MC	Medical center
MHAT	Multiprofile hospital for active treatment
MI	Ministry of Interior

MH	Ministry of Health
MRD	Ministry of Regional Development
MC	Medical center
NIGGG	National Institute of Geophysics, Geodesy, Geography - BAS
NIMH	National Institute of Meteorology and Hydrology – BAS
NFAT	National Flood Action Team
NDPP	National Disaster Protection Program
NEWNS	National Early Warning and Notification System
EDI	Especially dangerous infections
OUN	Organization of the united nations
MIS	Medical insurance squad
MSC	Municipal Security Council
OC	Operations center
PS	Psychoactive substances
PFRA	Preliminary flood risk assessment
RBMP	River basin management plan
FRMP	Flood risk management plan
RHI	Regional health inspections
SHAT	Specialized hospital for active treatment
WHO	World health organization
SCP	Sanitary control points
APT	Assembly points for transportation
EWARS	Early Warning, Alert and Response System
TPP	Thermal power plant
ECP	Export cargo points
SES	Sanitary Epidemiological Service
HE	Hydraulic equipment

I. Introduction

We are witnessing various severely destructive cataclysms, which have led to huge material damage, medical losses and a deteriorating hygienic and epidemiological situation.

The fight against the natural disasters is becoming a topical issue for the world science and politics, including for the Republic of Bulgaria.

According to the United Nations, the distribution of natural disasters on a global scale is as follows: Floods - 40%, cyclones - 20%, earthquakes and landslides - 15%, avalanches, cold and droughts - 15%.

Of all natural disasters, floods are the most common natural disaster, every year on Earth there are about 10,000 floods with various parameters, consequences and losses.

In the period from 2005 to 2020, the floods in the Republic of Bulgaria account for 40% of all natural disasters. One of the risk regions for catastrophic floods in the Danube region are the rivers - Danube, Rusenski Lom, Vit, Osam, Yantra, Iskar and Ogosta.

The floods kill more than 22,000 people a year worldwide. In addition to damage to the population inhabiting the flooded areas and regions, there are a number of serious environmental problems, pollution of air, water, soil, plants.

All this determines the need for organization and conduct of hygienic and anti-epidemic measures and actions, formation of reliable measures for protection, prevention and adequate organization of the rescue of the victims.

Currently, there is a steady trend of increasing natural disasters and catastrophes - floods, whirlwinds, tornadoes, water cyclones, landslides, heat waves, drought, forest fires and others.

The reasons for all this are various global climate change, ecological instability and imbalance in the environment, the growing population density, the rapidly expanding urbanization and the constant dynamics of the planet Earth.

In the Republic of Bulgaria there are systems for forecasting, prevention and early warning of these phenomena:

- National Institute of Geophysics, Geodesy and Geography (NIGGG)
- National Institute of Meteorology and Hydrology (NMH)
- Aerospace Observation Center (AOC)
- Executive Environment Agency (EEA)
- Ministry of Interior (MI)
- Prevention systems and centers (National emergency call system).

People in general, regardless of gender, age and ethnicity, must first and foremost be prepared, theoretically knowledgeable, well-informed and practically trained to respond properly in the event of floods.

This whole process is complex, slow and difficult. It requires joint efforts, patience, system, consistency and teamwork of existing institutions and society.

The correct and true knowledge of the people can be formed, built and acquired only with the help of good information and in-depth training in the field of risk and related risk factors, potential dangers and problems.

If we want our society to become more independent and better prepared in case of floods, we need to understand the necessity for them to be well informed.

II. Purpose, tasks and hypotheses

1. Objective - To study and analyze the health and environmental problems of the Danube region, as well as the awareness and the degree of readiness of the society for proper behavior and protection in case of flood.

Research tasks:

1. To study the risk of floods for the Danube regions to make a risk assessment.
2. Study of the main tasks of the medical service (hospitals) in case of floods, measures and basic means of protection.
3. To study the awareness and readiness for protection in case of floods of Bulgarian citizens aged between 18 and 39 years - 120 people.
Comparison of data from the two age groups.
4. To study the awareness and readiness for protection in case of floods of Bulgarian citizens aged between 40 and 64 - 120 people. Comparison of data from the two age groups.
5. To develop recommendations for raising awareness and preparing the society for flood protection. To develop protocols for preparation of the hospitals located in case of flooding in the flood zone and outside it.

Main thesis and hypotheses.

The main thesis of the dissertation is that the floods are the leading disasters for the Danube region and by raising awareness and preparing the population for protection, the significant negative effects of it can be reduced.

Research hypotheses:

- The floods are leading disasters for the Danube region and create a number of negative effects for the community and society.
- The public awareness and preliminary preparation is important to reduce the negative consequences.
- The society in the Danube region needs higher awareness and preparation for disasters (including floods).
- The Bulgarian citizens aged 18-39 are better informed and better prepared for flood protection than people aged 40-60.

III. Materials and methods

1. Formulation and materials.

The present study examines the level of awareness and preparation for flood protection of the society from the Danube region (the population of two selected cities: Pleven and Svishtov, located in the Danube region of the Basin Directorate).

The necessary information was collected by the method of direct individual and anonymous survey (study), conducted in the period from May 2019 to May 2020. The data collection from the institutions was conducted in the period from March 2019 until March 2020.

The questionnaire was developed by the doctoral student and approved by the Department Council at the Medical University of Varna, working in RD "FSCP", RHI, BRC, Regional Administration - Pleven and Svishtov Municipality. The subject of the present study is a population exposed to an increased risk of flooding in selected settlements in the Danube region - Pleven municipality and Svishtov municipality.

The selection of all questions from the anonymous questionnaire is strictly and individually consistent with the purpose of this study - to test and assess the level of awareness and preparation for flood protection in the Danube region (Pleven and Svishtov) among younger people (18 to 39 years) as well as the elderly (40 to 64 years). The participation in this study is voluntary. Students and employees of the Medical University of Pleven, students of the Dimitar Apostolov Tsenov Academy of Economics in the town of Svishtov were interviewed in the group of 18 to 39 years old. For the second group of respondents over 40 to 64 years old, the survey was conducted among various employees and workers from the two municipalities of Pleven and Svishtov.

2. Methods.

Different methods have been used to process the information gathered on the topic.

2.1. Historical method - in different literary sources are studied the global trends in the country - the Republic of Bulgaria for the emergence of disasters - floods of natural, anthropogenic, artificial origin. Many cases of different prescription have been studied, but with a significant impact on the environment, nature, people, economy, tourism and so on. The purpose of the historical research is to substantiate the relevance of the problem.

2.2. Documentary method - used to gather information about disasters and accidents leading to mass, catastrophic incidents with many people affected by the floods.

Review of documents defining the place and role of the individual, rescue teams, medical teams, military formations, politicians, government, etc. in emergency situations, for collecting data from the Internet from the official websites of various ministries and agencies, data from the National Statistical Institute, data from the National Disaster Protection Program, Water Act, Disaster Protection Act, Health Act, Bulgarian Red Cross Act, Ministry of Interior Act, Flood Risk Management Plan, Directives and official documents issued by the European Union (Directive 2007/60 / EU), National Disaster Protection Program, Flood Risk Management Plan 2016-2021, Disaster Protection Plan in Pleven District, Disaster Protection Plan in Veliko Tarnovo District, Technical Report - Floods, Environmental Assessment Report 2016-2012, manuals on medical insurance in crises.

2.3. Descriptive method - used to summarize the data collected and researched in the study of all literature sources on the problem by applying historical and documentary methods.

2.4. Comparative method - used in analyzing and studying the results of the two age groups over 18 years and over 40 years, surveyed with anonymous surveys in two municipalities Pleven and Svishtov from the Danube region. Comparison of the indicators between different territorial units and analysis of the obtained results.

2.5. Sociological method - the sociological survey of a specific group, persons from two different age groups over 18 and over 40 years and with different place of residence, gender, profession, and with different levels of information and training. The method of direct individual survey with a standardized questionnaire with 25 questions was applied.

2.5.1. Questionnaire method - applied to determine the knowledge and training of two large age groups (over 18 years and over 40 years) from two different settlements - Pleven municipality and Svishtov municipality, on the risk of floods.

The survey contains 25 questions, a stochastic (or random) selection method was used, in which all units of the general population have an equal chance to be included in the survey sample.

2.6. Quantitative method - a method of survey and primary analysis of data collected through it.

2.7. Statistical methods.

Processing of the results of the survey was performed using a licensed software statistical package IBM SPSS Statistics 19, software products - Excel 2013.

For this purpose are used:

2.7.1 Descriptive analysis - in tabular form is presented the frequency distribution of the considered signs, broken down by groups of research.

2.7.1.1. One-dimensional tables of frequency distribution and the variety of features characterizing the phenomena under consideration (in this case, the varieties of possible answers to each question).

2.7.1.2. Two-dimensional tables of the frequency distribution (cross-tabulation) to search for the relationship between two categories of variables.

2.7.2. Variation analysis - for evaluation of the characteristics of the central trend and statistical scattering, determination of indicators arithmetic mean (Mean), standard deviation (Std Deviation).

2.7.3. Non-parametric method of analysis - to search for statistical dependence between two features, nominally or ordinarily scanned, multiplied X^2 (Pearson's chi-square method) is used. In testing the hypotheses are applied:

- Pearson's agreement criterion (X^2) for multiple tables.
- Fisher's test for searching for dependencies between categorical features.
- non-parametric Kruskal - Wallis test for multiple tables.
- non - parametric Mann - Whitnew test for multiple tables.
- Student's T-test - to test hypotheses for the difference between two independent samples.

2.7.4. Correlation analysis - applied to reveal causal relationships between individual traits (Pearson's coefficient, Spearman's rank correlation coefficient).

The statistical reliability was assessed at the highest significance p less than 0.05. The results are presented tabularly and graphically.

2.8. Graphic analysis - is used to illustrate the processes and dependencies found in the statistical processing of survey data. EXCEL for Windows XP was used to illustrate and visualize the obtained results.

2.9. Alternative analysis - when processing qualitatively measurable (unmetered) and grouped data.

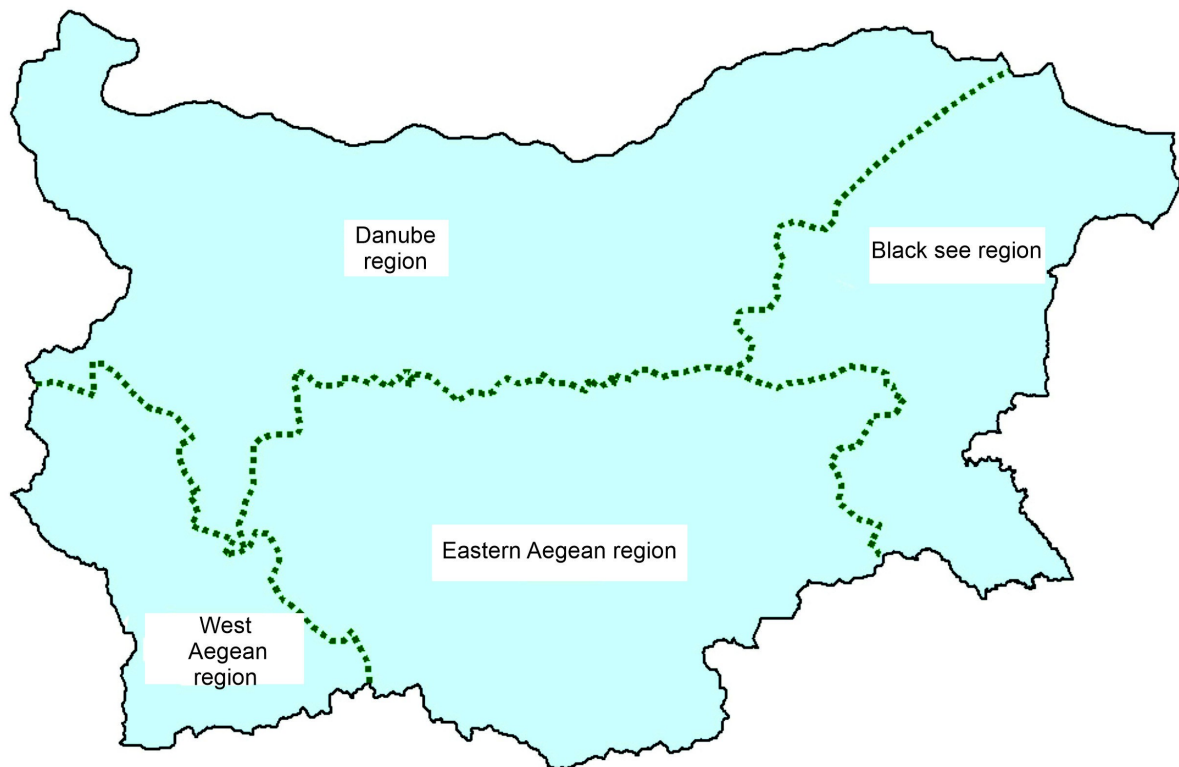
3.0. Registration analysis - different registers were used, and a secondary analysis of the data of RHI-Pleven, RHI-Veliko Tarnovo (lists of medical institutions for pre-hospital and hospital care in Pleven and Svishtov), of the Ministry of Health (Register of medical institutions for pre-hospital care and register of medical establishments for hospital care) and others.

IV. Own research

4.1. Flood risk study for Danube regions and risk assessment.

For the Republic of Bulgaria, the floods are defined as the most significant and serious natural disaster and the damage caused is amounted to hundreds of millions of levs. In the last 15 years (from 2005 to 2020), floods accounted for 40% of all natural disasters. There have been catastrophic floods in Bulgaria along the rivers - Maritsa, Iskar, Danube, Arda, Osam, Yantra, Kamchiya, Rusenski Lom, Provadiyska and others. Of the dams available for Bulgaria - 4390 in number, they were inspected in 2017 and 2018 and over 2000 dams were identified as "at risk" and 81 are in "emergency". The worst condition is the Beli Iskar dam. This dam has not been repaired for almost 80 years.

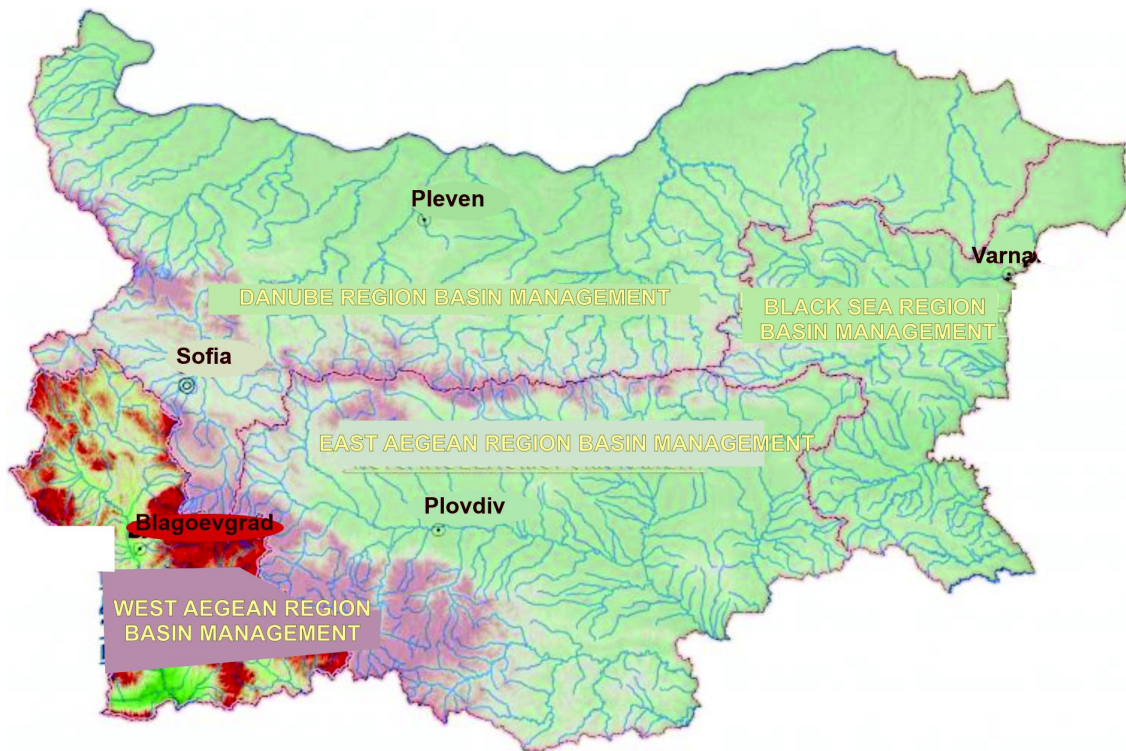
According to the European Floods Directive 2007/60 / EC for the risk assessment and management, the following division of the risk areas in the Republic of Bulgaria - Danube, Black Sea, East Aegean and West Aegean regions. The four reporting regions are entrusted to the basin directorates of the same name, which are directly subordinated to the Ministry of Environment and Water MEW(map No 1).



Map No 1 Basin management regions in the Republic of Bulgaria.

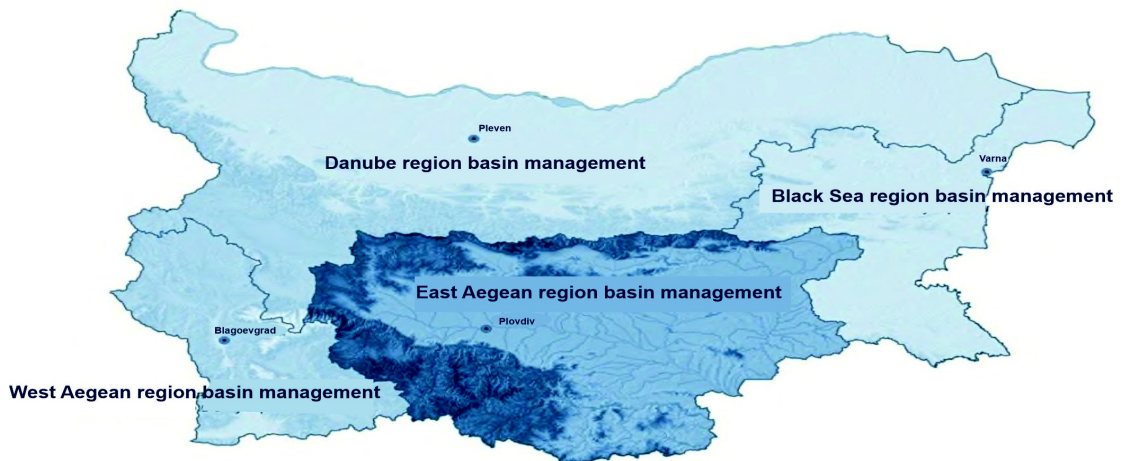
1) West Aegean region.

The main, larger rivers in the West Aegean region are Struma, Mesta and Dospat (map No 2).



Map No 2 West Aegean region for basin management in the Republic of Bulgaria.

2) East Aegean region. It covers the watersheds of three other large rivers: Maritsa, Arda and Tundzha (map No 3).



Map No 3 East Aegean runoff region

3) Black Sea region.

This region includes all rivers forming their currents mainly on Bulgarian territory, which flow into the Black Sea.

4) Danube region.

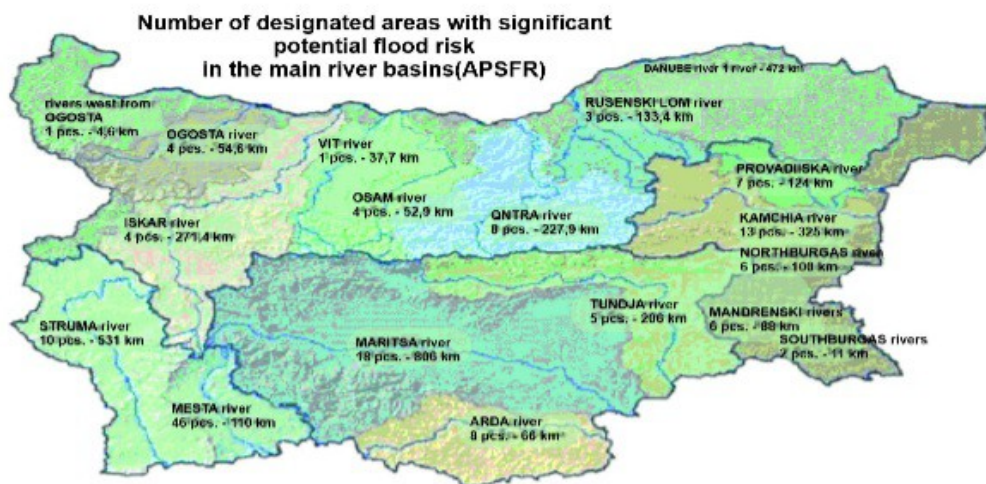
The Danube Region Basin Directorate (BD "DR") with the center in Pleven covers the watershed areas of the rivers - Iskar, Erma, Nishava, Ogosta and west of Ogosta, Vit, Osam, Yantra, Rusenski Lom and Danube Dobrudzha rivers. The Danube region covers almost the whole of Northern Bulgaria, which is 42.5% of the territory and 44% of the total population. The total population is 3,950,000 people. The capital, the city of Sofia, is also located in the region.

The Danube Basin Management Region is located on the territory of 126 municipalities in 18 districts, 25 water and sewerage companies operate. About 98.9% of the population is connected to the public water supply system. The water supply is provided by surface waters (Iskar dam, Srechanska bara dam, Hristo Smirnenski dam and Yovkovtzi dam). The sewerage network in this region is not 100% built, in the cities it is 80-98%, in the villages 50-60%. In the Danube region, the continental climate is best expressed. The winter season has average monthly temperatures 1.5-3.5 degrees below zero, can reach minus 30-35. In summer, the average July temperatures vary from 22 to 24 degrees, the maximum temperatures in the Danube region in some places (Pleven, Lovech, Veliko Tarnovo) can reach 40 degrees. The annual course of precipitation is markedly continental with a maximum in the summer months and a minimum in the winter-spring season - February – March.

The Danube region includes all three mountain regions - Stara Planina, Vitosha and Rila. Of all the rivers that enter the Danube region, the Danube River is the largest, with a total catchment area of 700000 square kilometers in the Republic of Bulgaria.

The Preliminary Flood Risk Assessment (PRDP) for the whole country has registered a total of 1903 past floods. Of these, 1028 specialists put in the column significant past floods and 573 significant significant potential future floods.

The territories of the country, which have registered significant past floods, are grouped by the specialists in areas with significant potential flood risk (RPF). For Bulgaria, 116 such regions have been identified with a total length of 3889 kilometers, including 11 regions (sea floods) with a total length of 267 kilometers and the Danube River - 472 kilometers (map No 4).



Map No 4 Areas with significant potential flood risk (APSFR)

From the preliminary risk assessment: 49 pcs. water bodies are identified at risk, 20 pcs. at potential risk and 51 in good general condition. The significant past floods for the analyzed Danube region - a total of 629, river floods - 56, rainfall, occurred directly from precipitation - 366, river and rain floods-combination -122, groundwater floods - 4, river and floods from groundwater -3, infrastructural floods - 1, other floods with unknown source - 73 cases.

The preliminary risk assessment for the Danube region collected data on 744 past floods, of which 629 at the beginning of the assessment and after in-depth consultations another 115.

Due to past floods occurred in the Danube region, the experts provide information on 556 floods: 66% - due to surface swelling (precipitation), 10% - river floods and 22% combined with rivers and precipitation.

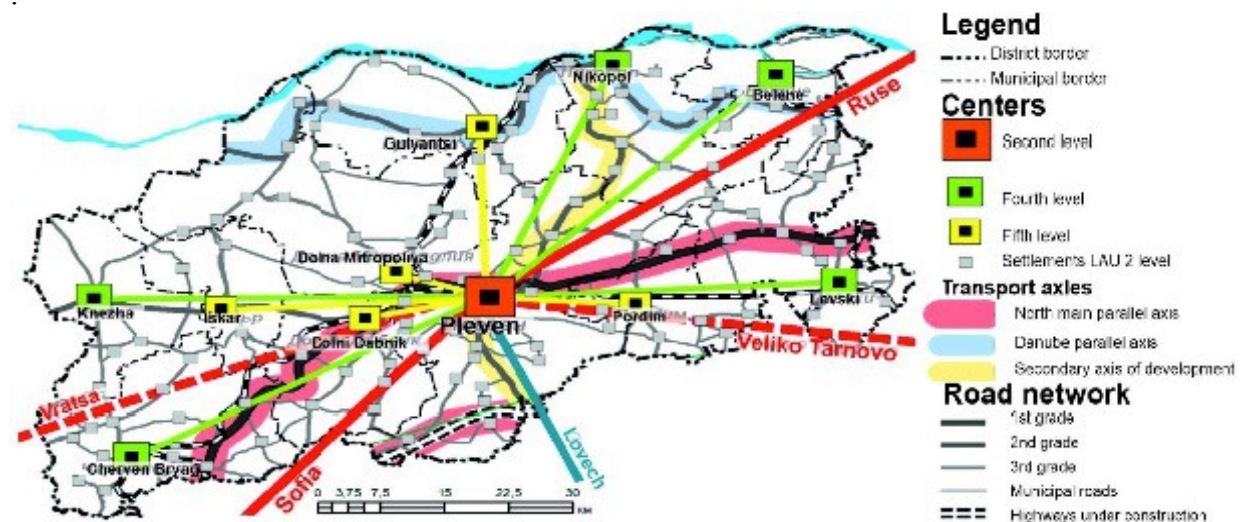
In summary - 88% past floods from precipitation and 32% river floods.

In the official annual reports of the National Statistical Institute (NSI) of 87 municipal administrations, the floods in 2017 were registered for Bulgaria in total - 159 crisis events and a total of BGN 135,530 material damage.

According to documents, 797 dams officially exist in the Danube region, of which 16 are large, complex and significant, 83 are state-owned and 698 are municipal-owned. The specialists identify and describe 163 sites for potential risk of future major floods. Of these 163 - 25 are for the Danube, in 138 sections there is data on documented, registered, devastating past floods, which are expected to recur in the future.

Possible causes of floods in the municipality of Pleven.

Pleven Municipality is located in the Central part of the Danube plain. The territory of the municipality is 4 653.3 square kilometers, 4.2% of the entire territory of our country. There are 11 municipalities in the regional center - Belene, Gulyantsi, Dolna Mitropoliya, Dolni Dabnik, Iskar, Levski, Knezha, Nikopol, Pleven, Pordim and Cherven Bryag. There are four ports on the territory - in the town of Nikopol, the village of Somovit, the village of Zagrazhden and the village of Baykal. It borders Veliko Tarnovo district to the east, Lovech district to the south, Vratsa district to the west and the Danube river to the north (map No 5)



Map No 5 Structure of Pleven - centers, road network and transport axes.

Three large rivers Iskar, Vit and Osam pass through the territory of Pleven municipality. The climate is temperate - continental. The winter is cold, it creates conditions for the invasion of cold air masses. The summer is hot with maximum temperatures of 40-43 degrees in July and August. The summer rainfall is between 150 and 250 liters per square meter. Average annual rainfall - 643 liters per square meter. The rainfall prevails. From the days with all types of precipitation - rain, snow, rain and snow (138 days a year) precipitation with quantities up to 10 mm prevails. The relative humidity is 75% and is a prerequisite for the formation of fog, the number of registered days with fog is 51. The fogs favor the increase of the level of pollutants in the air. An ecological problem of the municipality is the pollution of the atmospheric air with fine dust particles with aerodynamic diameter below 10 (FDP 10). The average number of days with snow cover is 40 days. Average thickness of the snow cover -10 cm. Highest snow cover -100 cm.

According to official data of the National Statistical Institute (NSI), 269,572 people live in the district since the 2011 census, or 3.6% of the population.

The lower reaches of the rivers Iskar, Vit and Osam flow through the territory of the municipality. The Tuchenitsa River springs on the same territory and flows entirely through it until its confluence as a right tributary into the Vit River. According to their ecological status, the rivers of the Vit River catchment area are categorized as "rivers at risk". The Tuchenitsa River is defined in "good" chemical and "bad" ecological condition. The main reason for the poor status of the river is the sewerage system of the city of Pleven, which is of a mixed type. No significant investments have been made in the water and sewerage sector for more than 50 years.

The Municipality of Pleven is among the leading regions of Bulgaria in the production of barley, wheat and corn. From the degradation processes of the land and the soil, the erosion can be considered as the most significant factor for the agricultural lands in this region. The wind erosion is not a significant factor for the soils. In the municipality of Pleven, the wind erosion causes damage requiring anti-epidemic measures. Along the banks of the Danube there is coastal erosion and landslides, especially in the municipality of Nikopol. For the municipality of Pleven the risk in terms of soil erosion is moderate. The arable lands in the watersheds of the Vit, Yantra and Dolen Iskar rivers have been identified with the highest intensity of erosive risk. Precipitation with the highest erosive index for 2005 are registered in the Danube region (Vratsa, Lovech and Pleven districts).

In zoogeographical terms, the territory belongs to the Euro-Siberian, in the Danube region. Predominant - Euro-Siberian, Central European, Holarctic species. The Red Book of Bulgaria (Bisserov, 2009) includes 78 species, of which 25 species of birds, 23 species of mammals and 3 species of fish.

In the river Vit there are suitable habitats for rheophilic species - srobar, black barbel and river mullet. 22 species of fish have been identified along the Tuchenitsa River and the associated water bodies (Berberova, 2011). There are 10 species of amphibians on the territory out of a total of 16 for the country (62.5%). There are 4 sites on the territory with the status of protected areas - Kaylaka Protected area (Protected area), Bulin Dol Protected Area, Natural Landmark (NL) Razbititsa Cave and Fossil Site of Babenska Fauna (NL). The housing stock is characterized by relatively "new construction" after 1950. On the territory of Pleven district there are 5 hydroelectric power plants (HPP) - "Koynare" on the river Iskar, Cherven Bryag municipality, "Rakita" in Cherven bryag municipality, "Radomirtsii" on Zlatna Panega river in Cherven bryag, "Telish" on the dam "Telish", "Gorni Dabnik" on the dam "Gorni Dabnik".

In the city of Pleven there are 21 dams with state ownership of "Irrigation Systems", branch Middle Danube, town of Pleven. There are also 72 dams of municipal property and 1 privately owned by the Irrigation Association of the village of Koilovtsi. On the territory of the municipality of Pleven, the specialists from Geozashtita EOOD describe 181 landslides, with 1113 total for the Danube region. As the leading danger for the registered landslides the specialists define the intensive spring-summer precipitations. The consequences of the occurrence of landslide activity for the municipality of Pleven: overburdening or destruction of the buildings - the most severe applies to the town of Nikopol, the village of Somovit and the village of Milkovitsa, the municipality of Gulyantsi.

The territory of the municipality of Pleven falls in an area with a significant potential risk of flooding of the river Vit near the town of Pleven. These are territories east of the village of Yasen and along the Tuchenitsa River.

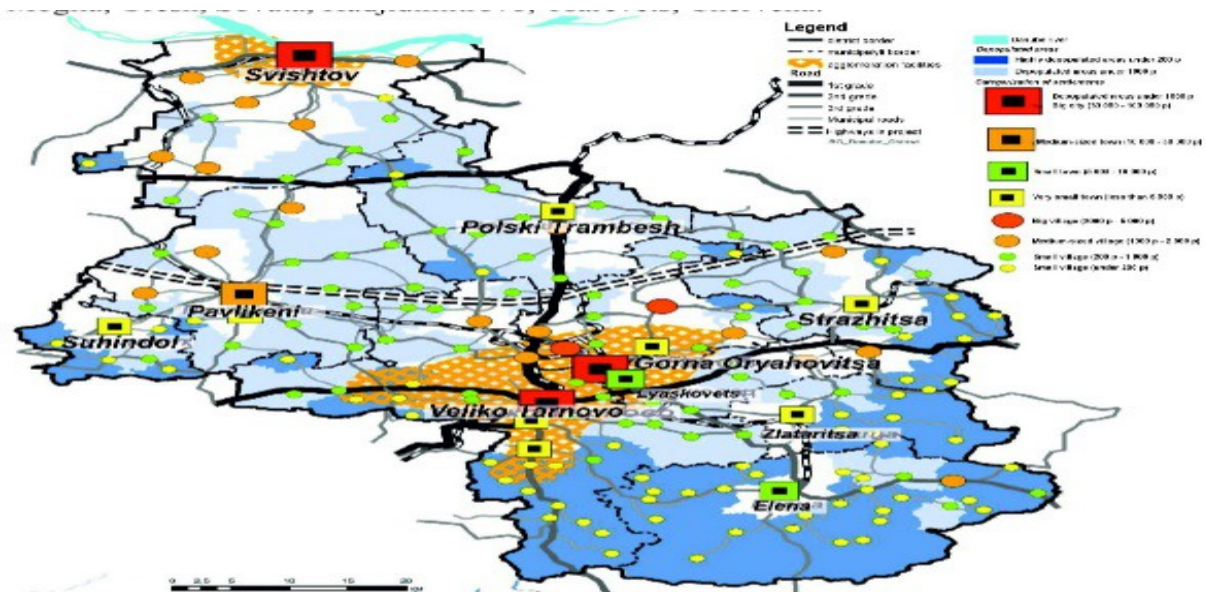
There are 797 dams in the Danube region (16 - large, complex, significant, 83 with state ownership and 698 dams with municipal property), of which specialists after a thorough

inspection identify 50 dams (14%) in the so-called pre-emergency situation, the remaining 747 dams need improvements to meet the safety standards. According to various sources, there are between 30 and 70 vacant dams on the territory of Bulgaria. The poor management of these dams or lack of care and maintenance at all cause major local floods, with huge material damage, loss of life, tragedy and more. The specialists describe large and potentially dangerous dams in the Danube plain - three in number - Alexandar Stamboliyski Dam, Ogosta Dam and Iskar Dam.

Possible causes of floods in Svishtov municipality.

Svishtov Municipality is located in Central Northern Bulgaria and covers an area of 625 square kilometers. To the east Svishtov municipality borders with Tsenovo municipality, to the south with two municipalities - Polski Trambesh and Pavlikeni, to the west - with the municipalities of Belene and Levski.

To the north is the Danube River, the northern border of Bulgaria with Romania - Zimnich municipality. The population of Svishtov municipality amounts to 38,701 (data as of 31.12.2015). This puts it in third place among the municipalities in Veliko Tarnovo district (15.8%). The population density is 61.87 inhabitants / sq. km. and is higher than the district average (52.56). 71% live in the town of Svishtov, the degree of urbanization is close, but lower than the national average (72%). The remaining 21% live in 15 settlements close to the municipality, and half of these settlements have a population of less than 1000 people (map No 6). The settlement system of the municipality has the following structure - municipal center of Svishtov and fifteen mayoralties - Alekovo, Aleksandrovo, Balgarsko Slivovo, Vardim, Gorna Studena, Delyanovtsi, Dragomirovo, Kozlovets, Morava, Ovcha Mogila, Oresh, Sovata, Hadzhidimitrovo, Tsarevets, Chervena.



Map № 6 Structure on the territory of Veliko Tarnovo district and Svishtov municipality.

The agricultural territories cover 527 924 decares (84.4%) of the total territory, the forests - 28 926 decares and represent 4.6%

According to the RBMP for the period 2016-2021 the water bodies in the catchment area of the Danube, Yantra and Osam rivers are in a moderate ecological state.

The territory of Svishtov municipality according to Order No ПД 146/26.02.2015 of the Minister of Environment and Water, falls within the vulnerable zone for the determination of nitrates.

The climate in Svishtov municipality is temperate - continental.

The average annual rainfall is 543 mm, with a maximum in May to 104 mm and a minimum in September of 37 mm. Relative humidity 73%. The proximity of the Danube River favors the retention of moisture in the air, in combination with temperature inversions favors the formation of fog. The average annual number of foggy days is 39.

The territory of Svishtov municipality is dominated by natural landscapes. The forest resources are limited. The islands along the Danube are dominated by natural willow and acacia forests. There are two protected natural sites in the municipality - "Persina" and "Stariat dab". In terms of zoogeography, there is a great variety of waterfowl. Of the mammals are typical - otter, ferret, water rat and others. Protected areas of "Natura 2000" - Belenski Ostrov complex, Obnova, Vardim Island, Hadji Dimitrovo Fishponds, Svishtov area - Belenska Lowland, Persina, Studena Reka, Svishtovska Gora and Cherna Mogila. Cultural and historical heritage from prehistory, Antiquity and the Middle Ages, Christian religious sites, historical values, monuments and memorial plaques.

On the territory of the municipality are located enterprises with low and high risk potential from the occurrence of a major accident: "Svilotsell" EAD, town of Svishtov, Western Industrial Zone - an enterprise with low risk potential and "E. Mirolio EAD - with high risk potential.

The territory of Svishtov municipality falls under the influence of the internal focus from the region of Vrancea (Republic of Romania) and the town of Strazhitsa. It is characterized by a magnitude of 7.1 to 7.5 on the Richter scale and 8 degrees of intensity. The depth of the outbreak is set at 120 km. One of the deepest earthquakes on the European continent occurs in this area on March 4, 1977 at 21.24 - a deadly earthquake in the town of Svishtov. The disaster is of 7.3 on the Richter scale and lasts only one minute, the death toll from the earthquake in March 1977 was between 120 and 250. The municipality falls in an area with a intensity of 1-8 and a value of seismic coefficient K_s - 0.15

Catastrophic floods can potentially occur on the territory of Svishtov municipality.

When the level of the Danube reaches more than 890 centimeters, the most endangered by flooding are the Port of Svishtov, the Customs of Svishtov, the Istar Dredging Fleet, the railway station and over 20 residential properties on the river bank in the village of Vardim. When the "high wave" was formed, the first ones threatened by flooding were the residential properties in the villages of Morava, Ovcha Mogila and Dragomirovo.

On the territory of Svishtov municipality, as of 31.12.2015 there are registered landslides - 43, with an affected area of 11,601,466 square kilometers. The Danube River has a confirmed role as a serious erosive factor and takes away part of the most fertile lands of Svishtov municipality. The potential hazards described so far - earthquakes with an expected magnitude of up to 7.5 on the Richter scale, micro-dams in the municipality, the potential disintegration of the Danube dikes, river rupture due to heavy rainfall and melting snow, the large number (43) of officially registered landslides define the municipality of Svishtov and the town itself as particularly dangerous in the future from the occurrence of natural disasters, including floods.

Conclusions:

1. The natural floods (rain-river type) in the Danube region represent a major risk to society in the last 15 years (from 2005 to 2020).

2. In the municipality of Pleven rainfall prevails 138 days a year, 75% air humidity. With increased risk of overflow of local rivers in the Danube region are: Danube River, Iskar River, Vit River, Osam River, Yantra River, Rositsa River and Dolapdere River. With a moderate risk of overflow are determined - Elena River, Chernyalka River and Gostilya River.

3. In the Danube region of 797 dams, 26 (3.26%) are extremely dangerous and pose a high risk of floods.

4. Man-caused floods are not reported for the observed period.
5. The sewerage network in the municipality of Pleven is morally and technically obsolete.
6. The old sewerage system of mixed type in the municipality of Pleven is the reason for the poor ecological condition of the Tuchenitsa river .
7. A very serious ecological problem for both municipalities Pleven and Svishtov are: the water erosion of soils and the large number of landslides, 181 in Pleven and 43 in Svishtov, 1113 throughout the Danube region. The Danube River has a confirmed role as a serious erosive factor and takes away some of the most fertile lands. The seismic coefficient Kc for Svishtov municipality is 0.15 and intensity level 1-8. The combination of soil erosion, a large number of landslides, the high seismic coefficient pose a huge risk of potential catastrophic floods.

4.2 Study of the main tasks of the medical service (hospitals) in case of flood. Measures and basic means of protection.

The structure of the general medical insurance in case of floods includes:

- A). Governmental bodies
 - At national level - Ministry of Health (MH)
 - At the regional level - Regional Health Inspectorates (RHI)
 - At the municipal level – Multiprofile hospitals for active treatment (MHAT)
 - B). Forces and means
 - Mass medical and sanitary formations - national rescue team, voluntary teams, voluntary youth emergency teams, a team of professionals for first psychological aid.
 - Medical formations - medical teams, specialized medical teams, ordinary medical teams, paramedic teams, transport teams and others.
 - Medical formations with increased readiness - Medical Insurance Squad (MIS), Military Medical Emergency Response Team (MMERT), Sanitary Control Points (SCP), Sampling Groups (SG), Auto Sanitary Columns (ASC).
 - C). Medical institutions
 - medical establishments for individual and group practice, diagnostic counseling centers (DCC)
 - medical institutions for hospital care, hospitals for active treatment - Multiprofile hospitals for active treatment (MHAT), Specialized hospitals for active treatment (SHAT), hospitals for pre-treatment and long-term treatment, hospitals for rehabilitation.
 - D). Regional Health Inspectorates (RHI)
 - E). Center for Hematology and Transfusiology (K. Kanev, 2007).
- Teams of the Chief Directorate "Fire Safety and Civil Protection" (CG "FSCP"), voluntary, military formations and others also take part in the rescue operations in case of floods. The official coordinator of actions for rendering first medical aid is the director of the Regional Health Inspectorate in the respective region, who is directly subordinated to the Ministry of Health.

The number of staff working in RHI - Veliko Tarnovo is 132, in RHI - Pleven is 139.

Types of medical care in case of floods.

First aid (FA) is in the form of self or mutual aid. FA includes: restoration of respiratory and cardiac activity (cardiopulmonary resuscitation (CPR)), temporary cessation of bleeding, primary anti-shock activities, prevention of possible infectious complications, preparation and evacuation of the affected persons.

First aid is provided by doctors from the Central Emergency Medical Service (CSMP), by GPs, by surviving medical facilities and by all other doctors who are close to the flood site. Qualified and specialized medical care is provided outside the source of the lesion in the respective hospitals.

After assessing the medical situation during a flood, the first step that is taken and done by the medical team is to assess the condition of the victims – a medical sorting (triage).

Basic rules of medical sorting:

- All injured people are subject to medical sorting
- It starts from the scene of the accident, continues during transportation and admission to a medical center or hospital
- It should be performed by specialist physicians
- A brief, systematic examination of all patients is required in advance
- The distribution of the victims is done depending on their condition and prognosis.

The sorting teams include doctors with extensive experience in various specialties (anesthesiologists, surgeons, toxicologists) able to quickly assess the condition of the victims. The examination should last no more than 3 minutes. The in-hospital medical sorting is carried out in a medical institution, where the victims are evacuated.

Flood protection means are divided into collective and individual.

The collective means of protection are engineering facilities - hiding places and radiation protection shelters, which are designed to ensure the protection of the population. The procedure for construction, maintenance and use of the collective means of protection shall be determined by an ordinance of the Council of Ministers.

The individual devices are designed to protect the respiratory organs, eyes and skin from toxic and radioactive substances, vapors and aerosols, from high temperatures and burns, from explosions and other mechanical impacts (Disaster Protection Act).

The healthcare in Pleven municipality and Svishtov municipality.

Outside the hospital treatment activity in both settlements is subject to municipal development plans MDP. This activity has a strong local character, carried out by general practitioners, specialists and dentists.

The hospital care and the hospital infrastructure in the town of Svishtov is with municipal participation in the management. The health care of the entire population of the town of Svishtov and the municipality is organized and is carried out as follows:

The school and children's health care is provided by 12 nurses and two paramedics. The primary outpatient care is provided by 20 general practitioners with individual and group practice. The specialized non-hospital care is provided by private doctors' offices, private medical centers: Medical Center "Antiva" EOOD, with address 1 Petar Angelov Str. and telephone 0632 / 441-18, Medical Center "Norma" OOD, with address 32 Petar Angelov Str. and telephones: 0886703050 and 0888622687, Medical Center "Hiron", with address 32 Petar Angelov Str. and telephone 0631 / 2772-34.

The hospital from MHAT "Dr. Dimitar Pavlovich" EOOD, town of Svishtov, 18 Petar Angelov Str. and telephone: 0631/60732

At the present, the Multiprofile Hospital for Active Treatment "Dr. Dimitar Pavlovich" has the following wards and beds: Children's ward with 11 beds, Neurology ward with 18 beds, Surgical ward with 6 beds, Ward for hemodialysis treatment, Ward for imaging diagnostics, Internal ward with 42 beds, Department of Anesthesiology and Intensive Care (DAIC), Department of Physiotherapy and Rehabilitation (DPR) with 12 beds, Clinical Laboratory and Hospital Pharmacy. The total number of staff in MHAT "Dr. Dimitar Pavlovich" in the town of Svishtov is 107 of which 27 doctors and 43 nurses.

The preliminary preparation of all hospitals requires in case of emergency (flood, fire, earthquake) or accident to have two entrances, a larger site for helicopter landings and the ability to open a larger number of beds if necessary. In this respect, the hospital in the town of Svishtov currently meets these requirements. It does not have an infectious ward, it was

closed 10 years ago, but from October 2020 has been transformed into a Covid compartment. There is no specialist in infectious diseases at the time of the own investigation, the working specialists in internal medicine are elderly. Working pharmacies - 4 in the city itself and one pharmacy in the region. There are no intensive beds because the hospital in the city does not have an intensive care unit.

In case of a potential catastrophic flood in the town of Svishtov, which can be defined as a town near the flood zone in case of possible shortage of local medical teams and staff, the available ones can be strengthened by medical staff working in the nearby areas of the municipality - Pavlikeni, Polski Trambesh, Gorna Oryahovitsa. In a more difficult situation, the population of Svishtov municipality can be directed for temporary or permanent evacuation to the nearby municipalities of Ruse, Pleven, Veliko Tarnovo, Pavlikeni and Polski Trambesh.

For the district of Pleven the hospital activity has supra-municipal significance.

According to the official register of RHI Pleven in the district there are 310 medical institutions for hospital care, of which 96 individual practices for primary care, 7 group practices for primary care, 74 individual practices for dental care, 3 group practices also for dental care, 75 individual specialized medical practices, 5 group specialized medical practices. In the municipal center there are 7 diagnostic-consulting centers DCC and 19 medical centers MC.

In the municipality of Pleven there are twice as many doctors and medical specialists per 1000 people of the population compared to the national level.

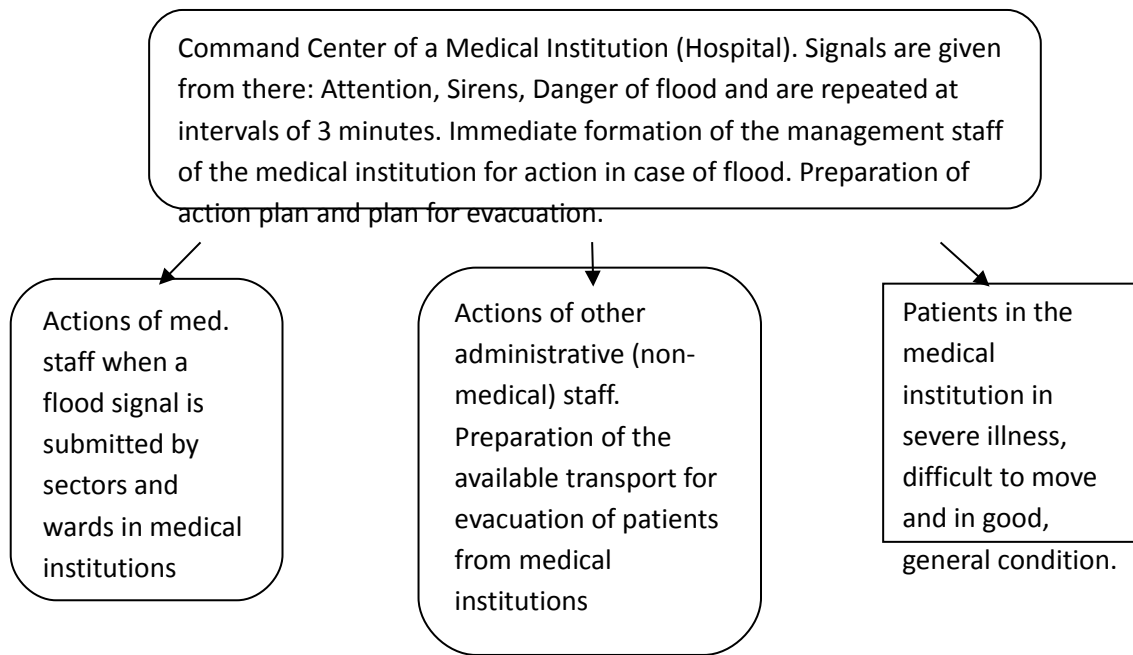
The hospital care in Pleven has 12 health care facilities, of which 9 are multi-profile hospitals, 2 are UMHAT, 2 specialized hospitals for active treatment, 1 for posttreatment and long-term care and 1 military hospital. Eight (8) of the hospitals are public property (state and municipal), 4 are private property. The territorial location of the hospital infrastructure is a function of the population. The capacity of the individual hospitals and respectively their service areas is determined accordingly. With regional functions are UMHAT "Georgi Stranski" EAD, as well as other hospitals in the private sector - UMHAT "St. Marina" OOD, MHAT "Avis Medica" EOOD, MHAT "St. Panteleymon" OOD, MHAT "St. Paraskeva" OOD and MHAT "Sartse i mozak" EAD.

Of greater municipal importance are MHAT "Knezha" EOOD in the town of Knezha and MHAT "Levski" EOOD in the town of Levski. The other municipal hospitals in the town of Belene, Gulyantsi, Nikopol, Cherven Bryag have a small capacity and serve the population of the respective municipality. The specialized hospitals - Hospital for Cardiology and Hospital for Obstetrics and Gynecology in the city of Pleven and "Specialized Hospital for Internal Medicine for treatment, long-term treatment and rehabilitation - Iskar" EOOD also have regional functions. In the city of Pleven there is also a Military Hospital - MMA – MHAT Pleven. The main settlement centers in which hospitals with above municipal functions are located in the towns of Pleven, Levski and Knezha. For the municipality of Pleven as a whole there is a lasting trend to increase the number of beds in many specialized hospitals for active treatment (MHAT). At the same time, the number of beds in specialized hospitals is decreasing and is currently twice smaller than the national level. According to the RHI registers, the number of beds in the hospital is 1632, the number of beds in the hospital is only 36 (the reference is from 16.06.2019).

In the municipality of Pleven at the moment in connection with the Covid pandemic there are 150 intensive beds. The number of the operating pharmacies is 54 in the town of Pleven, Druzhba 1, Mara Dencheva and Storgozia, respectively.

Scheme No 1 shows how the flood hazard is announced in a medical institution, hospital. From the command center, sound and voice signals of flood danger are given every three minutes, several times on the territory of the hospital. The same center issues all orders

for actions to other units and structures. The actions are divided into three main areas: actions by the available medical staff, actions by administrative staff, including those responsible for transport, and actions by the patients at the respective hospital.

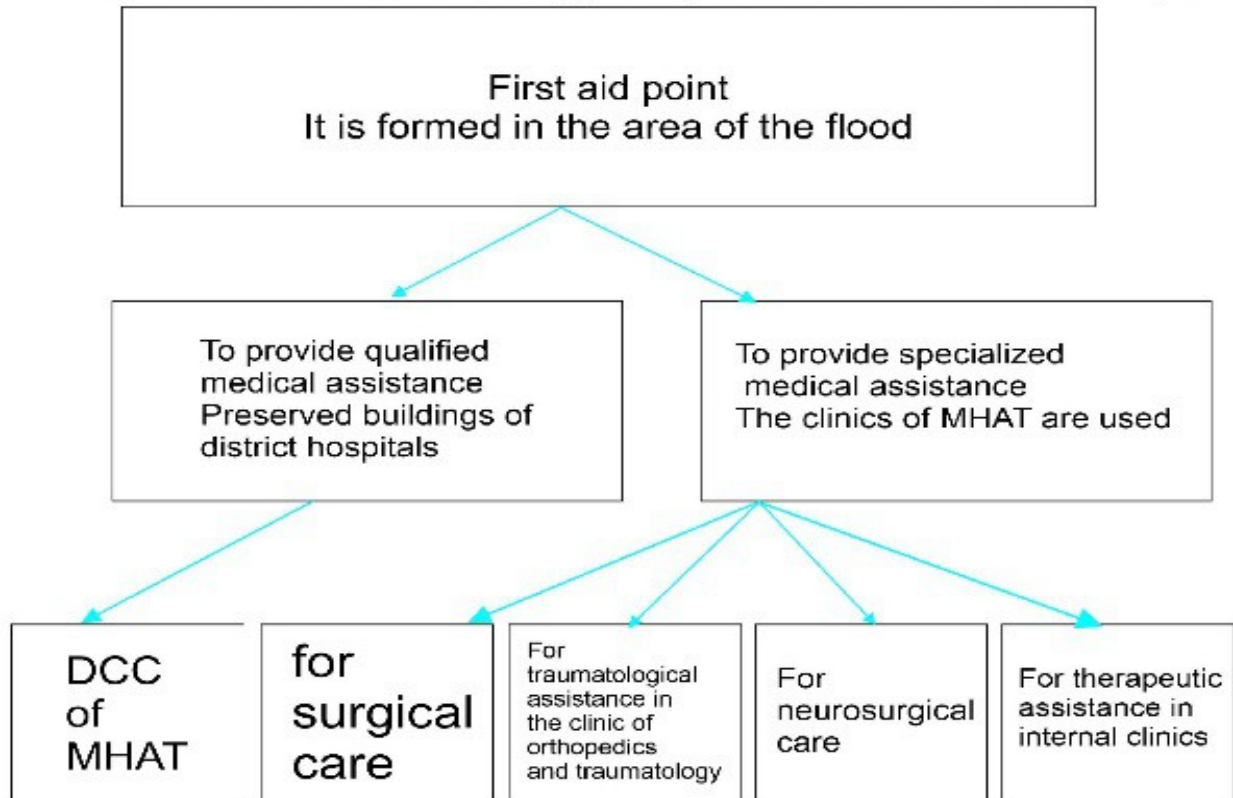


Scheme No 1 Disclosure of flood risk in the medical institution (hospital).

Scheme No 2 shows the basic distribution of the entire population affected by the flood, after the incident a first aid post was formed. Most often in the area of the flood itself or in the vicinity.

The preserved buildings of the local district hospitals and their diagnostic and counseling centers are used for providing qualified medical care, the clinics of many specialized hospitals for active treatment and the departments for surgical, traumatological, neurosurgical and therapeutic care are used for the specialized medical care. In the point for rendering first medical aid are accepted all victims and in need of help, the medical sorting is carried out according to the severity of the injuries and the need for medical or specialized help.

Scheme for distribution of the affected population, for treatment and evacuation to hospitals



Scheme No 2 Distribution of the flood-affected population.

Conclusions:

1. The medical services (hospitals) in the municipality of Pleven in case of potential introduction are in full readiness for showing first and specialized medical aid. Provided with the required number of 1668 hospital beds and 2000 medical specialists (Masters of medicine). The territory of the municipality of Pleven is the most secure in terms of the number of hospital beds between 12 - 18 per 1000 inhabitants.

2. Currently the medical service (hospital) in Svishtov municipality has fewer hospital beds - 89 and working specialists in the hospital 27 (Masters of medicine). In the event of a potential devastating flood in Svishtov municipality, the local authorities are ready for a temporary or permanent evacuation to the nearby municipalities of Ruse, Pleven, Veliko Tarnovo, Pavlikeni and Polski Trambesh.

3. A very good organization has been established to provide medical assistance to flood victims in both municipalities of Pleven and Svishtov.

4. The events of the institutions (RD "PBZN", RHI and BRC) for protection of the population in the municipalities of Pleven and Svishtov are properly organized.

4.3 Survey of awareness and preparedness for flood protection of Bulgarian citizens from the Danube region aged 18 to 39 years. Comparison of the two age groups.

During the survey, a total of 240 people were surveyed, with a place of residence from the municipality of Pleven and the municipality of Svishtov. A sociological method was used to study the awareness and preparedness for floods of Bulgarian citizens from the Danube region (Table 1).

Type of respondent	Age group	Total	% of the total number
Persons from 18 to 39 years.	120	240	50%
Persons from 40 to 64 years.	120	240	50%
Total	240	240	100%

Table No 1 Distribution of respondents by age.

Of the surveyed contingent 240 by gender, women predominate over men (Table 2).

Type of respondent	Gender	Total	% of the total number
Men	100	240	41.6%
Women	140	240	58.33%
Total	240	240	100%

Table No 2 Distribution of respondents by gender.

Question No 3 of the questionnaire “What is the completed education so far?” Highest relative share 62% with completed secondary education, followed by 18% bachelor's degree, 15% master's degree and 5% primary education. The difference between bachelors (18%) and masters (15%) is insignificant $p \leq 0.05$ (Table 3).

Education	Total respondent	% of the total number
Secondary	240	62%
Bachelor	240	18%
Master	240	15%
Primary	240	5%
Total	240	100%

Table No 3 Distribution of respondents by education.

Question No 4 of the survey "Where is your current place of residence?"

There is no statistically significant difference in the responses of the two surveyed groups ($p \leq 0.05$) - (Fig. 1).

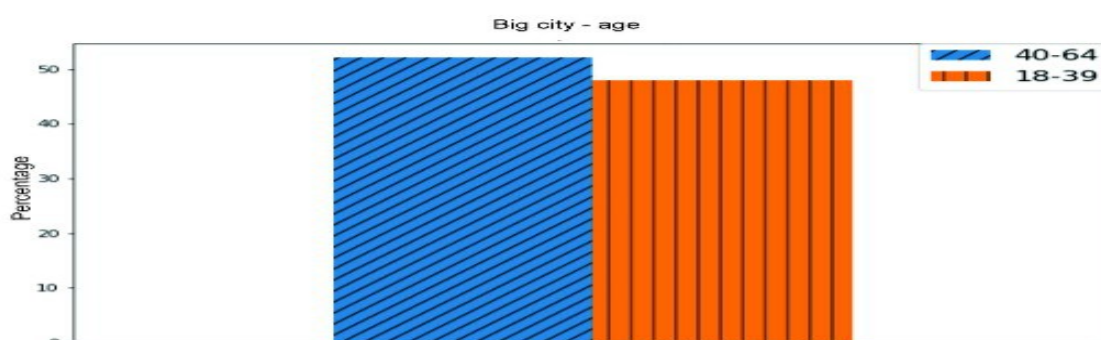


Figure No 1 Distribution of respondents by place of residence (large city).

In a small town they marked 45% of the adult age group 40 to 64 years and 55% of the young age group 18 to 39 years.

In the small town live a higher percentage of young people, while in the big town the persons from the mature age group from 40 to 64 years predominate (Fig. 2).

In the village they noted that 68% of the mature age group 40 to 64 live and 32% of persons aged 18 to 39 years (Fig. 3).

In the big town and the small settlements (villages) of the two municipalities of Plevna and Svishtov as permanent place of residence more persons from the mature age group over 40 to 64 years were noted in the surveys (Fig. 3).

There was no statistically significant difference in the responses of the two age groups by gender and place of residence ($p \leq 0.05$).

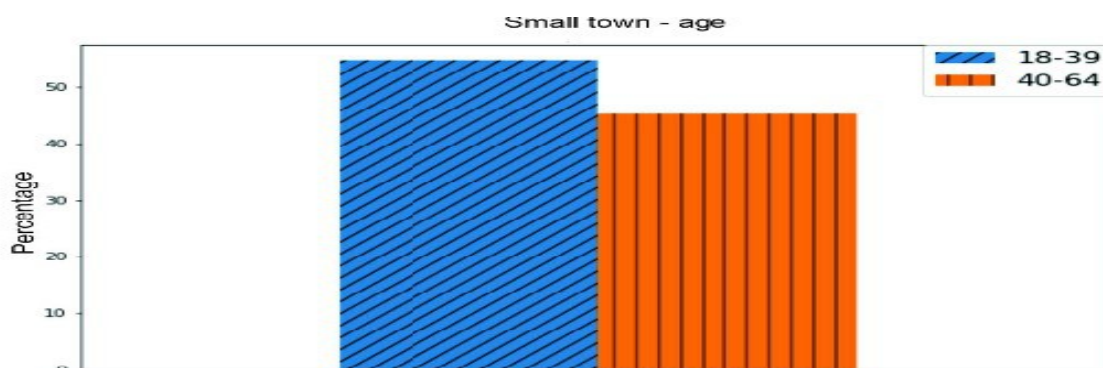


Figure No 2 Distribution of respondents by place of residence (small town).

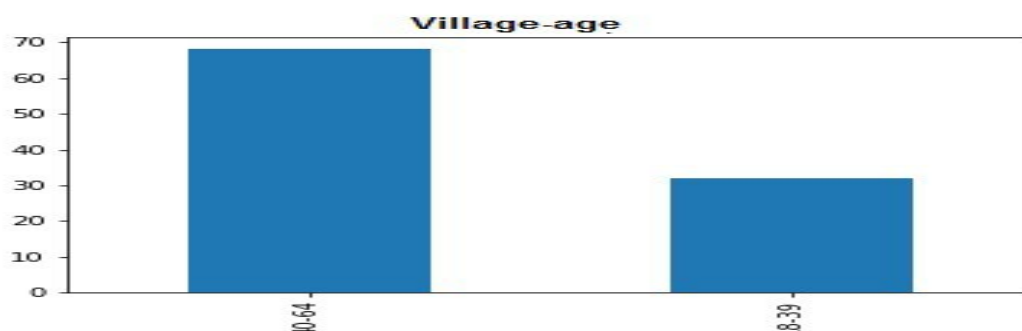


Figure No 3 Distribution of respondents by place of residence (village).

To question No 5 “Which of the following disasters have you experienced so far?” In the small town, 37% experienced an earthquake in the first place, 12% flood - in the second place and 8% transport accident in the third place, combination of flood and earthquake 8% , earthquake with a transport accident also 8% (Table 4).

Experienced past disasters / small town	% relative share
Earthquake	37%
Flood	12%
Car accident	8%
Flood and earthquake	8%
Car accidents and earthquakes	8%

Table No 4 Distribution of experienced past disasters in a small town

In the big town, 43% earthquake, 12% flood and earthquake, 12% fire (Table 5). In the mature age group, as in the young age group, the leading disasters experienced are also

natural. There was no statistically significant difference in the responses of the two age groups ($p \leq 0.05$).

Experienced past disasters/big town	% relative share
Earthquake	43%
Flood and earthquake	12%
Fire	12%

Table No 5 Distribution of past disasters in a large city.

Respondents living in rural areas have experienced in the past: 40% earthquake, 15% flood, 15% fire (Table 6).

Experienced past disasters/village	% relative share
Earthquake	40%
Flood	15%
Fire	15%

Table No 6 Village

Question No 6 of the survey "Which of the following disasters do you consider to be most at risk of an epidemic?"

According to the young age group, the two municipalities: Pleven and Svishtov, 20% believe that the floods are the first cause of epidemics, which is a correct answer, but 15% of young people cited a production accident as another reason, which is a wrong answer, 15% believe that epidemics occur in floods with industrial accidents, 10% floods and terrorist attacks - correct answer, 5% industrial accidents and terrorist attacks, 4% floods and earthquakes - correct answers (Fig. 4). A total of 34% of young people gave a correct answer to the question asked, 40.8 of young people are well aware of the risks and disasters that can lead to an epidemic.

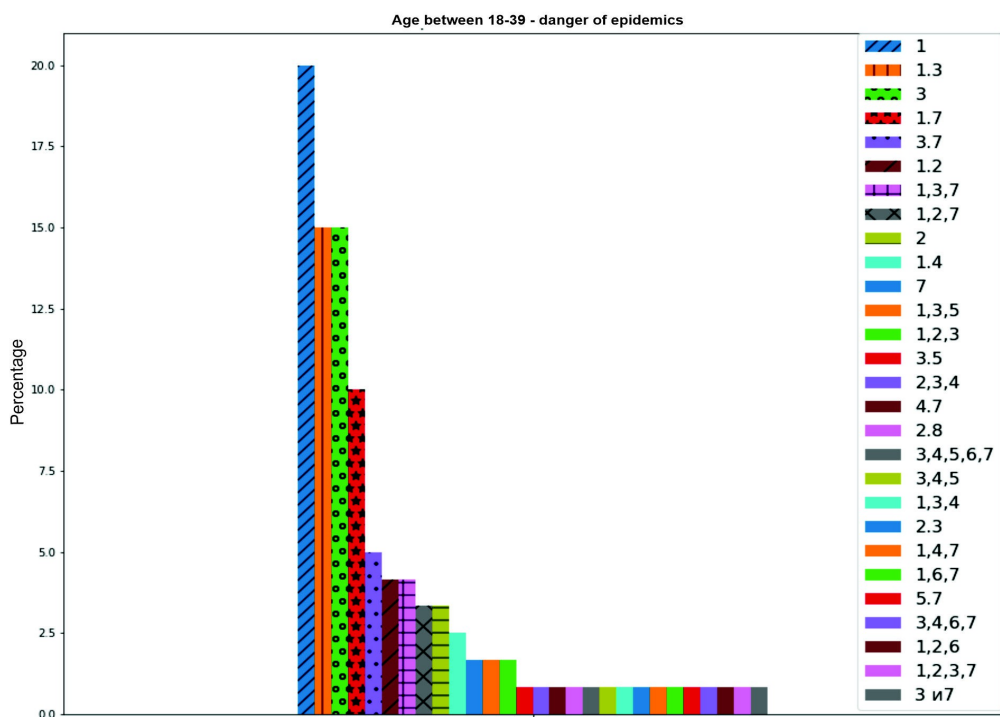


Figure No 4 Danger of epidemics (young age group 18-39)

Question No 7 “Are you informed if there is a potential threat of flooding in your settlement?” The young age group: 45% are informed, 35% are not informed, 20% answered with I do not know (Fig. 5).

The percentage of negative answers is high (55% or 66 respondents), which seriously endangers their lives, home, property and relatives if a real threat or situation arises. Again, this group deserves attention and taking measures to address the gaps.

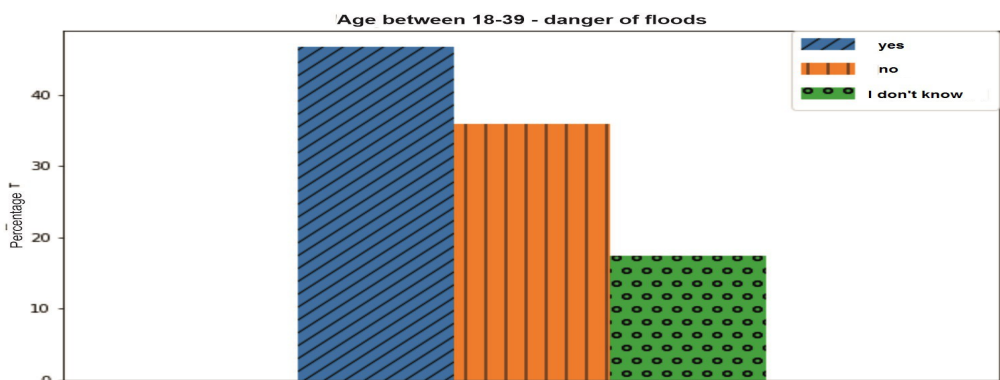


Figure No 5 Danger of potential flooding in the young age group 18-39.

The same problem of awareness of the danger of floods was addressed according to the completed education noted in the survey.

The problem with the persons with the lowest completed primary (5%) and the persons with secondary education (62%) is considered. The persons with primary education: 48% have no information about a potential flood threat, 35% answered with I do not know, 17% have information about a flood threat (Fig. 6)

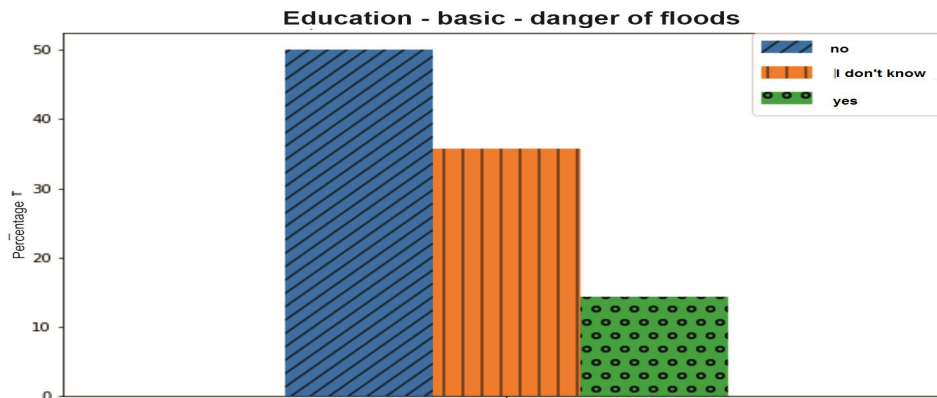


Figure No 6 Danger of potential flooding by persons with primary education.

The sum of the respondents (I do not know and I have no information) is 83% for people with primary education. The result is due to the low education. People with secondary education: 40% have information about potential danger, 35% have no information, 25% do not know. The sum of negative answers is 60% (Fig. 7).

The persons with completed secondary education are better informed (40%) than persons with completed primary education (17%). The difference between the answers of the two groups of respondents was statistically significant ($p \geq 0.005$).

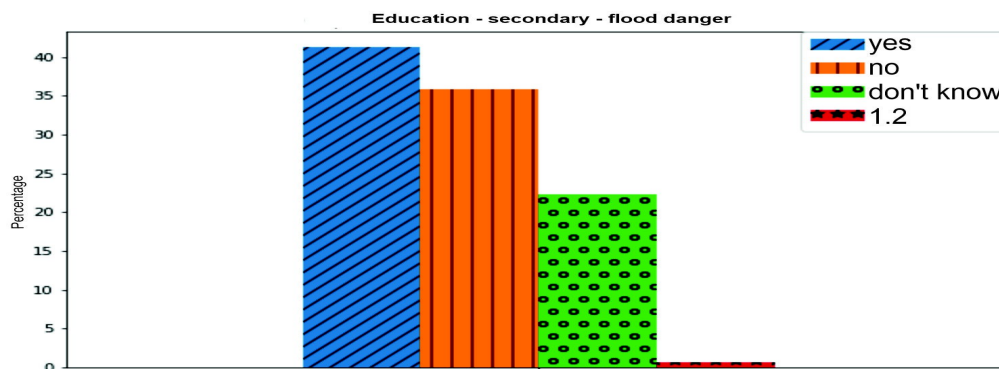


Figure No 7 Danger of potential flooding by people with secondary education.

Of all 240 respondents and according to their current education (Table 7). There was no statistically significant difference in the answers of bachelor (15%) and master (12%) - ($p \leq 0.05$).

In the two educational specialties at the Medical Universities, training in Emergency Medicine is provided and conducted.

acquired education	% of the total number
Secondary	70%
Bachelor	15%
Master	12%
Primary	3%
Total	100%

Table No 7 Respondents' awareness of the threat of floods according to completed education.

Question No 8 “Do you have insurance of the home where you live and the property in case of disaster including flood?” As reasons for the lack of home / property insurance they pointed out - lack of awareness of the problem, lack of own home, inability to make independent decisions, reluctance of the parents with whom they live together (Fig. 8).

More than half (62.4) of the young respondents understand the seriousness of the problem of natural disaster (flood, earthquake) and have currently insured their home and property. The remaining (56.4) young people need additional reassurance about the seriousness of the problem.

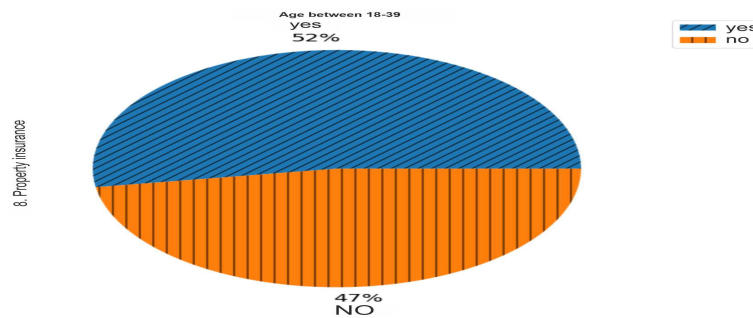


Figure No 8 Home and property insurance for the young age group.

Question No 9 "Do they have a prepared backpack / bag with important documents, dry food and readiness for evacuation in case of disaster, including flood?"

The answers of the respondents were processed on the basis of age (Fig. 9).

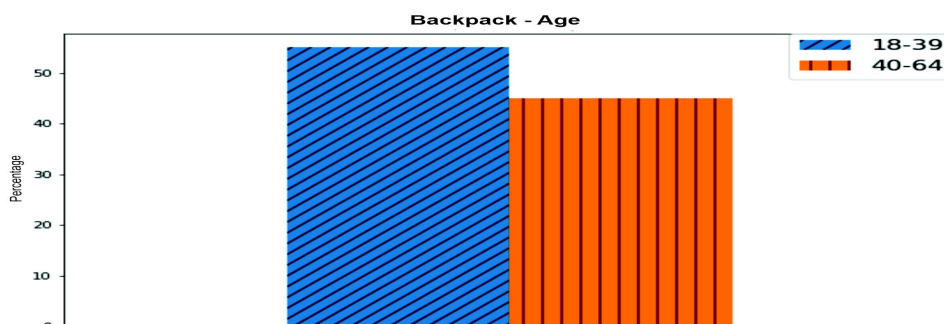


Figure No 9 Prepared backpack for evacuation according to the two age groups.

Statistical processing of two identical responses in the young and mature age groups - the presence of a prepared backpack / bag for evacuation in an emergency situation has a difference of 10% ($p \geq 0.05$).

According to gender, out of 240 respondents, 55% of men gave a positive answer and 45% of women also answered positively to the question asked (Fig. 10).

The statistical difference in the responses between the two genders was 10% ($p \geq 0.05$).

Men are better prepared than women with a backpack to evacuate in a disaster including flood ($p \geq 0.05$).

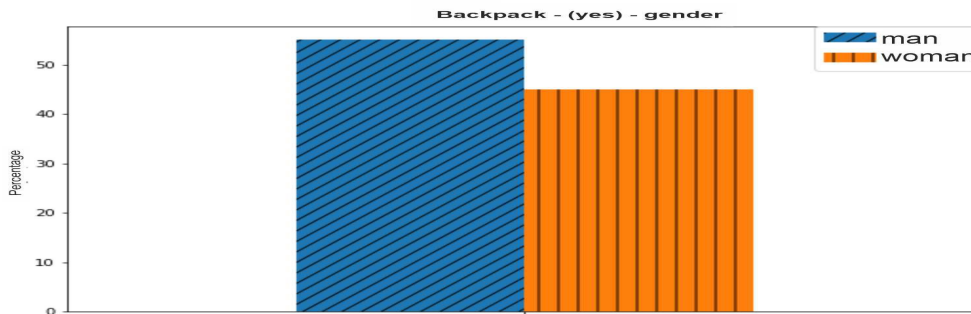


Figure No 10 With a backpack prepared for evacuation according to gender.

Question No 10 "Is the riverbed that passes through your settlement cleaned and how often is this done?" Possibilities for answer (Table 8).

Place of residence	Cleaning every few years	Cleaning the river once a year	No river cleaning
Big town	41%	30%	29%
Small town	30%	32%	38%
Village	14%	32%	64%

Table No 8 Cleaning the riverbed in a big, small town and village.

The percentages that the bed of the river, which passes through the respective settlement, is not cleaned ($p \geq 0.05$) are high.

Question No 11 "Where will you drink water in a potential flood?"

55% bottled water, 15% bottled and boiled water, 5% boiled water, 5% tap water / wrong answer, 5% water from a water carrier, drilling and bottled water, 2.5% water carrier, bottled water and boiled water, 2.5% will drink water from drilling, well.

The respondents from both age groups (95%) have the right attitude to the choice of drinking water and in a real disaster can cope and respond adequately. In general, a small part of the participants in the current survey 5% gave the wrong answer to the question (Fig. 11).

Data from the National Center of Public Health and Analyses (NCPHA) show that the health indicators of the population in the Danube region are better than the national average. The epidemiological indicators as of 12.2015 are too low: Pleven municipality - 0.8, Svishnov municipality 0.6, the whole country 0.4.

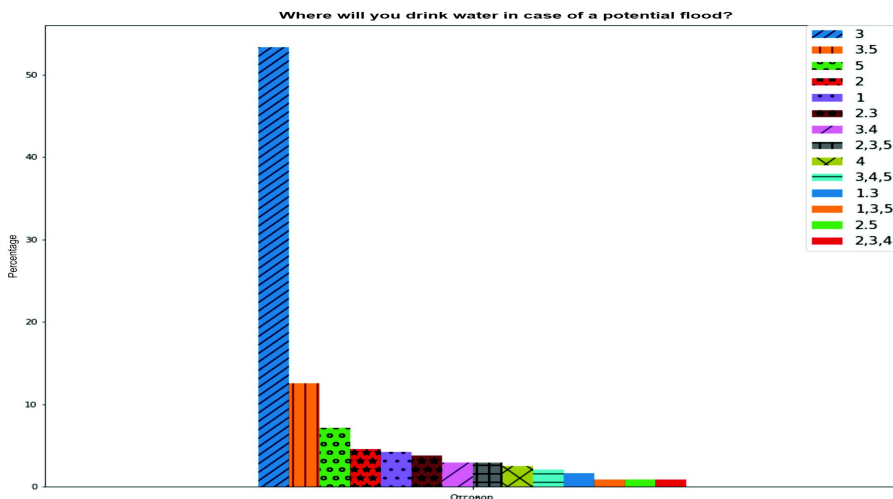


Figure No 11 What kind of water will be drunk after a potential flood.

Question No 12 “Is there a risk of gastrointestinal diseases during and after floods?”
 Graphic representation of all 240 respondents: 80% have a risk, 15% have no risk / wrong answer, 2.5% do not know, 2.5% have answered with the three possible answers to the question (Fig. 12). 192 respondents answered correctly, 48 incorrectly.

The differences obtained in percentages are statistically significant ($p \geq 0.05$).

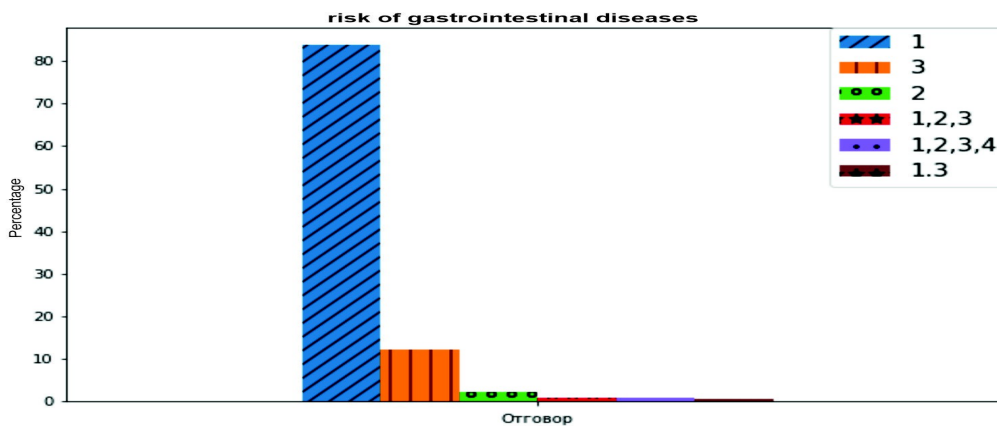


Figure No 12 Risk of gastrointestinal diseases after flood.

Question No 13 "What measures would you take to prevent gastrointestinal diseases after a flood?"

The graph is for all 240 respondents, young and mature age group:

45% fenced off all four possible answers, regular hand washing with soap and water, boiling water for drinking, good food handling, good home hygiene, 45% the first three answers - washing hands with soap and water, boiling water, drinking water and good food handling, 38% consider it sufficient to boil drinking water, 36% regular hand washing with soap and water, 28% regular hand washing with soap and water and boiling of drinking water, 18% boiling of drinking water and good food handling, 15% indicate as a regular protection the regular washing with water and soap and good food handling, 80% of respondents answered the question with three correct answers (Fig.13). The study shows a high percentage

of awareness and competence in both age groups regarding measures to prevent gastrointestinal diseases.

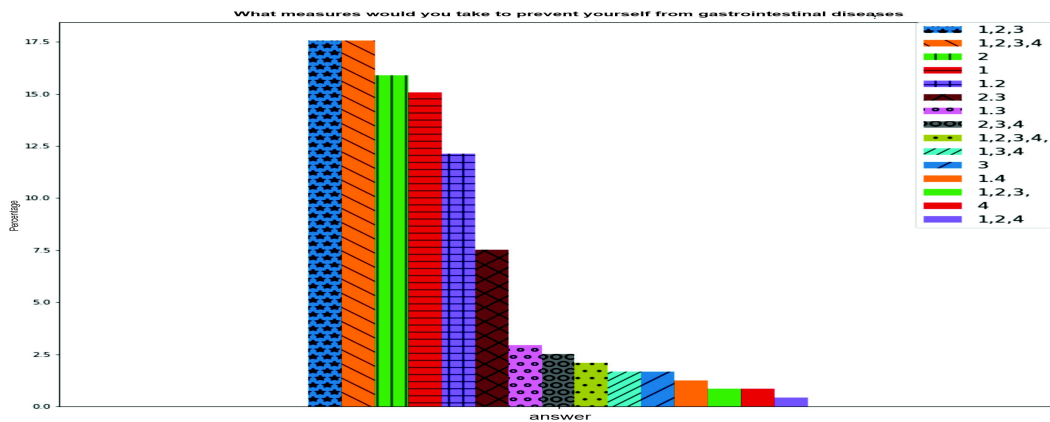


Figure No 13 Measures to prevent gastrointestinal diseases after floods.

Question No 14 “Are you familiar with the Disaster Protection Plan, part „Floods“ in your settlement?” The distribution is made for the two age groups, according to place of residence. Living in a big town (Fig. 14).

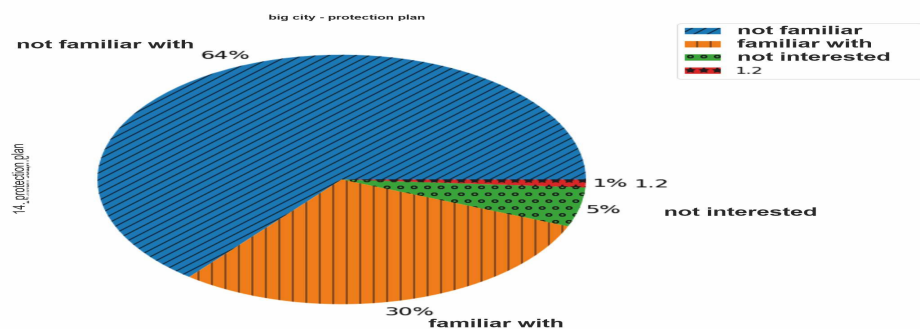


Figure No 14 Protection plan - familiar with it, living in a big town. Living in a small town (Fig. 15).

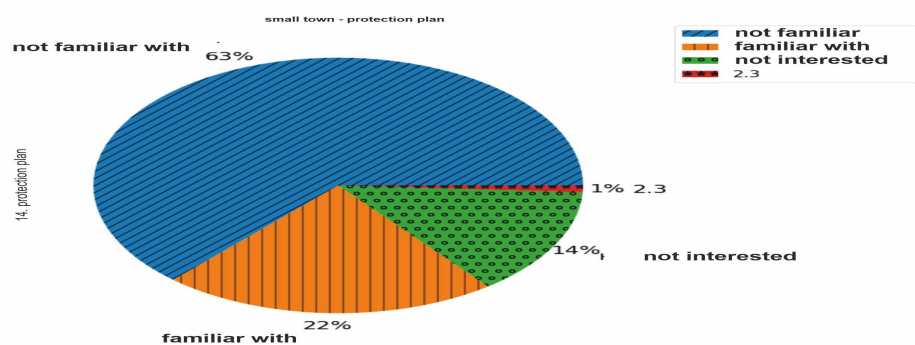


Figure No 15 Protection plan - familiar with it, living in a small town.

Living in the village (Fig. 16).

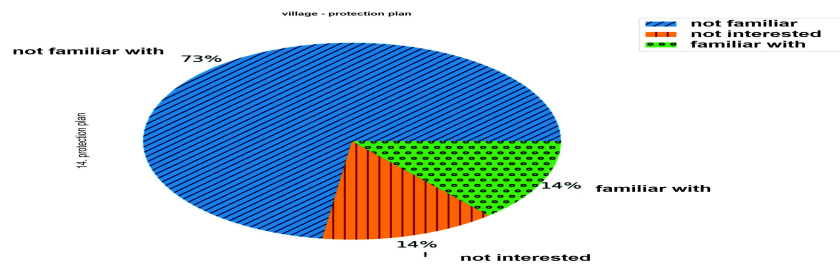


Figure No 16 Protection plan – persons living in the villages familiar with it

The percentage of people unfamiliar with the Protection plan is 87% for the villages, 70% for the big towns and 78% for the small towns. The statistical difference in negative responses was insignificant ($p \geq 0.05$).

Question No 15 “Is the riverbed fortified in your settlement, are there any dikes built?” Graphs of the answers are made according to the indicated place of residence (Fig. 17). In the big towns awareness of strengthening the riverbed is good, but ineffective actions by the local institutions and public disinterest are too high (relative share 54%).

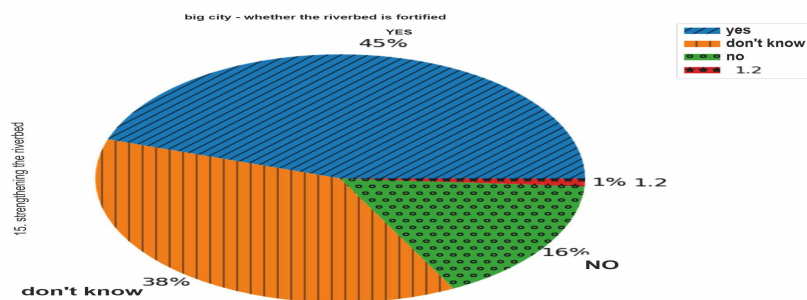


Figure No 17 Fortified riverbeds - big town.

The respondents from a small town (Fig. 18).

The respondents from the villages (Fig. 19).

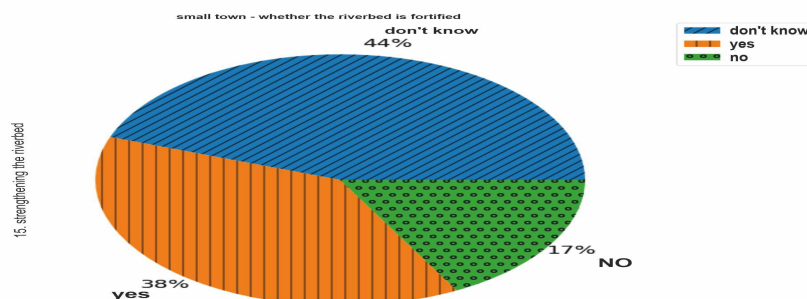


Figure No 18 Fortified riverbeds - a small town.

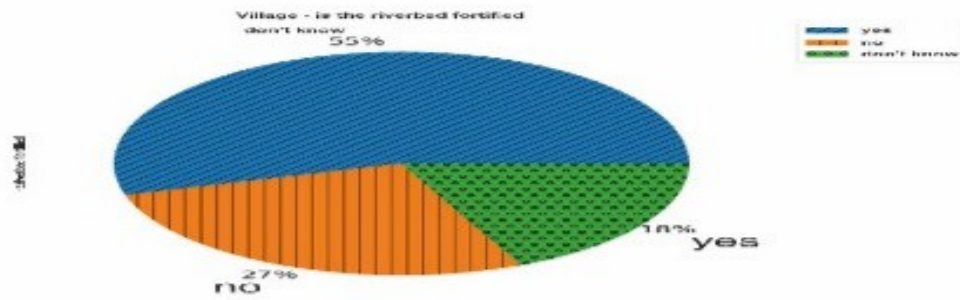


Figure No 19 Fortified riverbed - village.

Question No 16 "Do you know who organizes assistance in case of floods?"

The answers of the persons from the young age group (Fig. 20). The ratio of knowledgeable young respondents to ignorant from the same group was 47% versus 52% ($p \leq 0.05$).

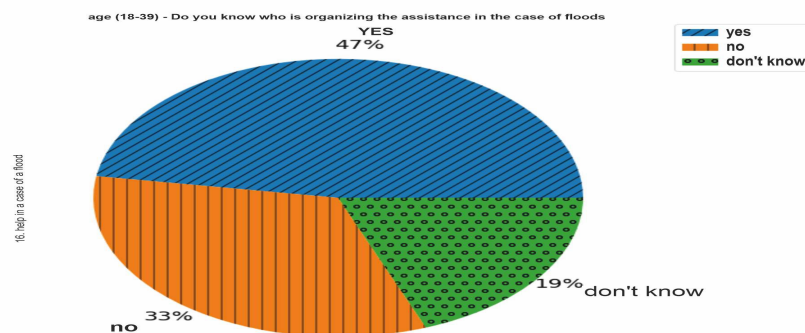


Figure No 20 Organizing assistance in case of a flood - young age group.

Question No 17 "Have you heard the sirens for early warning in case of disaster?"

The answers were broken down graphically by age and place of residence (Fig. 21).

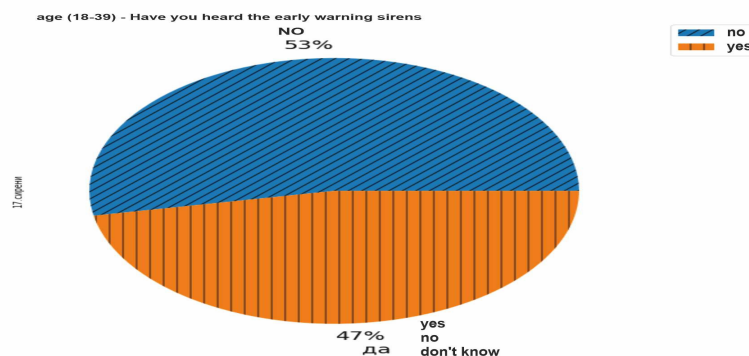


Figure No 21 Disaster early warning sirens - young age group.

The answers to the same question according to the place of residence indicated in the surveys (Table 9).

Place of residence	Early warning sirens	Negative answers
Big town	47% yes	53% no
Small town	29 % yes	71 % no
Village	57 % yes	43 % no

Table No 9 Early warning sirens for respondents from a big, small town or village.

Question No 18 “What do you think are the causes of past floods in the settlement?” It is significant that 5% of young people consider and have noted the actions of the institutions as ineffective. (Fig. 22).

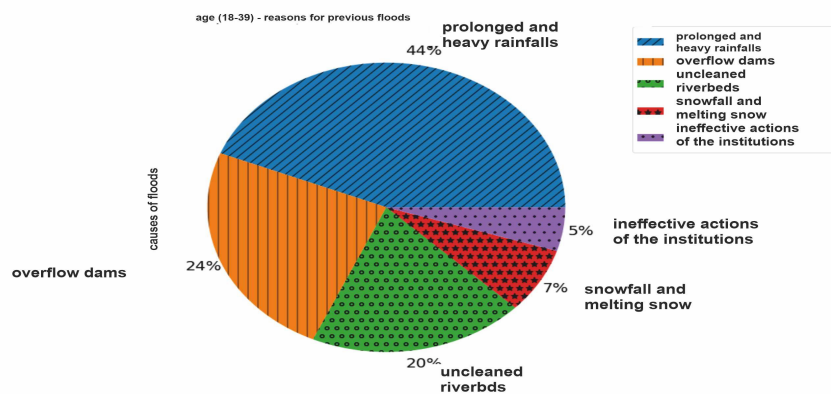


Figure No 22 Causes of past floods - young age group 18-39 years.

Question No 19 "Is there deforestation in the area of your settlement as a result of excessive logging or fires?"

Young age group (Fig. 23).

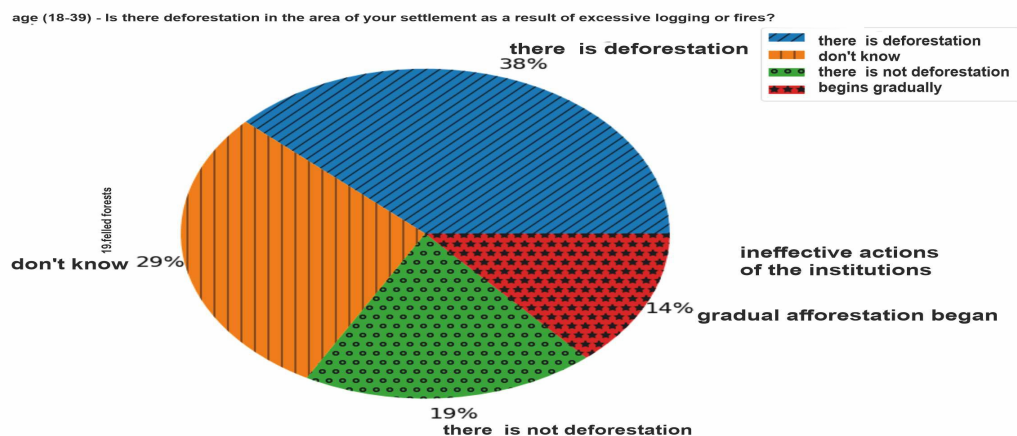


Figure No 23 Causes of deforestation - young group 18-39 years.

Question No 20 “Do you know how to swim?” The swimming is essential for a disaster such as a flood. Graphically, the answers are based on age and gender.

In the young age group (Fig. 24). Swimming skills, surveyed men (Fig. 25). There was a statistically significant difference in swimming skills of young men and women of both genders ($p \leq 0.05$). In a real situation, these young people are at very serious risk.

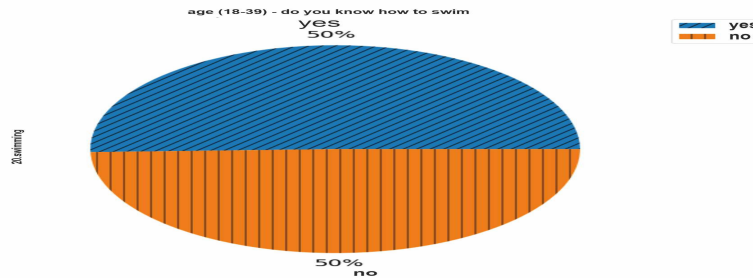


Figure No 24 Swimming skills young age group 18 - 39 years

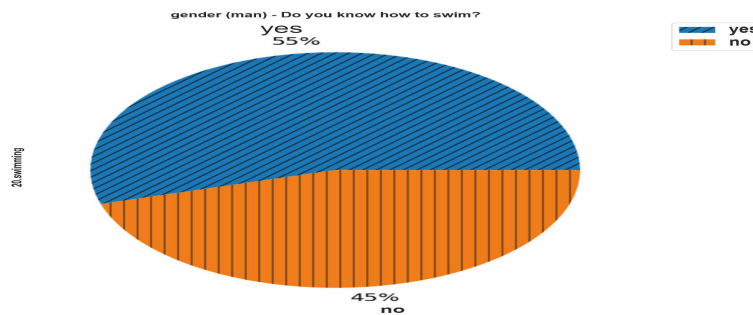


Figure No 25 Swimming skills surveyed men.

Question No 21 “Which phone should you call in case of a flood or other disaster?”. The answers were processed on the basis of age and education. The young age group from 18 to 39 years (Fig. 26).

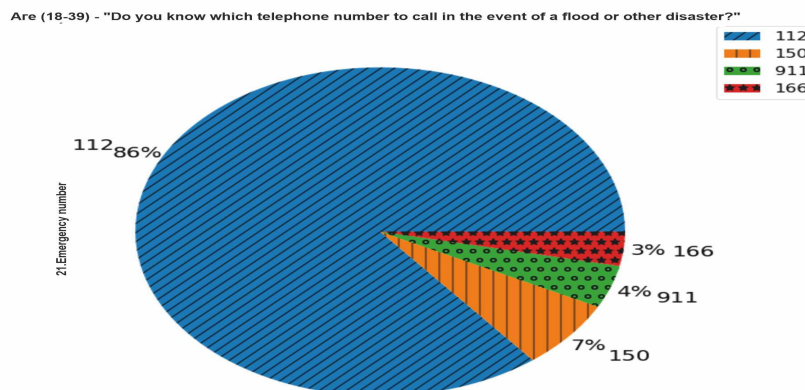


Figure No 26 Phone for calls in case of flood - young age group.

The statistical processing of this question: the persons with completed primary, secondary education, bachelors, masters give the correct answer, know the correct number 122 to call in case of a flood, which indicates sufficient and effective information, without statistically significant difference ($p \leq 0.05$).

Question No 22 “Do you know where to look for information about floods or other disasters?” The graphical distribution of the received answers is made on the basis of age (Fig. 27).

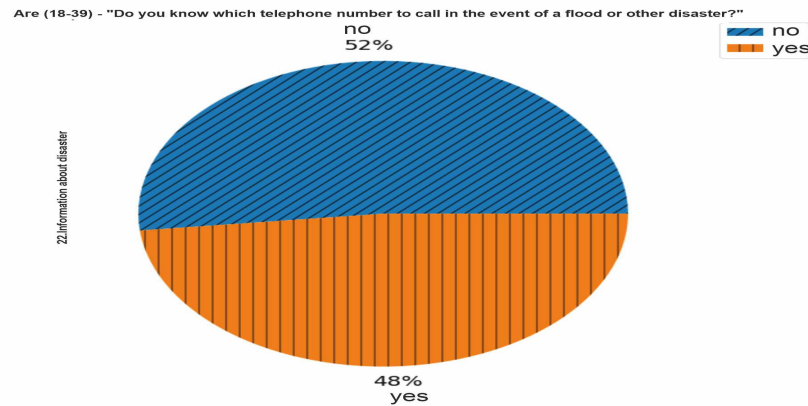


Figure No 27 Searching for flood information - young age group.

The distribution of the answers to the same question according to education (Table 10).

The described differences in percentages are statistically significant ($p \leq 0.05$).

Education	% answered yes	% answered no
Secondary	45%	55%
Master	54%	46%
Bachelor	71%	29%
Primary	36%	64%

Table No 10 Search for information floods according to the education of the respondents.

Question No 23 “Do you have enough knowledge for adequate behavior and protection in case of a flood?” Graphically the answers of the young age group from 18 to 39 (Fig. 28).

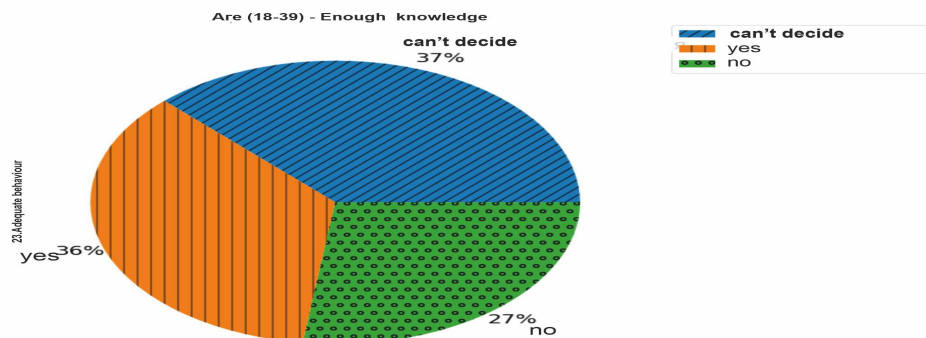


Figure No 28 Is there enough knowledge for adequate behavior in case of a flood - young age group.

Question No 24 “Do you think that your own knowledge of protection and adequate behavior should be increased?” The young age group 18 to 39 years. (Fig.29).

All respondents answered with over 55% regardless of the completed education that they need to increase their own knowledge of adequate behavior and protection in case of a flood (Fig. 30).

There was no statistically significant difference in the responses of the four groups ($p \leq 0.05$).

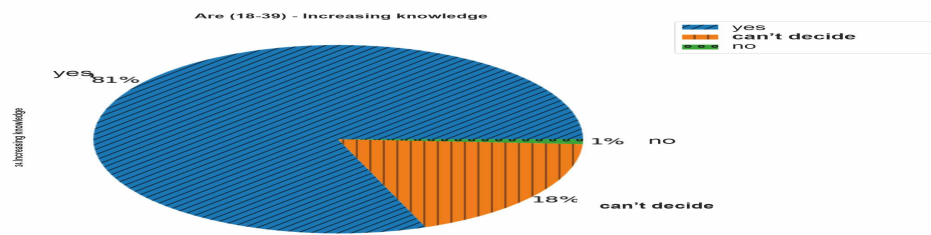


Figure No 29 Increasing knowledge about adequate behavior in case of a flood - young age group.

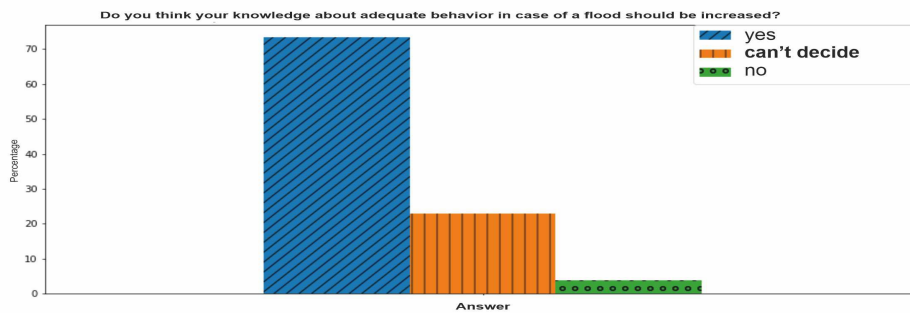


Figure No 30 Increasing the knowledge of adequate behavior of all respondents.

Question No 25 “How do you want to get more knowledge about adequate behavior and protection in case of a flood?” The statistical processing is based on education (Figs. 31, 32, 33, 34). All respondents wish to receive more knowledge, information on proper behavior in case of a flood or other natural disaster.

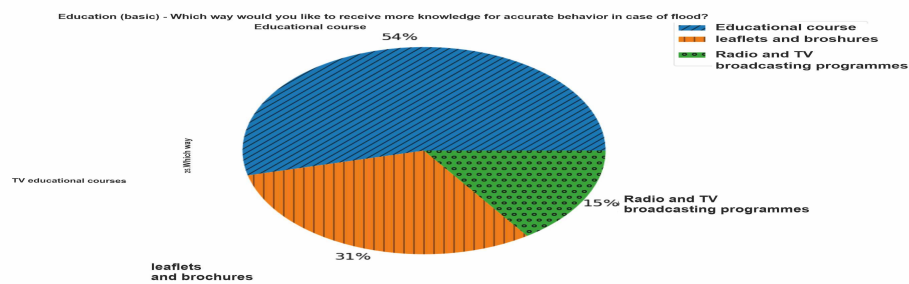


Figure No 31 Ways to gain more knowledge - people with primary education.

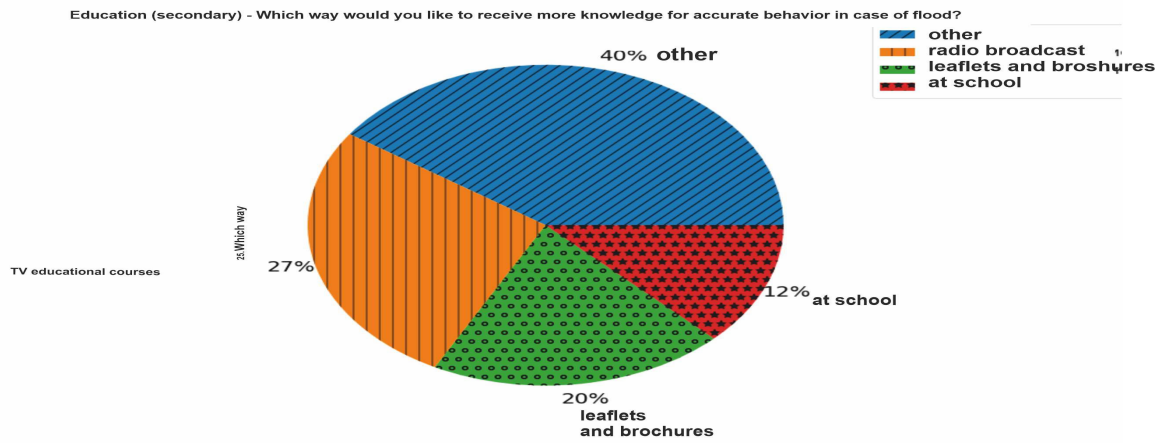


Figure No 32 Ways to gain more knowledge - people with secondary education.

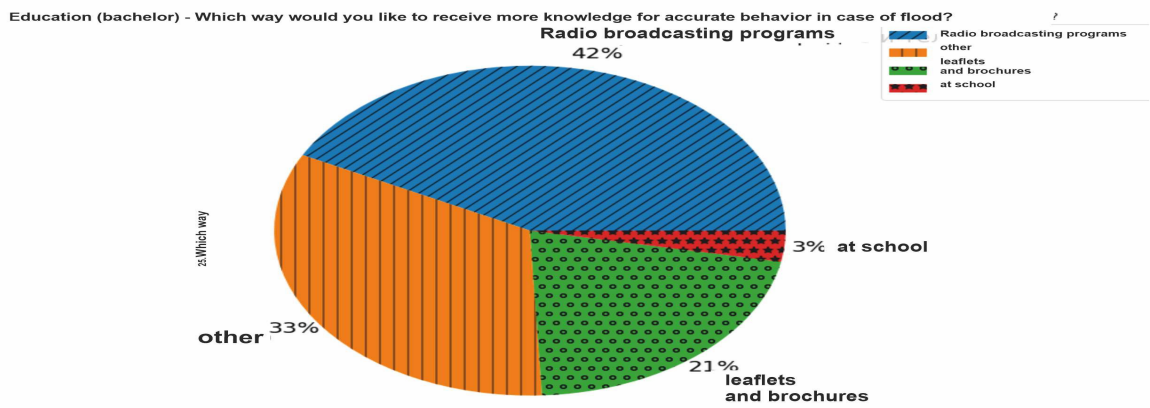


Figure No 33 Ways to gain more knowledge - individuals with a bachelor's degree.

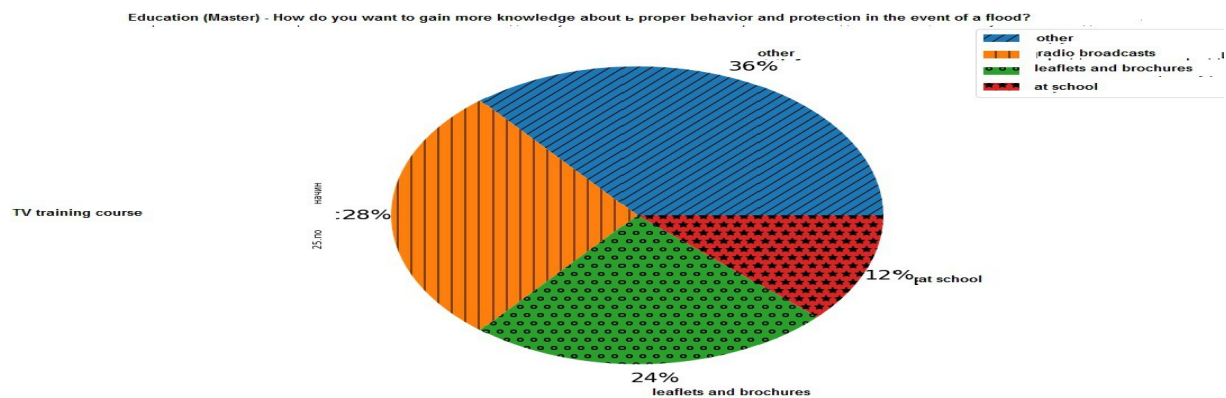


Figure No 34 Ways to gain more knowledge – individuals with a Master's degree.

Conclusions:

1. A high percentage of the two surveyed groups have experienced natural disasters in their past - a young group 37% earthquakes and 12% floods, a mature group - 45% earthquakes and 12% floods.

2. The percentage of unawareness of a potential flood threat is high - young group - 55%, mature - 75%.

3. Respondents with primary education - 83%, on average 60% of ignorance.

4. The awareness of both groups about the disaster protection plan, part "Floods" is low: in the big towns 30%, in the small ones: 22%, in the villages: 14%.

5. There is low awareness about the organization of the assistance in case of floods: 18-39 years - 47% and 40-64 years - 38%.

6. Insufficient deforestation awareness in the areas where they live and work. Young group - 38% and mature group - 41%.

7. The percentage of answers for leaving the riverbeds uncleaned in the big towns are high - 29%, in the small towns - 38%, the villages - 64%.

8. The percentages for unfortified riverbeds are high: big towns - 54%, small towns - 61%, villages - 82%.

9. Approximately twice as many young groups (52%) as adults (31%) take out home and property insurance in advance.

10. There is a significant difference between the two groups in the preparation of a backpack for evacuation. Young group - 55% have a ready backpack at home, the mature group has 45% prepared backpack. In a real disaster situation, the young group is better prepared with a backpack for evacuation and property insurance.

11. The percentage of those familiar with the signals of CD "FSCP" for early warning and notification is low (18-39 years - 47% and 40-64 years - 30%).

12. Awareness of the causes of past floods is high and almost the same. Young group - 88% correct answers and mature group - 83%.

13. The two groups of young (86%) and mature (92%) gave a correct answer which is the emergency number in case of flood or other disasters. The knowledge on this topic is assessed as very good.

14. Awareness of measures to prevent an epidemic after a flood is close and very good in both groups - 70% correct answers.

15. The percentage of the two surveyed groups from where they should drink water in case of a potential flood is high. 95% of all respondents give a correct answer and only 5% give a wrong answer.

16. The self-esteem for sufficient knowledge and skills regarding adequate behavior and flood protection is low.

17. Young age group - 36%, mature age group 18%.

4.4 Study of awareness and readiness for protection in case of floods of Bulgarian citizens from the Danube region aged 40 to 64 years. Comparison of data from the two age groups.

Question No 6 of the survey "Which of the following disasters do you consider to be most at risk of an epidemic? The answers of the adult age group: 45% floods - correct answer, 18% industrial accident - wrong answer, 8% floods and accident, also correct answer, 5% earthquakes (Fig. 35). On this question from the survey - the adult age group gives 45% correct answer against 20% by the young age group.

The difference in the correct answer between the two groups was statistically significant ($p \geq 0.05$).

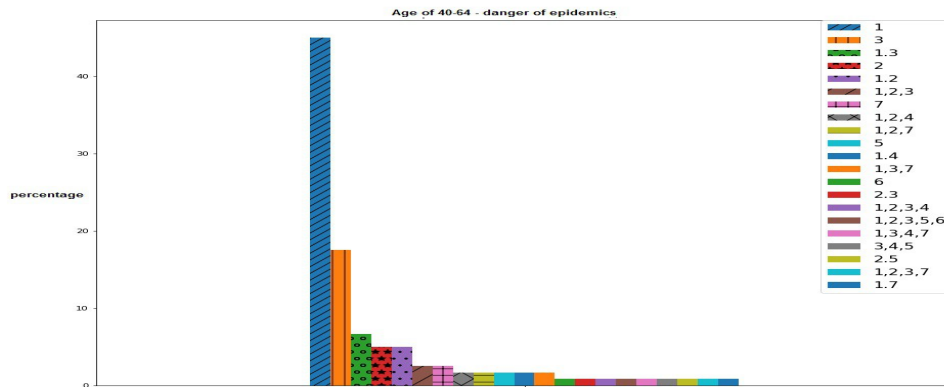


Fig.35 Epidemic risk - adult age group.

Question No 7 from the survey “Are you informed if there is a potential threat of floods in your locality?” Answers of the mature age group (Fig. 36). Informed respondents from the young group are 45% versus 25% of the mature group. The difference in the answers was statistically significant ($p \geq 0.05$).

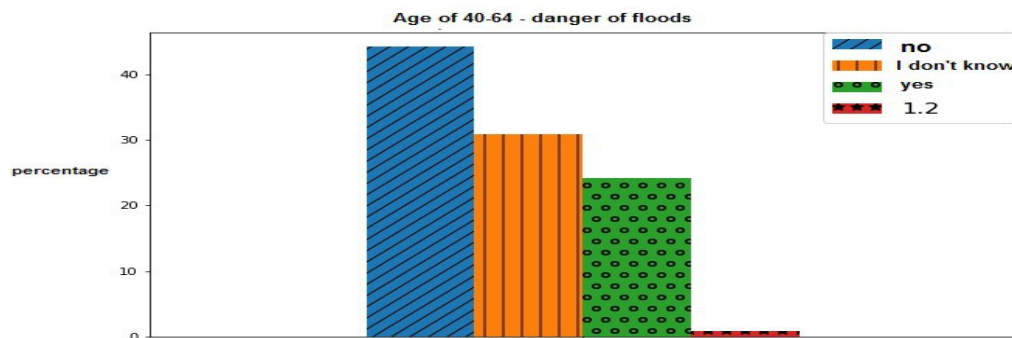


Fig.36 Flood threat - mature age group.

Question No 8 of the survey “Do you have home insurance in case of disaster, including flood?” The answers to the mature age group (Fig. 37).

The young respondents are leading to the same issue. 52% of them have property insurance against 31%. There is a statistically significant difference between the two groups of respondents ($p \geq 0.05$).

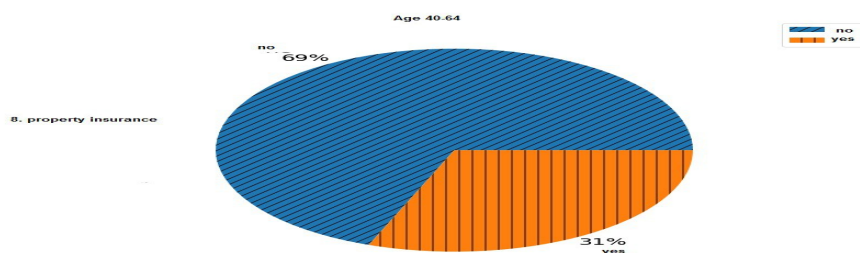


Fig. 37 Home and property insurance - mature age group.

Question No 16 of the survey “Do you know who organizes flood assistance?” The mature age group from 40 to 64 years answers (Fig.38).

On the same question, the young group (47%) answered yes, 38% from the mature group answered positively. The described differences between the two groups in percentages are not statistically significant ($p \leq 0.05$).

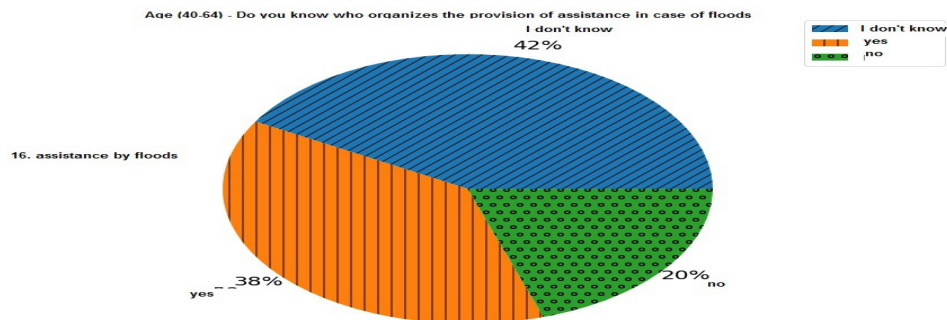


Fig. 38 Organization of assistance in case of a flood. (40-64)

Question No 17 "Have you heard of early warning sirens?"

47% of the respondents from the young age group heard sirens for early warning and only 30% of the adult age group answered positively (Fig. 39). Statistically significant is the difference in the answers "yes" in the two groups ($p \leq 0.05$). The campaign for early warning and prevention of disasters in the adult age group is too weak and in a real situation, this part of society will be put at serious risk.

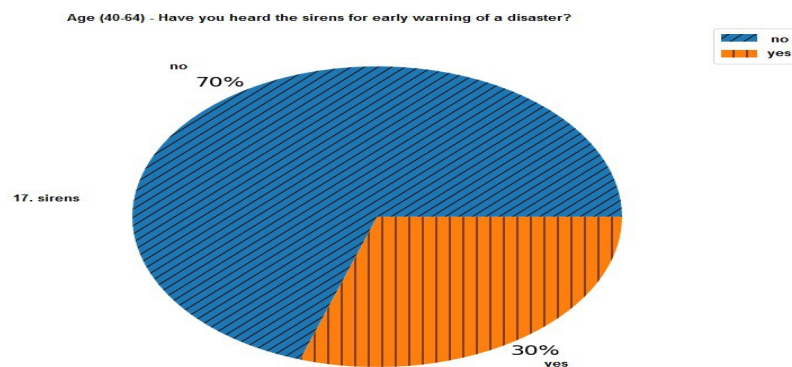


Fig.39 Early warning sirens - mature age group.

Question No 18 "What do you think are the causes of past floods?"

44% of the young group gave a correct answer to this question. Respondents from 40 to 64 respond as follows (Fig.40).

The difference in the responses of the two groups was statistically significant ($p \leq 0.05$).

Both age groups were found to be well informed about the main causes of past dangerous floods in the municipalities where they live.

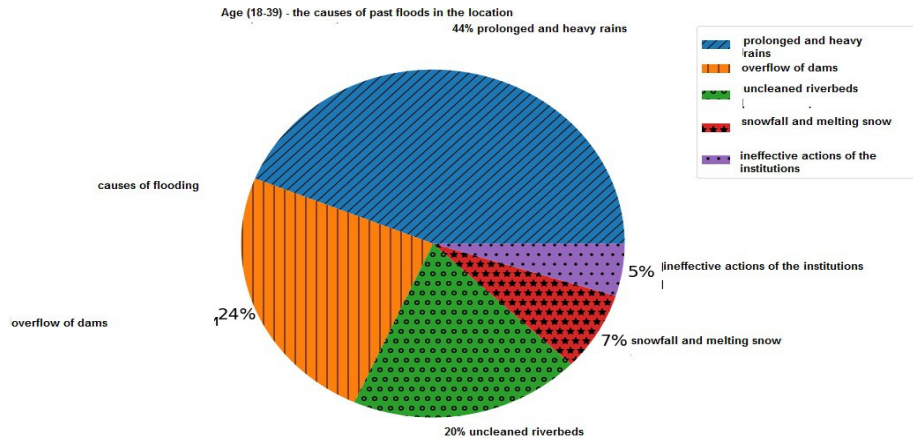


Fig.40 Causes of past floods - mature age group.

Question No 19 "Is there deforestation as a result of excessive logging or fire?" There is no statistically significant difference in the answers of the two age groups ($p \leq 0.05$), 38% of young people (18-39) answered that there is deforestation and 41% of the mature (40-64) the same.

Question No 20 "Can you swim?"

In the mature group (Fig. 41).

On the same question, 55% of all surveyed men indicated that they know how to swim and maintain this with regular swimming training in indoor and outdoor swimming pools. The "yes" answers between young and mature are 50% vs. 34%, respectively.

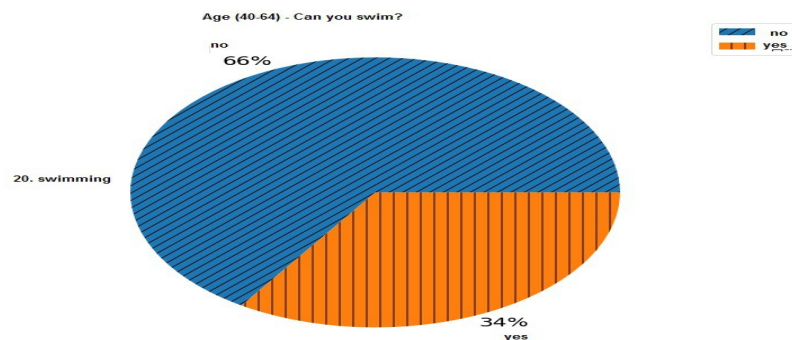


Fig.41 Swimming skills - 40-64 years.

Question No 21 "Do you know which phone to call in a case of flood?"

The mature age group on this question gives 92% correct answer (Fig. 42).

Young people also answered correctly with a high percentage of 86%. There was no significant statistical difference in the responses between the two age groups ($p \leq 0.05$).

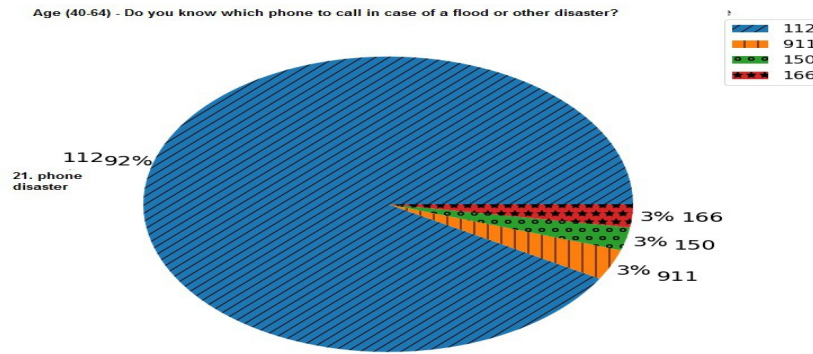


Fig.42 Disaster telephone - mature age group.

Question No 22 "Do you know where to look for flood information?"

More than a half of the mature age group responded positively (Fig.43). 48% of young respondents also answered in the affirmative.

There is no statistically significant difference in the answers to this question between the two analyzed age groups ($p \leq 0.05$).

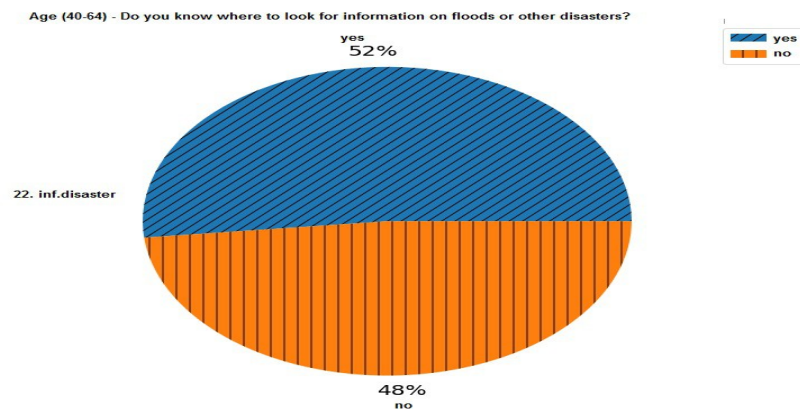


Fig.43 Flood information - mature age group

Question No 23 "Do you have sufficient knowledge of proper behavior and protection in the event of a flood?"

The percentage of respondents from the mature group with sufficient knowledge is very low 18%, in the young group it is significantly higher 36%. Again, there is a statistically significant difference in the responses of the two groups, as the young age group shows more knowledge about proper behavior and protection ($p \leq 0.05$).

Question No 24 "Do you think that your own knowledge of protection and proper behavior in the event of a flood should be increased?"

The answers to the question at 40-64. (Fig.44).

The statistical differences in the answer "yes" between the two age groups was significant 66% (mature group) and 81% (young group) $p \leq 0.05$.

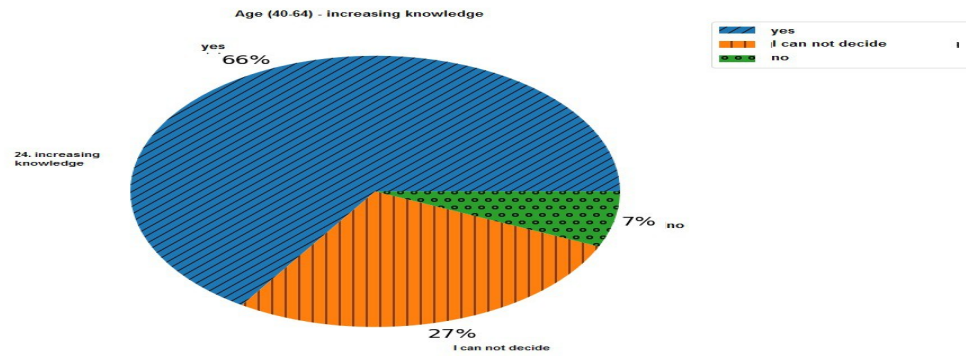


Figure No 44 Increasing knowledge about proper behavior in the case of floods - mature age group.

Conclusions:

1. The mature age group is better informed than the young, 45% vs. 20% which disasters are most at risk of developing epidemics.
2. High is the percentage 65% of the mature group who give a correct answer to the causes of past floods. They know their settlement and past disasters well.
3. The percentage of 92% of the mature group who indicated the correct answer to which phone should be called in case of flood is high.
4. The percentage 69% who do not have preliminary made insurance of their home and property in case of flood is high. This makes them vulnerable and unprepared for future disasters, including floods.
5. High is the percentage 70% of the same group who indicated in the survey that they had not heard the sirens for early warning of disasters, including floods.
In a real situation with a sound signal for warning a serious percentage of people from 40 to 64 years will not know what to do.
6. The percentage 66% of the group who indicated in the survey that they do not know how to swim is also high.

4.5 Development of protocols for hospital preparation in case of floods

Protocol for preparation of a hospital in the flood zone

4.5.1 Management actions:

1. Preparation of a plan for the actions of the management staff in case of flood risk.
2. Designation of the "command center" of the hospital (or outside it) and equipment of the same if necessary.
3. Equipping the "command center" with means of communication (telephone, fax, internet).
4. Determining the "management staff" of the hospital annually by order of the Chief physician. Documenting the issued regulations and orders.

5. Training of the "management" staff of the hospital annually for correct actions in case of flood risk. Documentation of the conducted trainings.

6. Preparation of a plan for evacuation from the building and annual play with documentation. Placing the prepared evacuation plan from the building in various prominent and accessible places.

4.5.2 Staff actions:

1. Preparation of a staff action plan in case of flood risk.

2. Training of the staff annually for correct actions in case of flood risk. Documentation of all conducted trainings and archiving.

3. Preparation of a system for continuous control and assessment of staff absences.

4. Preparation of a plan for evacuation of the building. Familiarization of all staff with the prepared evacuation plan and placing it in places visible to staff inside the building.

4.5.3 Actions for patients in case of need for evacuation:

1. Daily counting of patients in serious condition and with special needs during evacuation (mentally ill, difficult to move).

2. Determining the number of patients requiring continuous care (attendant or medical person).

3. Determining the number of patients requiring life-saving equipment (Must be evacuated by ambulance or helicopter).

4.5.4 Calculation on a monthly basis of the necessary vehicles for evacuation of patients and staff.

1. Number of rulers/ambulances.

2. Number of cars.

3. Number of minibuses or buses.

4. Helicopter or other off-road equipment.

5. By order of the manager of medical center a person from the staff shall be appointed, who shall be responsible for the whole transport and the condition of the means of transport.

Protocol for preparation of a hospital outside a flood zone (for admission of patients from a hospital in an area with a flood)

4.6.1 Management actions:

1. Preparation of a plan for actions of the management staff in case of flood risk in the region (outside the region).

2. Designation of a "command center" in the hospital and equipment with means of communication (telephone, fax, internet).

3. Determining the "management staff" of the hospital annually and updating the address and contact phone number. Documentation of the specified composition and lists of addresses and telephone numbers for emergency calls.

Annual training of the "management staff". Logging of trainings and archiving them.

4. Preparation of a work plan for accommodation of patients from another hospital located in a flood area. This plan is familiar to all working medical and non-medical staff. Documenting and placing in a visible place.

5. Providing a reserve of medicines and property in case of evacuation of other hospitals in case of flood.

6. Compilation of lists of necessary medicines and materials, determination of responsible persons by the staff of the hospital for monitoring the expiration dates and in case of expiration of the same to make replacement and recharging.

4.6.2 Staff actions:

1. Training of the staff annually for correct actions in case of flood risk. Documenting the trainings and monitoring the deadlines.

2. Establishment of a system for continuous control and assessment of staff absences.

3. Preparation of a plan for evacuation of the building. The plan is presented and approved by the management of the medical institution and supplemented in case of omissions.

4.6.3 Actions for patients on evacuation from another hospital:

1. Daily counting of patients in serious condition and with special needs during evacuation (mentally ill, difficult to move).

2. Determining the number of patients requiring continuous care (attendant or medical person).

3. Determining the number of patients requiring life-saving equipment (Must be evacuated by ambulance or helicopter).

5.6.4 Daily determination of the free bed stock for accommodation of patients evacuated from other hospitals in a flooded area.

1. Determination of free beds.

2. Identification of patients in mild and moderate condition who can be signed out.

3. Determining opportunities for opening new beds.

4. Determining the possibilities for changing the purpose of internal compartments to infectious if necessary.

Recommendations:

Targeted actions are needed by all institutions, companies, enterprises, society in identifying problems, eliminating the risks of floods.

More knowledge and skills are needed for proper behavior and flood risk management in practice.

To the General Directorate "Fire Safety and Protection of the Population":

1. To update the methods, means and information for improving the preventive preparation of the society from the Danube region in case of flood.

2. To periodically acquaint the public in the respective region with the rules for proper behavior in case of floods.

3. To provide timely methodological and practical assistance in floodplains and outside floodplains of disaster.

4. To develop thematic courses and training sessions for training of all age groups in flood protection.

To the mayors of Pleven municipality and Svishtov municipality:

1. Communication between municipalities, the population and the private sector needs to be improved before, during and after floods.

2. Annually to clean the riverbeds and to observe all the provisions concerning the condition of the same.

To the employers from the municipalities of Pleven and Svishtov:

1. To create good practices in the training of all workers and employees in protection and proper behavior in case of flood or other disaster situation.

To the Media:

1. To raise awareness of the Disaster Protection Plan, part "Floods" among the entire population and especially young people.

2. To ensure timely disposal of waste and availability of sufficient quantities of clean drinking water to avoid risks of diseases and epidemics related to floods.

3. To increase their activity and participation in the awareness and training of the population in the municipalities for proper behavior and protection in case of floods.

To the Ministry of Education and Science:

1. Development and approval of mandatory training programs for all students of the Higher Schools for proper behavior and protection in case of floods and other disasters.

To the Ministry of Health and Regional Health Inspectorates Pleven and Veliko Tarnovo:

1. To synchronize the activity between the Ministry of Health and RHI in case of floods, according to the preparedness of the society and the rescue teams for dealing with floods, according to the risk in the different settlements of the Danube region.

2. To organize and conduct systematically and annually events and trainings of employees from all levels of the medical establishments, including all age groups of the population in order to reduce the risk factors in case of floods.

3. To raise public awareness in the Danube region about measures and ways to behave properly before, during and after floods.

To the Bulgarian Red Cross:

1. To carry out synchronization between the Bulgarian Red Cross and all institutions directly involved in the risk of floods and all rescue measures before, during and after floods.

To the Pleven Basin Directorate:

1. To raise awareness of the Flood Risk Assessment Plan (FRAP), the Flood Risk Management Plan (FRMP) and the Disaster Protection Plan - part of "Floods" among the whole society and mainly young people.

2. To carry out purposeful group work among the young and mature age groups on the risk of drowning in periods with and without flooding in the rivers Danube, Iskar, Vit.

V. General conclusions:

1. The Danube region covers a large part of Northern Bulgaria (42.5%), is part of the international basin of the Danube, the population density is significant - 44% of the total population.

2. The main risk of floods in the Danube region is natural. The areas with significant potential flood risk represent 49% of all settlements and municipalities.

3. According to the preliminary assessment of the risk of floods from all functioning water bodies (rivers, lakes) 43.13% are in a state of serious risk.

4. The Floods Directive has had a positive impact on the entire Danube region and has led to progress in flood risk assessments.

5. The five-step approach in the process of flood assessment and management is followed by the two surveyed municipalities of Pleven and Svishtov. In both municipalities there are developed and currently available - preliminary flood risk assessment, areas with potentially significant risk, maps of areas at risk, maps of areas at risk of floods and a flood risk management plan.

6. For the whole Danube region a Plan for management of the river basins has been adopted and zones for their protection have been created.

7. The problems that arose during the floods in the Republic of Bulgaria in 2005 lead to 146 changes in our legislation to improve flood protection activities. The improvement process is applied in the two surveyed municipalities and will continue to be applied.

8. A survey on public awareness of the causes of floods shows good awareness (65% correct answers in the mature group and 44% correct answers in the young group).

9. The acquired knowledge and skills for protection in case of flood are insufficient.

10. A good organization of medical care in case of flooding has been established in the two municipalities of Pleven and Svishtov.

11. Hygienic and anti-epidemic measures are properly carried out by RHI - Pleven and Svishtov and they do not allow the emergence of an epidemic situation in case of potential flooding.

12. The two age groups from 18-39 years. (81%) and 40-64 years. (66%) expressed a high percentage of desire in the survey to gain more knowledge about protection and proper behavior in the event of a flood or other disaster.

13. A high percentage of respondents (70%) have an attitude of the need to increase awareness, knowledge and skills for flood protection.

14. To improve their theoretical and practical training, over 50% of the respondents are ready to participate in groups at school, college, university.

VI. Contributions to the dissertation

1. Scientific-theoretical:

1.1. The dangers of major floods for the Danube regions have been studied and the potential risk has been assessed.

1.2. All possible health consequences and environmental hazards for the society have been thoroughly analyzed. The main measures and means for flood protection are presented.

1.3. Two schemes have been proposed: for early warning and notification of the danger of floods in hospitals and a basic organizational scheme for the initial distribution of the affected population for evacuation and treatment in hospitals.

1.4. Presented for implementation are the main preventive measures in the activity of the medical - prophylactic establishments in order to reduce the negative effects and to limit the occurrence of epidemics during and after floods.

1.5. Sociological surveys of awareness and readiness for flood protection have been conducted for two age groups 18 years. -39 years and 40-64 years of Bulgarian citizens from the Danube regions and the obtained results are compared.

2. Scientific - applied:

2.1. Protocols have been developed for the preparation of Medical Establishments (hospitals) in the areas and outside the flood zones.

2.2. The actions and responsibilities of the management, medical staff, transport and patients at risk in the area and outside the flood area are defined.

2.3. Two types of leaflets with recommendations for the development of plans for protection of personnel from sites and companies in case of floods have been developed and distributed.

2.4. The medical establishments (hospitals) from the Danube region are systematized in flooded and non-flooded zones for the rivers Danube, Iskar, Zlatna Panega, Beli Vit, Gostilya and Lomya.

2.5. Insufficient awareness, low self-esteem for knowledge and skills regarding proper behavior and protection against floods in sociological surveys among 240 Bulgarian citizens from two age groups 18-39 years and 40-64 years of the Danube regions have been proven and analyzed.

2.6. Proposals have been developed for:

General Directorate "Fire Safety and Protection of the Population" - to periodically acquaint the public in the region with the rules for proper behavior in floods and to develop thematic courses and training sessions for all age groups in flood protection.

The mayors of the two municipalities of Pleven and Svishtov – have to improve the communication between municipalities, population and private sector before, during and after floods and to organize and conduct annual cleaning of the riverbeds.

Employers from both municipalities - to create good practices in the training of all workers and employees in protection and proper behavior in emergencies and floods.

Media - to raise the general awareness of the public about the disaster protection plan, part "Flood", to increase their activity and participation in the awareness and training of the population in both municipalities for proper behavior and protection.

MES - development and approval of mandatory training programs for all students of higher education for proper behavior and protection in case of floods and other disasters.

Bulgarian Red Cross - to carry out synchronization between the Bulgarian Red Cross and all institutions involved in the rescue operations.

Pleven Basin Directorate - to carry out targeted group work among young and mature age groups on the risk of drowning in periods with and without flooding in the Danube, Iskar and Vit rivers.

Targeted actions are needed by all functioning institutions, companies, enterprises, media and society to properly identify and eliminate the risks of natural disasters, including floods. Through hard work and systematic actions by all can be formed and built the right behavior for action and protection in disasters or floods.

VII. Publications and participations in scientific forums in connection with the dissertation.

1. **Vasileva R**, Georgiev A, Romanova Hr. Floods - a leading disaster for Bulgaria. Varna Medical Forum 2019, 8 (2): 150-155.
2. Romanova Hr, Radeva N, **Vasileva R**. Study of awareness and preparedness for floods of foreign citizens temporarily residing in Varna - part one. Varna Medical Forum 2019, 8 (2): 156-160.
3. Romanova Hr, Radeva N, **Vasileva R**. Study of the awareness and readiness for floods of foreign citizens temporarily residing in Varna – part two. Varna Medical Forum 2019, 8 (2): 161-165