PUBLIC HEALTH

EVALUATION AND RELATION OF DETERMINANTS OF RISK PERCEPTION IN THE RESIDENT POPULATION LIVING NEAR INDUSTRIALLY CONTAMINATED SITES

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Abstract

The association between industrial pollution and human health is of high importance for public health. Living near industrially contaminated sites (ICSs) and being exposed to increasing concentrations of environmental pollutants along with disadvantaged social and economic conditions result in an increased occurrence of diseases. There are 16 identified industrially contaminated sites in the Republic of North Macedonia, and of all of them, chemical industry AD OHIS - Skopje and lindane dump located near the plant, according to almost all categorizations, has been evaluated to pose the highest level of ecological and health risk, although there has been no recent evidence about these issues. The main aim of this study was to obtain general information about risk perception of resident population living around and near AD OHIS in the Skopje region. Methods: A standardized and modified questionnaire was sent to the participants in an electronic form by e-mail and was published on social networks and municipalities' web sites. The responses to the questionnaire were given anonymously and voluntarily. The results were analyzed using descriptive statistical methods with calculating central tendency parameters and analytical statistical methods with correlation and Pearson $\chi 2$ test and independent sample test. Results: During the observation period, 220 people responded to the survey, with female respondents being predominant (70%). Analysis showed that there was no significant difference between genders regarding risk perception. According to Likert scale, with 95% CI, among anthropogenic sources, respondents stated they were extremely worried about air pollution and very worried or worried about water pollution, noise, waste and dangerous industry. The diseases that trigger a response of greater concern were those related to allergies, respiratory diseases and cancer. Age, education and information related to ecological risks significantly influenced on judgement of the environmental conditions in the living area of resident population ($p<0.05$). Conclusions:Investigation results showed that resident population in the exposed Skopje region has a high level of perception and is susceptible to ecological risks by anthropogenic and natural influence. There is a direct relationship between exposure and environmental health impact. Also, socioeconomic characteristics (gender, age, education) and cognitive factors have influence on risk perception level.

ЈАВНО ЗДРАВЈЕ

ЕВАЛУАЦИЈА НА ФАКТОРИТЕ И НИВНАТА ПОВРЗАНОСТ ПРИ ПЕРЦЕПЦИЈА НА РИЗИКОТ КАЈ РЕЗИДЕНТНОТО НАСЕЛЕНИЕ ВО ОКОЛИНАТА НА ИНДУСТРИСКИ КОНТАМИНИРАНИ ТОЧКИ

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Извадок

Врската помеѓу загадувањето кое потекнува од индустријата и човековото здравје е од високо значење за јавното здравје. Животот во непосредна близина на индустриски контаминираните точки (ИКТ) и експонираноста на високи концентрации на еколошки полутанти, придружени со нарушени социјални и економски услови, резултира со зголемена појава на заболувања. Од вкупно 16 идентификувани контаминирани точки во Република Северна Македонија, хемиската индустрија во АД ОХИС - Скопје и депонијата со линдан која се наоѓа во непосредна близина, безмалку во сите категоризации правени досега е оценета со највисок еколошки но и јавноздравствен ризик иако никогаш не е правено опсежно истражување на тие аспекти.Главната цел на ова истражување беше да се добијат основни податоци за перцепцијата на ризик на резидентното население кое живее во околината или непосредна близина на ИКТ АД Скопје во скопскиот регион. Методи.Истражувањето беше спроведено со доставување на стандардизиран модифициран прашалник во електронска форма преку електронска пошта и објавен на социјалните мрежи и интернет страницата на скопските општини. Пополнувањето беше анонимно и доброволно.За анализа на резултатите беа користени дескриптивни статистички методи со одредување мерки на централна тенденција и аналитички статистички методи со корелација и Pearson $\chi 2$ (хи-квадрат тест) и t-тест за независни примероци и анализа на варијанса. Резултати.Вкупно 220 испитаници доброволно го пополнија прашалникот, од кои поголемиот дел (70%) беа испитаници од женски пол, меѓутоа анализата покажа дека нема сигнификантна разлика меѓу половите во однос на перцепција на ризикот. Според Likert-овата скала, со 95% CI од антропогените извори како најголем ризик со екстремна изложеност испитаниците го чувствуваат загадувањето на воздухот,а со значително до умерено загадувањето на водата, бучавата, отпадот и опасната индустрија.Како три најчести патолошки состојби кои може да се појават при изложеност на контаминирана средина ги сметаат алергиите, респираторните заболувања и канцерот. Возраста, степенот на образование и информираноста за еколошките ризици сигнификантно влијае ат на мислењето поврзано со условите на животната средина во која живее резидентното население ($p<0,05$). Заклучок.Резултатите покажаа дека резидентното население во експонираниот скопски регион има високо ниво на перцепција и е чувствително на влијанието на еколошките ризици од антропоген и природен карактер и смета дека постои директна поврзаност помеѓу експозицијата и влијанието на еколошката средина врз здравствената состојба. Исто така, може да се заклучи дека социоекономските карактеристики (пол, возраст, степен на образование) и когнитивните фактори имаат влијание врз нивото на перцепција на ризиците.

Introduction

The association between industrial pollution and human health is of high importance for public health. Living near Industrially Contaminated Sites (ICSs) and being exposed to increasing concentrations of environmental pollutants along with disadvantaged social and economic conditions result in an increased occurrence of diseases during both childhood and adulthood[1-3]. There are many identified ICSs in Europe, and in the Republic of North Macedonia 16 contaminated sites have been identified within National Plan and feasibility studies financed by EC[4].

In the past, industrially contaminated sites in North Macedonia have been investigated several times. Inappropriate treatment and waste handling (industrial and household waste) are considered as main sources of contamination. Stafilov has investigated dispersion of heavy metals in different regions of Macedonia[5-6]. According to these data, dispersion of waste substances, partially or in majority is done through the air that results in contamination of soil, surface and underground water, and by resuspension in dry soil is returning in the air again. This environmental pollution has impact on human population also, with serious health risks. Out of a total of 16 contaminated sites in North Macedonia, from health and ecological point, three are classified as the most dangerous[7]. Chemical industry AD OHIS –Skopje, according to almost all categorizations, has been evaluated with the highest level of ecological and health risk, although there has been no recent evidence about these issues. This company is no longer active, but there is lindane dump near the company (which is left there for more than 30 years), chlor-alkali dump and HCH dump (also left) as an extremely toxic organic compound. There is a treat that hazardous compounds from this locality could be dispersed in all near or wider environmental media, but the risk is much higher if we take into consideration that this factory is located in the middle of a populated area of the city of Skopje[8].

The European Environment Agency[9] has also confirmed that air pollution, noise, bad smells, and traffic have a severe impact on a population's health, and that human activities (mainly in the sectors of industry, energy, and transport) produce relevant environmental pressures[10-11].

Although environmental problems caused by industrial activities in the area have been subject of attention by governments and the industrial sector, many interested parties are still concerned and believe that the risks associated with industrial activities still exist. One of the critical issues is failed risk communication among residents, governments, and the industrial sector. This failure has impacted the decision-making process which cannot be carried out if there is no agreement among all parties involved. Governments mostly make decisions regarding the development of industrial activities based on experts' scientifically estimated risks; however, local residents'risk judgments are not well understood or considered. As a result, industries have been grow-

ing despite public objections. Thus, the differences in risk judgments among residents, governments, and the industrial sector are a major cause of the problems in risk communication[12].

The causes determining residents's risk judgments and perceptions need to be thoroughly studied in order to create effective risk communication between governments and the public[13]. Comprehending resident's fundamental understanding of risk-related judgment can help risk communicators achieve the following: effectively establish communication efforts, properly select pieces of information and their formats and foster information sharing among relevant parties. Risk perception is filtered differently by people according to their attitudes and moral values. Crawford-Brown[14] noted that residents' perceived risks might depend on the evidence they possess regarding the frequency, severity, and variability of effects. Resident's risk judgments also involve judgments of probability, severity of catastrophic consequences[15], and perceived control.

Currently, a range of previous, relevant researches has mostly explained risk perception based on the assumption that residential people have limited scientific knowledge and capability to cope with the risks they face; thus, their perceptions are significantly influenced by a wide spectrum of social and psychological factors such as fear, familiarity with the risk, ability to control the risk. For example, Slovic[16] in his book mentioned that Americans' perceptions of the dangers of nuclear waste storage were significantly affected by psychological factors such as fear, distrust, and uncertainty. However, at present, the enhanced quality in people's education, an increase in public environmental awareness, the strength of residents' social networks with other organizations, and various public media, people's easier access to risk-related information, possibly increase resident's capabilities to assess the risks they face. Psychological factors might therefore be less influential. On the other side, resident's risk perceptions might be processed based on their analytical way of thinking. Factors related to the nature of risks such as perceived probability of occurrence and severity of facing risks might be more powerful in predicting resident's perceived risks[17, 18].

Risk perception is a judgment of the adverse consequences of a particular hazard and can be made by an individual, a group of people, or society[19]. The term "risk perception" generally refers to natural hazards and threats to the environment or health and can be formed based on both belief and self-appraisal[20]. Until now, four approaches have been used to study how risks are perceived.The first approach is the sociocultural model, whereas the risk perception is constructed from beliefs influenced by social forces in society[21]. The second approach is the psychometric paradigm (basic model) which describes how risk perception is influenced by physical properties of the risk, psychological and cognitive factors[22,23]. The third approach is the interdisciplinary paradigm that applies several concepts to explain risk perception. The most distinct concept is

Kasperson'smodel which amplifies psychological, social, institutional, and cultural processes[24]. The last approach is the axiomatic measurement paradigm that focuses on how average people subjectively transform objective risk information. It is believed that risk perception is influenced by possible catastrophic consequences (fatal outcomes, mortality rates, etc.) and likelihood of occurrence[25].

Risk perception can be processed based on a rational system or an experimental system. The experimental evaluation includes psychological and cognitive factors. The studies showed that controllability and previous experience with the occurrence are factors that have significant influence on risk perception. Paolo et al.[26] in their study demonstrated that people smelling unfamiliar odors may exhibit a high-risk perception due to their concerns about respiratory diseases such as asthma and lung cancer. Gregory and Mendelsohn[27] stated that individual risk assessment was included in the person's perceived benefits (positive and negative). The family concern is a very important factor which shouldn't be neglected and has high influence on perceived risk perception[28].

Given the complex relationship that exists among perception, behavior, and socioeconomic characteristics of local populations, discussions in the field of risk perception and communication are increasing and are subject of interest of many scientific debates.

The principal aim of this study was to obtain general information related to risk perception of residents living around and near industrially contaminated site AD OHIS in the Skopje region. To achieve this aim, the following sub-aims were set: to obtain information of risk perception related to healthy condition of resident population; to obtain information about level and confidence of available information regarding environmental risks; to determine the relation between risk perception factors, age, and education of resident population and impact of cognitive factors.

Materials and methods

Study design

This was a cross-sectional study which was conducted in the period of December 2021-January 2022.

Sample included in the study

In this study, a total of 220 respondents were involved, all of them living in the city of Skopje, from several municipalities, taking into the consideration that industrially contaminated site AD OHIS plant is located in Skopje. This ICS, in almost all categorizations has been evaluated with the highest level of ecological and health risk with a high emotional impact on the resident population. The sampling method was chosen to provide comprehensive data about the population surveyed.

Survey tool

The main tool of the survey was the questionnaire. To achieve the aim of the survey, the modified standardised questionnaire for multi-

purpose investigation of the population living near high-risk ICS[29], was developed. The questionnaire was composed of four sections, which aimed to investigate: a) the characteristics of individuals; b)risk perception; c) availability of ecological information; and d) home conditions and healthy status. The form of the questionnaire was structured to obtain answers to the questions with a purpose to present variables. The questionnaire contains closed questions, for which respondents should answer the questions according to Likert scale[30], grading with scores from 1 to 4, where score 1 indicates "extremely exposed/ most probably", and score 4 indicates "not at all/ impossible". The other questions are open, for which quantitative and qualitative information was required, as well as partially closed questions where an alternative answer "other" could be chosen. The factors, variables and types of the

Table 1. Description of factors, variables and content of questionnaire

Fact Factors	Variables	Questionss
Risk perception	Exposure level to natural and anthropogenic ecological risks	To which level do you feel you are exposed to floods, noise, dangerous materials transport, hazardous waste, air pollution, extreme weather conditions, fires, water pollution, hazardous industry, earthquakes?
	Perception of environmental condition	How do you estimate the environmental condition in your living area?
	Healthy issues	To which level do you consider that it is possible for someone who lives near contaminated site to have: allergies, temporary/ permanent respiratory damage, temporary/ permanent damage of different organs, liver damage, cancer, leukemia, congenital malformations in infants delivered by parents being exposed to pollution?
Level of knowledge	Knowledge regarding information related to ecological risks	How much are you satisfied with the information about ecological risks in your living area?
	Media/ source of information	Which media/ source do you prefer and usually use to receive more information? Which kind of media would you like to inform you about particular risks? Which source/media do you believe the most regarding information about the risks that you are exposed to?

Physiological and cognitive factors	Satisfaction regarding living conditions	Would you like to leave the present living place?
	Health condition	In the past year, did you receive medications for treatment of some disease related to the respiratory system (not related to COVID-19)? At this moment are you receiving medications for treatment of heart and vascular diseases?

questions used are given in Table 1.

A large set of the questionnaire included items related to biological data, sociodemographic information, and state of health (sex, age, place of birth, level of education, self-perceived health status).Some of this information was used in the analyses of risk perception.The questionnaire was sent by e-mail and was published on the official web sites of municipalities in the city of Skopje. The completion of the questionnaire was anonymous and voluntarily.

Statistical analysis

Descriptive statistical methods

The structure of statistical series with attributive characteristics was calculated by determining relationship coefficients, proportions and rates. The structure of statistical series with numerical characteristics was calculatedby determining measures of central tendency (mean values – arithmetical mean) and dispersion measures (standard deviation). A p-value less than 0.05 was considered statistically significant, 95% confidence interval (CI) was calculated.

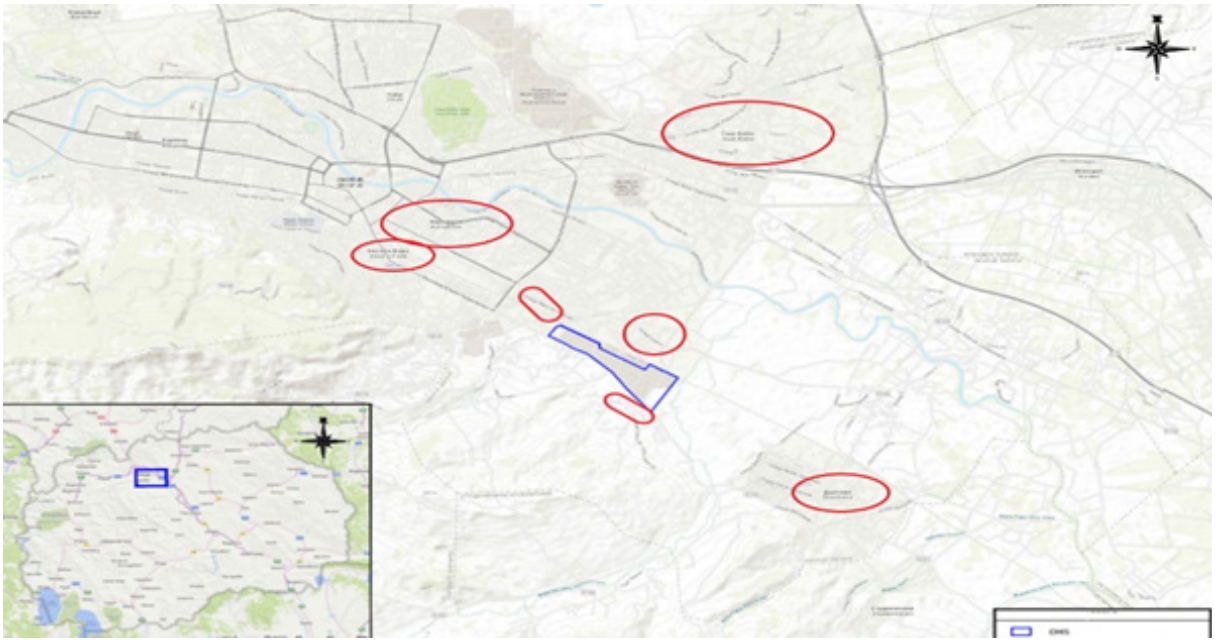
Analytical statistical methods

Significance in differences between distribution of responses of risk perception were tested applying correlation and Pearson $\chi 2$ (chi-square test).The differences between gender responses were tested applying Independent Sample Test (t-test) and analyses of variance. The results are presented using tables and figures.

Results

Of a total of 220 respondents, more than a half, about 70% (n=154) were female and the other 30% (n=66) were male respondents who voluntarily answered the questions. The average age of respondents was 40 years, where the youngest was 23 years old and the oldest 70 years. As regards the education, the majority of respondents had a high-school diploma. Distribution of living places in the city of Skopje showed that half of the respondents who voluntarily completed the questionnaire were living in settlements near OHIS plant, as presented in Picture 1.

Picture 1. Distribution of respondents living in settlements near OHIS Plant



Source: The picture was created by the author. Note: The blue color represents borders of OHIS Plant, with the red color are marked settlements around the plant: Drachevo, Pintija, Lisiche, Gorno Lisiche, Aerodrom, KiselaVoda, Gazi Baba

Analysis of the questions and received answers for risk perception (Table 2) showed that residents, from anthropogenic sources (given in scale from 1 "extremely exposed" to 4 "not at all") perceived air pollution as the highest risk with extreme exposure level (*m=1.47*), followed by water pollution (*m=2.58*) and noise (*m=2.51*) which were perceived as great to moderate risks, hazardous industry (*m=2.73*) and hazardous waste (*m=2.95*) as a moderate risk, and as a minimum risk, they felt exposure to dangerous materials transport (*m=3.11*). Regarding the natural disasters, residents perceived extreme weather conditions (*m=2.39*), earthquakes and fires (*m=2.5* to *2.7*) be the highest risks, and floods were perceived as minimal risk with great to moderate exposure level (*m=3.25*).

Table 2. Risk perception- exposure

To which level do you feel you are exposed to the following risks?	*Lowest*	*Highest*	*Arithmetical Mean (m)*	*Standard Deviation (SD)*
Floods	1	4	3.25	0.764
Noise	1	4	2.51	0.894
Dangerous materials transport	1	4	3.11	0.85
Hazardous waste (chemical, radioactive)	1	4	2.95	0.99
Air pollution	1	4	1.47	0.658

Extreme weather conditions (hot waves, overflows)	1	4	2.39	0.937
Fires	1	4	2.74	0.813
Water pollution (underground, surface)	1	4	2.58	0.945
Hazardous industry	1	4	2.73	1.055
Earthquakes	1	4	2.5	0.852

As regards to the perception of environmental impact on health status, majority of respondents considered that bad conditions for living near contaminated site were the reason for occurrence of various pathological health conditions. In scale from 1 "most probable" to 4 "impossible", respondents answered that a very probable option for someone who lives near contaminated site is to develop some type of allergy (m=1.74), temporary and permanent respiratory damage (*m=1.72*, *m=1.98*), temporary and permanent damage to various tissues (*m=1.95*, *m=2.13*), liver disease (*m=2.23*), cancer (*m=1.83*), leukemia (*m=2.12*), congenital malformations in children delivered by parents living near contaminated site (*m=2.01*). The results are given in Table 3.

Table 3. Risk perception- Probability of diseases onset

To which level do you consider that it is possible for someone who lives near contaminated site to develop:	*Lowest*	*Highest*	*Arithmetical Mean (m)*	*Standard Deviation (SD)*
Allergies	1	3	1.74	0.622
Temporary respiratory damage	1	3	1.72	0.609
Permanent respiratory damage	1	4	1.98	0.694
Temporary damage of various-tissues	1	4	1.95	0.647
Permanent damage to various tissues	1	4	2.13	0.747
Liver disease	1	4	2.22	0.772
Cancer	1	4	1.83	0.674
Leukemia	1	4	2.12	0.825
Congenital malformations in infants delivered by parents being exposed to pollution	1	4	2.01	0.796

Analysis given in Table 4 shows a positive correlation between age, education, and perception regarding environment. Older respondents and respondents with higher level of education perceived that environmental conditions in their living area are more serious (r<.275, p<0.01, r<.170, p<0.05, respectively).

Table 4. Impact of level of knowledge regarding awareness and cognitive factors on risk perception

		Age	*Education*	How do you estimate the environmental conditions in your living area?	How much are you satisfied with the information about ecological risks in your living area?	Would you like to leave the present place of living?
Age	Pearson Correlation	1	.306**	.275**	0.038	0.1
	Sig. (2-tailed)		0	0	0.574	0.142
Education	Pearson correlation	.306**	1	.170*	.139*	.146*
	Sig. (2-tailed)	0		0.012	0.041	0.032
How do you estimate the environmental conditions in your living area?	Pearson correlation	.275**	.170*	1	.274**	-.253**
	Sig. (2-tailed)	0	0,012		0	0
How much are you satisfied with the information about ecological risks in your living area?	Pearson Correlation	0.038	.139*	.274**	1	-.221**
	Sig. (2-tailed)	0.574	0.041	0		0,001
Would you like to leave the present place of living?	Pearson Correlation	0.1	.146*	-.253**	-.221**	1
	Sig. (2-tailed)	0.142	0.032	0	0.001	

Note: **p<0.01, *p<0.05

A positive correlation was considered between awareness of environmental risks and perception for environmental conditions. Respondents who were more aware of environmental risks evaluated environmental conditions to be poor ($r<.274$, $p<0.01$). For the other variables, a negative correlation was found between estimation of environmental conditions and willingness to leave the place of living ($r<-.253$, $p<0.01$), perception of having poor environmental conditions increased the wish to leave the current living place. Respondents who wanted to leave the current living place very much showed greater awareness of environmental risks ($r<-.221$, $p<0.01$).

As regards the gender, for these three issues, evaluation by independent sample test (t-test), given in Table 5, showed that there was no significant difference between female and male respondents ($p>0.05$).

Table 5. Summary difference between genders regarding perception of environmental condition

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
How much are you satisfied regarding information of ecological risks in your living area?	Equal variances assumed	2.437	.120	.276	215	.783	.024	.086	-.146	.193
	Equal variances not assumed			.257	106.409	.798	.024	.092	-.159	.206
How do you estimate the environmental condition in your living area?	Equal variances assumed	.108	.743	.392	215	.696	.039	.098	-.155	.232
	Equal variances not assumed			.384	118.104	.702	.039	.100	-.160	.237
Would you like to leave the present living place?	Equal variances assumed	4.861	.029	-.683	215	.495	-.071	.104	-.276	.134
	Equal variances not assumed			-.650	110.885	.517	-.071	.109	-.288	.146

Data regarding preferred media for providing information related to risks (Figure 1), showed that the highest percentage of respondents preferred electronic communication via internet networks (90%) and national TV (70%).

Figure 1. Information sources

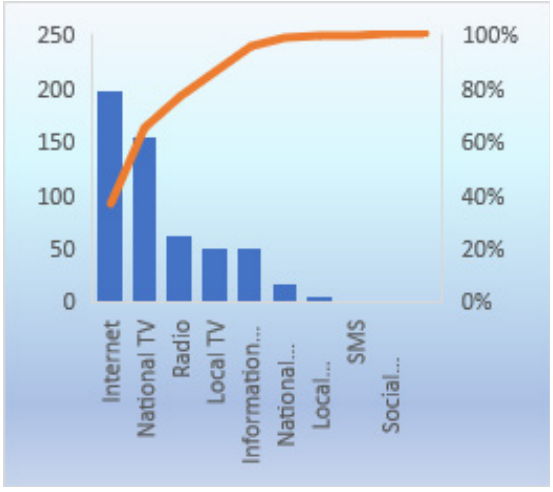
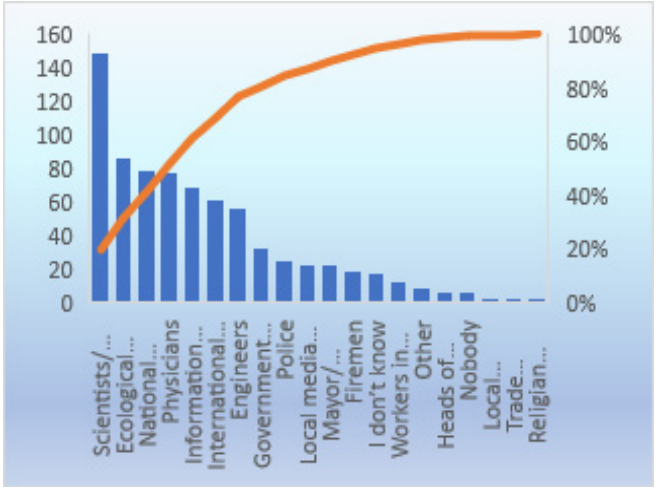


Figure 2. Level of confidence in information sources



The distribution of respondents' results as regards to confidence level in information sources related to environmental risks is given in Figure 2. However, it can be concluded that the largest percentage of respondents believed the scientists (approximately 68%), followed by ecological societies (39%) and physicians (35%).

Discussion

In this study we evaluated the perception of environmental risks by resident population living in the Skopje region, in the area where one of the 16 identified environmental hot spots in North Macedonia is located and has a high emotional impact and presents a huge health concern.

During the observation period, 220 people responded voluntarily to the survey, with female respondents being predominant. As it is known, the female population is more sensitive than the male to environmental issues and similar results with females more frequently responding is reported in other studies[31]. According to Flynn *et al.*[32], gender has a powerful impact on risk perception and in majority of studies, females are respondents who overestimate the risk. Nevertheless, there are studies[33] that reported opposite results or results with no differences in responses between genders, which is in agreement with our study.

As far as self-selected sample's general information is concerned, the respondents were aged between 23 and 70 years old, with an average age of 40 years. Although the survey was distributed in a way favored by people more inclined towards the use of IT tools, our respondents were represented by all age groups.

Another note worthy result was the correlation between education qualifications and perception of environmental risks. This has also been presented in other surveys such as those of Carducci *et al.* and Ozdemir *et al.*[34, 35]. Their respondents with a higher level of education perceived environmental risks to be high.

The correlation between respondents' concern regarding environmental impact and respondents' risk perception of health condition was also clearly seen in our study. The results of respondents' perception confirmed that there was a cause-related link between respondents' judgment of environmental conditions and health status. Most of the respondents in our study estimated environmental conditions in the living area to be severe and more concern was registered among older respondents. According to the literature data, there is no doubt that population exposed to contaminated environment has higher risk perception regarding development of diseases. In our study, diseases that triggered a response of greater concern were those related to allergies, respiratory problems and cancer. The concern about congenital defects was also high, although these pathological conditions were much rarer than other diseases. These points out toward one of the major problems of risk perception: the relationship between the sources of anxiety for the community and the actual existence of a health risk, couldn't always be clearly described.

Furthermore, the literature indicates limited evidence of increased risk for certain types of cancer[36] and for congenital defects as a whole[37]. These studies, however, mainly refer to old plants and have several methodological weaknesses which restrict the validity of the results (exposure assessment is often poor, the analysis is based on ecological level, reference to few individuals). Other studies indicated the effects of air pollution on respiratory diseases[38]. To summarize, the order of magnitude of the risk perception described in the literature could differ from what people perceive.

In the present study, respondents perceived polluted air, waste and hazardous industry as a three major risk factors for environmental exposure. This is similar to the results of a survey conducted by Bena et al.[39] who investigated the perception of local population living near the incineration plant for solid waste in Turin, Italy. In this study, anthropogenic hazards generated more concern than natural hazards. In other studies[40] it has also been found that people in Italy feel more vulnerable to anthropogenic than natural risk. Public acceptance of anthropogenic risk is influenced by trust and local experience. Furthermore, it is conditioned and constantly revised by information from multiple sources, including the media, and by the influence of peers and others so that communication plans must have reliable tools to support such elements. In many studies, including the previous mentioned survey by Bena *et al*.[39], there is an inverse proportion between greater risk perception and greater distance from the pollution source. This was not the case in the study of Cavazza *et al*.[41], who found no relationship between residence near the incineration plant that had been operational for more than 30 years, and citizens' attitudes towards it. This is very similar to the judgements of respondents in our survey where we found that perception was identical and irrespective of the distance of contaminated source, lindane dump, active for more than 30 years. The other finding in our study was the significant correlation between judgement of environmental conditions and level of education. This result corresponds with literature data which confirm that perception level, education, degree of involvement, cognitive factors and uncertainty are important factors which influence on local community judgment regarding potential source of environmental risk. As it has been described in the study of Janmaimol and Watanbe[42], respondents in high-risk communities judged risks based on their perceived probability of environmental contamination. Respondents in moderate-risk communities assessed risks by considering the probability of being impacted by the contamination, as well as the potential adverse impacts they might face; the perceptions of residents in low-risk communities were not processed based on the rational system but were created on the basis of their beliefs, which were affected by previous experiences.

In regard to the availability of information related to environmental risks, respondents expressed more trust in scientists and experts than in physicians, but nevertheless that is the time changing process. A high percentage of respondents

had more confidence in ecological societies, and this might have been expected given that in the period of conducting the survey there was an ongoing campaign for remediation of one of three lindane dump. A very low percentage of trust in the local institutions (only 10%) is a worrisome problem, and it must be emphasized in order to initiate actions for increasing public trust. The lack of trust could have a positive effect since it can stimulate critical thinking, which would result with more careful analysis of the problems and possible solutions.

Conclusions

In the present study we evaluated the determinants of environmental risk perception perceived by voluntary participants in the survey who are living near the ICS OHIS plant Skopje and surrounding settlements in the Skopje region. The results found that resident population has a high level of perception and vulnerability to anthropogenic and natural environmental risks and perceived direct correlation between exposure and environmental impact on health status (CI of 95%, $p<0.05$). The older population and population with a higher education perceived that environmental conditions in their living area are more serious ($r<.275$, $p<0.01$, $r<.170$, $p<0.05$, respectively), and it can be concluded that socio-economic characteristics (gender, age, education level) have impact on risk perception. On the other side, we determined a significant correlation between cognitive factors and perception levels. The availability and trust in information sources, the wish for leaving the present place of living have had an impact on respondents' estimation of environmental conditions, which resulted in a negative significant correlation ($p<0.05$).

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