# CAUSES OF ACCIDENTS IN THE MOUNTAINS - ANALYSIS OF THE ACTIVITY OF THE BIESZCZADY GROUP OF THE MOUNTAIN RESCUE SERVICE (GOPR)

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**Abstract:**
The aim of this study was to determine the influence of various factors on the reasons of accidents in the Bieszczady Mountains and part of the Lower Beskids. The analysis has been made on the basis of accident reports of the Bieszczady Group of the Mountain Rescue Service (GOPR) of 2009. Those reports were analyzed and they showed that there are many statistically important relations between categories like seasons, age and kind of touristic activity. The aforementioned accident reports include following information: sex and age of an injured person as well as the place of an accident, its place and weather conditions. There is also data concerning medical help that was provided, symptoms and medical research.

The result of the changes in the character of mountaineering, which took place at the turn of the 19th and the 20th century, was an increase in the number of accidents. In the Tatra Mountains, tourists more frequently decided to go on more difficult trips without guides, which was the reason for the establishment of the Tatra Mountain Rescue Service in 1909. Half a century later, mountain rescue workers also appeared in the Bieszczady Mountains.

Development of tourism in the Bieszczady Mountains after the 2nd World War was hindered by many factors. Fighting with the Ukrainian Insurgent Army continued, and when it finally stopped, war damage, lack of infrastructure (including tourist facilities), bad condition of roads and related problems in transport were particularly inconvenient for tourists. Furthermore, large part of the region, including Ustrzyki Dolne and the villages of Czarna, Lutowiska and Ustrzyki Górne, belonged to the Soviet Union until the border adjustment of 1951. Additionally, until the mid-1950s, there were serious restrictions for persons who were not residents of the borderland[1].

The first tourists to explore the Bieszczady Mountains were students. Conditions which were unfavourable for development of mass tourism, were advantageous for mountaineers. Pioneer conditions, difficulties in getting supplies, freedom to choose any route and place to sleep, even if it required cutting through the shrubbery, determined the attractiveness of such excursions and camps.

Mass tourism appeared in the Bieszczady Mountains in the 1960s. Blazing the red trail in 1954 and construction of the Large Bieszczady Ring Road in 1962 are examples of activities that provided easy access to the most distant areas and highest peaks, including Połonina Wetlińska, Połonina Caryńska, Wielka Rawka, Mała Rawka and Tarnica.

Further increase in popularity of the Bieszczady Mountains was the result of the construction of the Solina Dam in 1967 and creation of the artificial lake of Solina. In the following years it has been surrounded by numerous resorts, where tourists could start long

[1] J. B. Lipszyc, *Z dziejów turystyki w Bieszczadach.* W: Bieszczady. Przewodnik. Wyd. Rewasz, Pruszków, 2004, s. 140

bus trips to the high ranges of the Bieszczady Mountains, which became more accessible as the road network developed. The region became very popular, thanks to its undoubted beauty, natural diversity and the specific "western-movie" character.

In order to provide protection of the natural resources, the Bieszczady National Park was founded in 1973[2]. The Bieszczady Mountains became a destination for tourists who were not prepared for mountaineering – they considered these mountains easy to climb, undemanding in terms of equipment and physical condition. Perceiving the mountains this way resulted in the increase in the number of accidents. Volunteers rescue workers of the Mountain Rescue Service (GOPR) first appeared in the region in 1957. They were members of the Tatra Group, who came to guarantee safety during the cross-country skiing tournament. The task to guarantee tourists safety in specific local conditions was assigned to the Bieszczady Group of GOPR, formed in September 1961. First rescue workers were trained by the instructors from the Tatra Group. At the time, the Bieszczady Mountains were quite a hard area to coordinate rescue actions. Lack of shelters, very few tourist trails and large spaces with human settlement being just established, and above all, primitive and unreliable communication network, were the difficulties to be faced with by the rescue workers.

Currently, the operating area of the group is the Polish part of the Bieszczady Mountains and the Lower Beskids, with the western boundary along the Żmigród – Krempna road. The group consists of around 190 volunteer rescue workers, including 3 instructors and 15 professional rescuers – with additional 15 applicants. They use off-road vehicles, quads, snowmobiles and other various summer and winter transport equipment. Beside mountain rescue operations, the rescuers participate in actions carried out in case of natural disasters, road accidents and search of missing persons. They also provide medical aid for the local community. In fulfilment of their tasks, members of the group actively cooperate with the air medical service, fire service, forest and park service, border guard and the police.

One of the statutory tasks of GOPR workers is to provide help for wanderers whose health and life is endangered and to prevent accidents in the mountains. Rescuers can give warnings about the risk caused by the unstable weather. Another task of GOPR is protection of the natural environment – in this field, the group cooperates with the Bieszczady National Park. The goals of GOPR are fulfilled by organising and providing rescue service, which includes uniting and training of mountain rescuers, creating and maintaining rescue stations and points, participating in the liquidation of the effects of disasters, improvement and development of mountain rescue service, guaranteeing favourable conditions for provision of the rescue service and also cooperation with national and foreign organisations[3].

Beside that, GOPR carries out preventive activities, such as controlling and guaranteeing safety of tourists in the mountains, announcing avalanche alerts and informing on other dangers. Informative and instruction activities within the scope of prevention of accidents related with bad weather are also performed. The organisation promotes the rules of correct behaviour in the mountains.

Mountain rescue operations differ in particular seasons of the year. It is reflected in the methods of action of the rescue workers. In summer, various forms of aid are provided, depending on the site of the accident. While in winter, most rescue operations are carried out in hard weather conditions. Low temperature and deep snow cover make rescue actions very difficult – it takes longer to reach the accident site and different type of equipment must be used.

[2] K. Zarzycki, *25 lat bieszczadzkiego parku Narodowego (1973-1998) -trudne początki.* W: T. Winnicki (red), Roczniki Bieszczadzkie 1998(7) Wyd. Impuls, Ustrzyki Dolne 1999, s. 17

[3] http://www.gopr.pl/gopr/statut-gopr, 16.10.2013.

GOPR rescuers also carry out specialist interventions, such as avalanche, cave and air rescue. Such actions are much different from the rescue operations performed on the land. Rescuers participating in such activities must have proper experience and qualifications.

The purpose of the analysis was to determine the causes and character of accidents in the Bieszczady Mountains as well as dependences between them. It may seem that the Bieszczady Mountains are not dangerous, marked trails leading to the peaks are often perceived as short and easy, and in summer even the highest parts of the mountains can be reached within a few hours. For that reason, the mountains are also very attractive for less experienced tourists. However, in winter, the Bieszczady Mountains become more inaccessible. Roads, especially within the Bieszczady National Park, are often impassable due to heavy snowfall. Hiking becomes possible only for most experienced and perfectly prepared tourists. Those less experienced cannot believe that there are avalanche terrains in winter in the Bieszczady Mountains. They are generally located on all northern slopes of the meadows. In winter, mass tourism is also attracted by ski slopes in many towns of the Bieszczady Mountains and the Lower Beskids.

The analysis encompassed accident reports of 2009 of the Bieszczady Group of GOPR. An accident report is an A4 document containing two pages. The questionnaire contains information concerning the injured person and the details of the intervention. The data includes site of accident, cause of accident, weather, type of evacuation and means of transport, amount of hours spent on rescue operation, number of rescue workers participating in the rescue operation. The report also contains the information on the medical help provided, injuries, symptoms, medical history and medical materials used.

The analysis of the gathered data has been made with use of the SPSS software package for statistical analyses. Missing data have been excluded from all statistical calculations. The accepted level of significance was $\alpha = 0.05$. It means that null hypothesis is considered true or is rejected with the probability of 95%. The "p" value has been used in the presentation of the results. It is the highest ($p \leq \alpha$) level of significance, at which the verified hypothesis can be rejected on the basis of empirical data. In order to analyse the dependences between particular categories, several types of statistical tests have been used. The chi-squared test has been used in the analysis, as well as measures correlation, such as ETA, Cramer's V and Phi contingency coefficient.

The ETA value is the measure of the correlation between a nominal variable and a numeric variable. It is contained within the interval from 0 to 1. Values close to zero indicate weak correlation, while values close to 1 indicate strong correlation between these variables. The following classification has been used in the interpretation: 0 means no correlation, 1 - perfect correlation, (0; 0.2) - very weak correlation, <0.2; 0.4) - weak correlation, <0.4; 0.6) - medium correlation, 0.6 and more - strong correlation. For two nominal variables, measures correlation have been taken: Phi contingency coefficient and Cramer's V, which have the same values as the ETA.

Even though statistically important dependences between particular categories have been determined, the results should be interpreted very carefully. Although these results provide a certain view of the phenomenon, more general conclusions concerning the influence of one variable on another should not be drawn, since the total number of tourists visiting the area of activity of the Bieszczady Group GOPR is unknown. The data concerning the Bieszczady National Park alone indicate that the number of tourists increases every year. In 2001 it was 181 thousand, while in 2009 – 350 thousand tourists in a year[4]. The analysis includes data gathered from the end of April until the beginning of November and does not encompass the period from late autumn to early spring. Depending on the weather and snow

[4] R. Prędki, *Ruch turystyczny w Bieszczadzkim Parku Narodowym w latach 2009-2011*. W: T. Winnicki (red), Roczniki Bieszczadzkie 2012(20) Wyd. Impuls, Ustrzyki Dolne 2012, s. 361

cover, it is often a time of intense exploration of trails in the Bieszczady Mountains. Therefore the total number of park visitors can reach 500 thousand a year[5]. The intensity of tourist activity beyond the area of the national park, but within the area controlled by the Bieszczady Group rescuers, is unknown.

Rescue actions can be classified according to the site where first aid is provided or the use of special equipment. A rescue action is defined as the departure of rescuers from one rescue station using any means of transport. A rescue expedition is the departure of rescuers from several rescue stations using any means of transport. An intervention is an activity of a rescuer without the use of means of transport, while an intervention at the rescue station is an activity of a rescuer at a rescue station, without the use of means of transport. The percentage results of 2009 were as follows: 54.9%, 2.%, 4.7% and 37.7%. In order to simplify and make the results clearer, no such division will be made in remaining part of the study.

In 2009, the Bieszczady Group of GOPR participated in 380 interventions. One operation was a false alarm. 96% of all actions consisted in providing aid for single persons, while 4% of them concerned two and more persons. Among the injured, 56% were men and 44% were women. Majority of the injured represented the age group of 16-25 (29.1%), while 21.2% were between 26 and 35 years old and 17.4% were up to 15 years old. The percentage of injured from other age groups were as follows: 36-45 years old (13%), 46-55 years old (11.1%), 56-65 years old and 65 and more (4.1% each).

The number of operaions varied throughout the year, which is presented in Diagram 1. The rescuers intervened most often in winter (almost half of the total number of interventions - 49.1%) and in summer (31.7%). Less actions took place in spring and autumn, 14% and 5.3%, respectively. Seasons of the year and various forms of tourism appropriate for them, are reflected in the frequency of occurrence of different injuries.
In winter, those were most often injuries typical for skiing or snowboarding - head, face, knee joint, thigh, lower leg and wrist injuries. Backbone or shoulder joint injuries occurred only in winter. In spring, summer and autumn, most injuries were related with hiking. Among them were ankle, knee joint and feet injuries, as well as concussions, faintings and loss of consciousness.

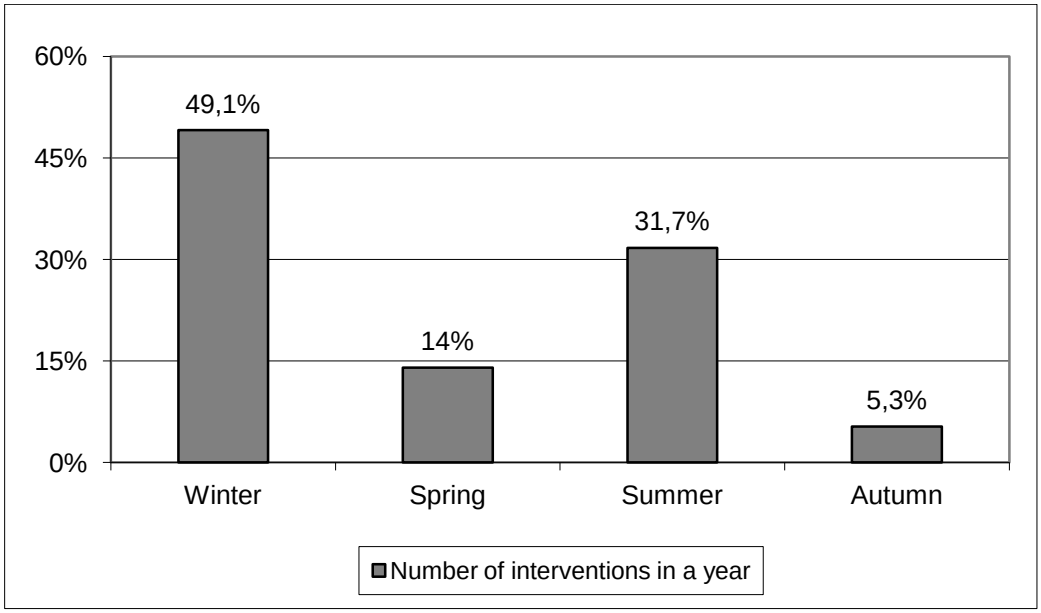


**Diagram 1.** Number of GOPR interventions in 2009

[5] T. Winnicki, B. Zemanek, *Przyroda Bieszczadzkiego Parku Narodowego.* Wyd. Bieszczadzkiego Parku Narodowego, Ustrzyki Dolne, 2009, s. 163.

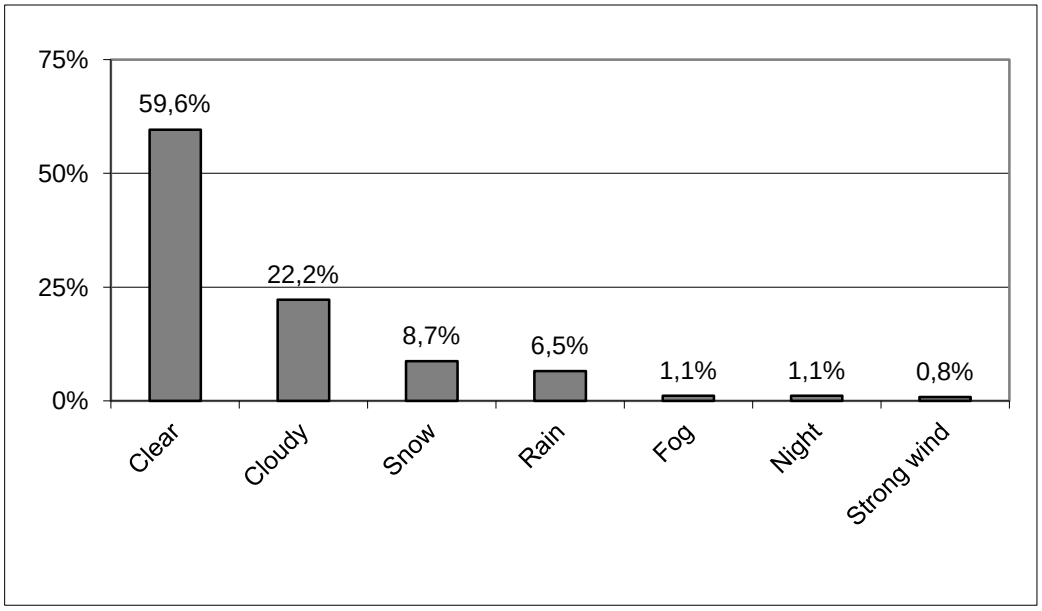


**Diagram 2.** Weather conditions during GOPR operations

In the majority of cases, the injured were on individually organised trips (75.3%), whereas 15.9% participated in excursions organised by travel agencies, schools, etc.

Fatal accidents were also reported in the area of activity of the Bieszczady Group of GOPR. 10 fatal accidents happened in 2009. Their causes were related with typical tourism and work (e.g. work in forest).

The rescue interventions in 2009 were carried out mostly on ski slopes (43.6%). Large number of such interventions is the reason for the presence of GOPR workers at the slopes in Puławy, Bystre, Karlików, Chyrowa, Przemyśl and at Gromadzyń in Ustrzyki Dolne during the winter season. Other interventions were carried out at marked trails (22.5%) and in mountain open space (18.4%). Less interventions took place in settled areas and houses (12.6%) as well as in other areas and sites, such as forest or huts (2.9%).

The analysis of accident reports indicates high diversification of interventions in relation to weather conditions. As it is presented in Diagram 2, almost 60% of interventions were carried out in fair weather conditions. The percentage of interventions in cloudy conditions reached 22.2%, while in case of those carried out in snow, rain or fog, it was 8.7%, 6.5% and 1.1%, respectively.

The accident reports also indicate causes of accidents determined by the rescue workers. Difficulties in objective and clear determination as well as legal regulations cause that these data cannot be used as a sufficient and credible source of information. It is confirmed by the fact that in 51.5% of all reports, "other causes" were indicated. In other cases, the indicated causes were: falls on the ski slope (40.6%), getting lost (3.7%), work (2.4%) and alcohol consumption (1.8%). Rarely indicated causes included thunder strike, snakebite, insect bites, lack of skills or overestimating skills in skiing/snowboarding.

A special type of rescue operations are those related with search for tourists who got lost. Such cases can be tragic and often tourists are found dead. The records of the rescue service are full of reports of accidents in which rescue teams were close to success, finding a path or shelter, but their skills were insufficient or equipment failed[6]. It seems that losing a way is a result of a coincidence of many factors, including bad weather – especially in winter. In such conditions chances to survive are reduced by snow and temperatures below zero.

[6] S. Maciejewski *Błękitny krzyż.* Krajowa Agencja Wydawnicza, Kraków 1981, s. 21

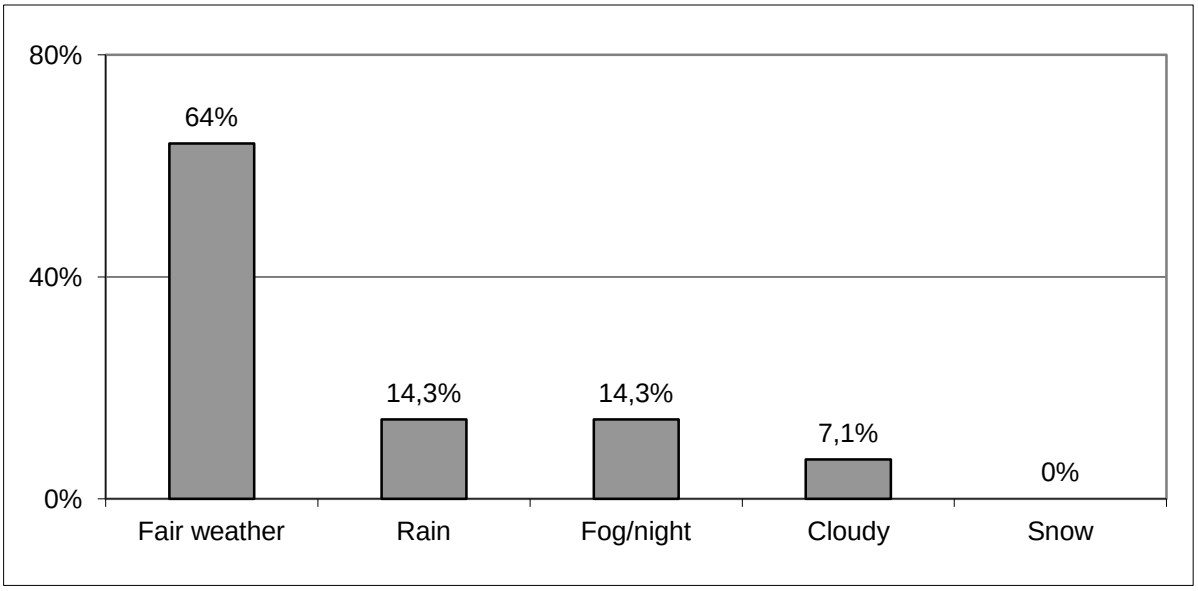


**Diagram 3.** Cases of getting lost in various weather conditions, p<0.001 and Cramer's V=0.2

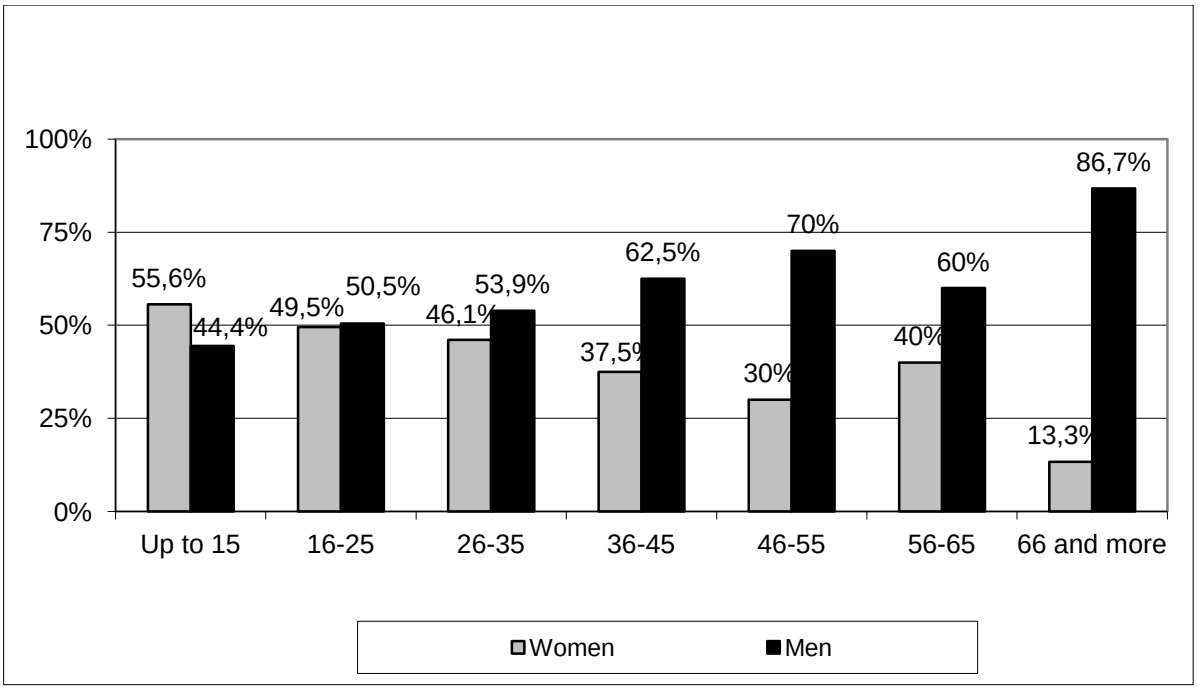


**Diagram 4.** Relationship of age and sex of the injured and the number of accidents p=0.02, ETA=0.2

However, it turned out that the majority of search actions in 2009 in the Bieszczady Mountains were carried out in fair weather conditions (64.3%). 14.3% took place in rain, another 14.3% in fog, in the night and windy conditions, while 7.1% in cloudy weather. No actions were reported to take place during snowfall, as it is indicated in Diagram 3.

But accident reports do not contain such categories as weather change or a break in the weather. Such conditions can in fact be the causes of getting lost. Above all, it has been determined that during the analysed year, all persons who lost their way were on individually organised trips. Excursions organised by tour operators are usually guided by a qualified person, therefore the possibility of getting lost is reduced.

A statistically significant dependence between the age and sex of the injured and the number of accidents has been observed (Diagram 4). The aid was provided mostly to young women, older women needed help less frequently. In case of men, the trend was opposite – mostly older men needed help.

It has also been found that young persons constitute the largest proportion of the injured in skiing and snowboarding (Chart 1). In the age group of 15 and less, they constituted 57.8%; while in two age groups from 15 to 35, this percentage reached 48%. In the same period, GOPR workers provided aid to a relatively smaller number of older skiers. It is probably caused, not only in the Bieszczady Mountains, by the fact that young people ride recklessly and unsafely[7]. It is also related with not knowing the FIS Skier's Decalogue, which defines the rules of behaviour on the slope[8].

The situation was quite different on hiking trails, where aid was needed mostly by older persons from the age group of 50-65 (66.7%). Younger persons were less frequently serviced, the percentage in two age groups up to 25 was 31.3% and 37.4%, respectively. Careful interpretation of these results may indicate that physical condition deteriorates with the age, which is followed by larger vulnerability to injuries among older persons.

**Chart 1.** Relationship of the form of tourism and the age of the injured p=0.001, ETA=0.26

| | Up to 15 | | 15-25 | | 26-35 | | 36-45 | | 46-55 | | 56-65 | | 65 and more | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| Ski/snowboard | 37 | 57.8 | 52 | 48.6 | 37 | 48.1 | 17 | 35.4 | 17 | 41.5 | 1 | 6.6 | 4 | 26.7 |
| Hiking | 20 | 31.3 | 40 | 37.4 | 36 | 46.8 | 24 | 50 | 17 | 41.5 | 10 | 66.7 | 4 | 26.7 |
| Other, work | 7 | 10.9 | 15 | 14 | 4 | 5.1 | 7 | 14.6 | 7 | 17 | 4 | 26.7 | 7 | 46.6 |
| Total | 64 | 100 | 107 | 100 | 77 | 100 | 48 | 100 | 41 | 100 | 15 | 100 | 15 | 100 |

Terrain rescue stations and special equipment are very helpful in the activity of the rescue workers, which is not limited only to providing help for tourists in the mountains. For the local community, rescue workers often perform the functions of ambulance service, medical centre and pharmacy. In winter, when many roads are temporarily impassable after heavy snowfall, the only vehicles able to get to people in need are those used by GOPR. Having considered the fact the caves of Dukla may also be tourist destinations, the rescuers are capable of performing professional speleological rescue operations.

Since the date of the official establishment of the Bieszczady Group of the Mountain Volunteer Search and Rescue until 2001, the number of all interventions reached 16,793, out of which 60 were fatal accidents[9]. The causes of accidents should be attributed not only to the random character or unfortunate coincidence. Many accidents are caused by tourists themselves. The most important cases of misconduct include those based on the assumption that the Bieszczady Mountains are easy for tourists. Among them are thoughtlessness, ignoring weather conditions, improper clothing and equipment as well as overestimation of skills and abilities.

[7] T. Sahaj, *Turystyka i sporty ekstremalne, czyli o źle pojętej wolności.* W: Z. Dziubiński (red), Aksjologia turystyki, Salezjańska Organizacja Sportowa Rzeczypospolitej Polskiej, Warszawa 2006, s. 117.
[8] K. Szymański, *Bezpieczna turystyka i rekreacja.* AWF Poznań 2009, s. 82.
[9] http://stary-gopr.velacms.pl/index.php?action=statystyki, 17.10.2013.