

Students' attitudes to tick risks

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Abstract

Introduction and objectives. The ever-increasing number of patients with tick-borne diseases resulted in the presented study investigating the awareness, attitudes and knowledge among students about the threats arising from tick bites and preventive anti-tick practices.

Materials and method. Questionnaires concerning these issues were distributed amongst Czech and Polish university students of science. Responses were analyzed by nationality and by gender.

Results. Nearly all respondents were aware of the risks arising from ticks and could name at least one disease transmitted by ticks. The Czech students felt more threatened by tick-borne diseases, had more frequently suffered from Lyme borreliosis and were vaccinated against tick-borne encephalitis more often than the Polish students. A large number of the participants applied preventive measures against ticks in order to protect themselves. The Czech students believed in the effectiveness of repellents statistically more often than the Polish students, while effectiveness is the main criterion for selection of the right repellent in both groups.

Conclusion. Differences in preferences between the two nations appeared in many areas, e.g. the Czechs felt more threatened by all kind of risks and suffered from Lyme disease more frequently. Gaps can still be found in both the knowledge and behaviour among the respondents. It can be expected that the general public knowledge of this issue is rather limited in comparison with the students participating in the study, who are systematically educated in the field.

Key words

questionnaire, tick-borne infections, knowledge, prevention

INTRODUCTION

Ticks are vectors spread worldwide that transmit numerous pathogenic microorganisms from viruses to bacteria and protozoa to vertebrate hosts. Moreover, skin damage, toxicosis or allergic reactions may appear as the consequence of contact with a tick. Tick-borne infections are common arthropod-borne diseases in humans and animals, with no exception in either Poland or the Czech Republic. They represent a serious problem for general public health.

The epidemiological situation can be illustrated by the following numbers: in 2011, 46.1 patients per 100,000 inhabitants suffered from Lyme borreliosis (hereafter designated as LB) in the Czech Republic; in 2012 there were 31.4 Czech patients with LB per 100,000 and in 2013, 44.2 cases per 100,000 inhabitants [1]. In Poland, 23.8 cases of LB per 100,000 inhabitants were recorded in 2011, 22.8 in 2012 and 33.1 in 2013 [2]. As for LB transmission to humans, nymphs of *Ixodes ricinus* ticks are probably the main vector stage in Central Europe [3].

Tick-borne encephalitis (TBE) is another serious tick-borne infection with 8.2 cases per 100,000 inhabitants in 2011 in the Czech Republic, 5.5 in 2012 and 5.9 in 2013 [1]. In Poland, the risk of TBE infection is lower with instances per 100,000 inhabitants monitored as follows: 0.57 in 2011, 0.49 in 2012 and 0.58 in 2013 [2].

The results obtained by the current questionnaire-based study can be used as a basis for further research, or possibly

as a source of information for health care providers, repellent manufacturers and other institutions involved. The results can help to set up strategy for an effective management of tick-borne diseases. The identified gaps in knowledge can help target education concerning tick-borne infections. Adequate knowledge and awareness of threats arising from ticks may result in more vigilant behaviour of people visiting tick habitats, thus possibly contributing to the elimination of medical, social and economic consequences connected with the issue.

OBJECTIVES

The intended aim was to obtain information on: 1) what level of knowledge the Czech and Polish university students have about ticks and risks arising from ticks, 2) what preventive anti-tick measures do they know and what is their attitude towards them, 3) if or how these preventive measures are practiced. Differences in responses between the Czech and Polish respondents (also reviewed by gender per nationality) are analyzed within this study.

MATERIAL AND METHODS

A questionnaire developed by the researchers was used for the data collection. The questions were mainly semi-closed: respondents were therefore not limited in their responses and the final answer depended on them. Selected questions are demonstrated in the table legend (Tab. 1–6). The research was carried out in 2012 when printed anonymous forms were distributed among the university students in Brno

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(Czech Republic – CZ) and Wrocław (Poland – PL). All participants were students of the faculties of science. Students of microbiology, environmental protection, molecular biology and genetics, animal physiology and immunology and secondary school teacher training in biology were interviewed.

94 Czech students (70 females and 24 males) and 96 Polish students (72 females and 24 males) participated in the research. The average age of the Czech female participants was 23.9; the average age of the Czech male participants was 22.5. In the Polish group, the average age of the females was 22.5 and the average age of the males was 22.2.

Apart from the common questions on age, gender and the field of study, the questionnaire included questions concerning awareness of risks arising from tick-bites and diseases transmitted by ticks. The participants were asked to provide information such as whether they have suffered from a tick-borne disease or which diseases they were aware of. Other questions focused on prophylactic behaviour of the participants and preferred practices against tick-bites; special attention being paid to repellents (opinion on their safety, effectiveness, etc.). Responses were evaluated by nationality (Czech / Polish) and by gender per nationality.

Data obtained from the individual questionnaires were transferred to a parametric and structured dataset. The data were further summarised in percentages as proportions of particular answers among all the respondents. The statistical significance of differences in answers provided by the individual groups (CZ/PL; male/female) was assessed using a two sample binomial test.

Table 1. Opinions on the risk of tick-bite

	A (F/M)	B (F/M)	C (F/M)	D (F/M)	E (F/M)
CZ	28%/17%	69%/75%		-/8%	3%/-
PL	14%/21%	69%/38%	7%/13%	7%/30%	3%/-

A – risk is always high; B – risk depends on the environment. C – risk is low; D – no risk at all; E – other comment

Table 2. Preference of preventive measures to avoid tick bites

COUNTRY	A (F/M)	B (F/M)	C (F/M)	D (F/M)	E (F/M)	F (F/M)	G (F/M)	H (F/M)	I (F/M)
CZ	4%/4%	17%/4%	50%/38%	64%/50%	30%/29%	23%/21%	17%/17%	89%/54%	1%/4%
PL	4%/4%	7%/-	46%/33%	65%/33%	17%/25%	3%/8%	43%/30%	17%/4%	3%/4%

A – no visit to areas where ticks can be expected; B – avoidance of grass fields, areas with bushes and covered with fallen leaves; C – wearing appropriate clothes, long sleeves; D – usage of repellents; E – consumption of beer or food rich in B vitamin; F – vaccination against encephalitis; G – having a shower after being in a risk environment; H – body checks after being in a risk environment; I – practising other individual preventive measures

Table 3. Criteria for selection of repellent for personal use

COUNTRY	A (F/M)	B (F/M)	C (F/M)	D (F/M)	E (F/M)
CZ	20%/25%	74%/54%	51%/21%	-/4%	-/4%
PL	11%/54%	65%/42%	35%/21%	3%/4%	3%/4%

A – price; B – effectiveness; C – toxicity and health impact; D – design of the package; E – other comments

Table 5. Attitudes towards type of repellent

COUNTRY	A (F/M)	B (F/M)	C (F/M)
CZ	39%/24%	11%/17%	50%/63%
PL	54%/46%	6%/42%	40%/13%

A – based on natural ingredients; B – based on synthetic ingredients; C – he/she does not care

RESULTS

All participants (100 %) were aware that when outdoors they could be attacked by ticks. Almost everyone (CZ: 99 % of the females / 95 % of the males; PL: 96 % of the females / 96 % of the males) agreed with the fact that ticks can transmit serious diseases. No significant differences between the nations were observed.

LB was the best known tick-transmitted disease: nearly all participants (CZ: 93 % / 92 %; PL: 92 % / 100 %) provided the name of this disease when asked to write down the names of any tick-borne diseases. Further, 41 % / 92 % of the Czech participants and 46 % / 21 % of the Poles were aware of TBE, while significantly lower knowledge was observed in awareness of ehrlichiosis (CZ: 7 % / 8 %; PL: 0 % / 0 %) and Q fever (CZ: 6 % / 13 %; PL: 1 % / 0 %). Knowledge of any other diseases, such as tularemia, bartonellosis, babesiosis, etc., was detected only rarely – by at most 3 % of the participants in each nationality group.

A high portion of respondents stated that the risk of tick-bite outdoors depends on the environmental conditions (CZ: 69 % / 75 %; PL: 69 % / 38 %); 28 % / 17 % of the Czech students and 14 % / 21 % of the Polish students claimed they always felt at high risk when outdoors in a risk area. The remaining students evaluated the risk as (very) low (Tab. 1). Based on the statistical evaluation, it can be summarised that the Czech students of both genders felt more at risk than the Polish students.

Most of the participants had not suffered from a tick-borne disease; only 9 % of the Czech women, 8 % of the Czech men and 1 % of the Polish women have suffered from LB. Statistical evaluation indicated that the Czechs (women more often than men) fell ill more often than the Polish respondents.

Of the Czech participants, 95 % / 71 %, and of the Polish participants, 86 % / 62 %, practice some kind of preventive measures to avoid/repel ticks and tick bites. The difference between the two groups was not significant. However, a more detailed analysis shows that women (irrespective of

Table 4. Preference of a repellent form

COUNTRY	A (F/M)	B (F/M)	C (F/M)	D (F/M)	E (F/M)
CZ	89%/83%	10%/-	4%/8%	3%/-	1%/8%
PL	72%/83%	19%/8%	10%/8%	-/4%	-/-

A – spray; B – cream; C – liquid; D – solid stick; E – other

Table 6. Opinion on the safety of repellents for children

COUNTRY	A (F/M)	B (F/M)	C (F/M) d/F	D (F/M)	E (F/M) e/M
CZ	16%/33%	1%/-	56%/54%	27%/33%	-/29%
PL	4%/13%	7%/-	49%/71%	38%/13%	3%/4%

A – repellents are safe; B – repellents are not safe; C – safety level depends on dosage of the active ingredient and composition; D – safety level depends on age of the child (i.e. repellents are not suitable for babies); E – other comments

nationality) practiced preventive measures against ticks significantly more often than men.

In the Czech group, checking their body for ticks after visiting a tick-infested area was the most common preventive measure (89 % / 54 %). Of the Czech participants, 64 % / 50 % use repellents, and/or 50 % / 38 % of them wear smooth and light coloured clothes and shoes, as well as long sleeves. Of the Czech respondents, 30 % were convinced that drinking beer or eating food rich in vitamin B can help repel ticks. Over 20 % of the Czech students were vaccinated against encephalitis and 17 % of them said they showered after being in tick-expected environment (as a procedure to avoid tick bites (Tab. 2)).

Among the Polish respondents, the usage of repellents is the most common measure to prevent tick bites (65 % / 33 %). Wearing appropriate clothing was evaluated to be the second most common measure (46 % / 33 %), and/or 43 % / 30 % of the Polish respondents showered after being in an area in which ticks are expected. Of the PL students, 17 % / 25 % knew that food and drinks rich in B vitamin can help repel ticks; 17 % / 4 % examined their body after spending time in an at risk area. Only 3 % of the Polish women and 8 % of the PL men were vaccinated against encephalitis (Tab. 2).

Statistical evaluation revealed significant differences between the nations: the Czechs were vaccinated and practiced body checks more frequently; the Poles preferred having a shower after being outdoors in a significantly higher number of cases than the Czechs.

Knowledge of traditional or home-made remedies that should help repel ticks was also examined. Only a few students stated that a protective effect against ticks can be expected from vitamin B (CZ: 11 % / 4 %; PL: 1 % / 0 %), beer (CZ: 6 % / 8 %; PL: 0 % / 0 %), yeast (CZ: 3 % / 4 %) and garlic (CZ: 6 % / 0 %; PL: 1 % / 4 %). Answers mentioning tomato sauce, alcohol, eucalyptus, citronella, basil, perfume and/or fatty cream were also recorded. However, each of these above-mentioned answers was scored only once in all the reviewed questionnaires. No details on dosage or application were provided by the participants. Statistical evaluation revealed that in the researched groups, the Czech women were better informed than the Polish women, and the Polish men were better informed than the Czech men.

As for the attitudes towards the real effectiveness of repellents, 93 % / 83 % of the Czech respondents and 76 % / 50 % of the Polish respondents believed that repellents helped prevent tick bites. The Czech students believed in the effectiveness of repellents in statistically more cases; differences between the genders (irrespective of nationality) were also found – i.e. females more frequently accepted as true the statement that repellents are effective. Effectiveness was an important criterion for the selection of repellent for personal use (CZ: 74 % / 54 %; PL: 65 % / 42 %). Of the Czech students, 51 % / 21 %, and of the Polish students 35 % / 21 % considered low toxicity of repellents as very important for health reasons. Price played a role for 20 % / 25 % of Czech respondents, and 11 % / 54 % of Polish respondents. The design of packaging was also important, but only to a low number of respondents (Tab. 3) – based on the statistical evaluation, it can be summarised that there was little difference between the two nations. As for the differences between the genders, women mentioned toxicity more often than men; men cared about price more often than women.

One of the questions focused on a preferred form of repellent – sprays resulted in being most convenient to both

nations (CZ: 89 % / 83 %; PL: 72 % / 83 %). Further details are provided in the Table 4. Statistical analysis revealed additional differences between the two nations: the Polish students tended to use cream more often than their Czech counterparts, while the Czech students preferred a spray (Tab. 4).

The presented study also revealed differences in attitudes towards the basis of a repellent product. Differences appeared between the nations as well as genders (irrespective of nationality). Of the Czech respondents, 50 % / 33 %, and of the Polish respondents, 40 % / 13 %, did not care whether the product was based on natural or synthetic ingredients, while other criteria were more relevant to them. Of the CZ students, 39 % / 24 %, and of the PL students, 54 % / 46 % preferred repellents with natural compounds, and only a minority decided on synthetic-based products (CZ: 11 % / 17 %; PL: 6 % / 42 %). Generally, the Poles preferred natural repellents more often than the Czechs. The women tended to use natural formulation more often than the men, who preferred a synthetic-based product (Tab. 5).

When an opinion on the safety of repellents for children was investigated, the most frequent answer was that the safety of repellents depended on the dosage of the active ingredient and composition (CZ: 56 % / 54 %; PL: 49 % / 71 %). The second most commonly occurring answer was that the safety depended on the age of the child, and that repellents are not suitable for babies (CZ: 27 % / 33 %; PL: 38 % / 13 %). Of the Czech respondents, 16 % / 33 %, and of the Polish respondents, 4 % / 13 % agreed to the fact that repellents are safe products. Only 1 % of the Czech women and 7 % of the Polish women did not consider repellents to be safe. Several respondents provided other comments to this question – CZ: 0 % / 29 %; PL: 3 % / 4 % (Tab. 6). As observed here, the Polish males seemed more cautious than the Czech males.

DISCUSSION

The current study is a questionnaire-based investigation on the educational level, attitudes and knowledge among students of a general-public health issue with far-reaching impacts (as e.g. [4, 5, 6]). Only a limited amount of information has been published in Europe about the public knowledge of risks arising from ticks and tick-bites (e.g. [7, 8, 9]). A remarkable study about Czech-Polish issue has been published recently by Stefanoff et al. [10]. The paper refers to the differences in LB and TBE occurrence between the two countries. This finding probably reflects possible differences in Czech and Polish surveillance systems and demonstrates the need of further attention to the problem. Additional information on the situation in Poland and Czech Republic has been published by e. g. Stefanoff et al., Zeman and Benes or Danielova et al. elsewhere [11, 12, 13, 14].

The current study was conducted with two gendersplit groups of Czech and Polish university students and focused on their awareness of risks arising from tick bites, disease transmission, tick-borne diseases, preventive anti-tick measures and attitudes towards different aspects of protection against ticks (repellent form, price and safety for children). The data results obtained from the questionnaires were compared by nationality and by gender. The obtained results show that the students of both countries were aware of the risks arising from tick bites. The Czech respondents

were more cautious of tick-borne diseases. This finding may be connected with the higher risk of LB among the Czechs compared to the Poles, and the epidemiological situation regarding TBE – the risk of TBE infection is 10 times higher in the Czech Republic [1, 2]. However, the repertoire of knowledge about tick-borne infections was rather limited: nearly all students of both nationalities were able to name LB, several respondents knew that ticks transmit TBE, while other diseases were named by only a few individuals.

Based on the presented data, it can be summarized that a high number of the participants practiced preventive behaviour against tick-bites, which is a positive finding. In the Czech group, with body checks and application of repellent belong among the most frequent preventive measures; one-third of the Czech participants also believed in the power of vitamin B. Among the Polish students, usage of repellent and appropriate clothes was most common. Having a shower after being in a tick-infested area was also stated by quite a high proportion of the Polish students. Therefore, to summarize the responses: the preventive measures practised to avoid contact with ticks were generally based on the belief in the effectiveness of repellents, and easily feasible behavioural procedures, such as body checks, wearing appropriate clothes, etc..

The questionnaire applied revealed that only a low number of the participants had been vaccinated against encephalitis, the Czechs more often than the Poles. This finding corresponds with the epidemiological situation regarding TBE, which is much more optimistic in Poland since the risk of infection is much lower in that country. With respect to the every-year massive vaccination campaign in the Czech Republic, and the fact that hundreds of Czech patients with this serious infection are registered every year (CZ: 589 in 2013, 535 in 2012, 840 in 2011) [1], the low percentage of vaccinated individuals among the students of science (where an above-average level of knowledge is expected in comparison with the rest of population) is surprising.

Knowledge of the traditional or home-made remedies helping to repel ticks was also examined and seems rather limited. In the part of the questionnaire focused on the natural compounds deterring ticks, only a low number of participants from both countries stated that vitamin B has a protective effect against tick bites. This data is in contrast with the numbers provided in Table 2, in which 30 % / 29 % (of the CZ) and 17 % / 25 % (of the PL) students stated consuming vitamin B as a protection against ticks. This discrepancy can be caused by the fact that vitamin B can be perceived a natural substance by some respondents, and a synthetic substance by others.

Of the Czech participants, 93 % / 83 %, and of the Polish participants, 76 % / 50 %, believed that repellents help prevent tick bites. Choice of the product was mainly based on its effectiveness; however, toxicity, health safety and price also played role when choosing a product for personal use. The spray-form of repellents seemed to be the most convenient for all participants in the study; the cream-form of repellents was more often used by the Polish students than their Czech counterparts. Only a minority of participants stated that they would choose a synthetic product; this finding, however, is in contrast with the situation in the market where most available products are based on DEET and other synthetic substances (Nejezchlebová, unpublished). The difference between the two nations was significant – the Polish students prefer anti-tick products on a natural basis more often than

the Czech students. The presented findings can thus provide useful guidelines for repellent manufacturers or retailers. Although the naturally-derived repellents did not prove to be as effective as their synthetic counterparts, they may have an advantage in being perceived as safer and less toxic [15, 16, 17].

When an opinion on the safety of repellents for children was investigated, most participants disagreed with the statement that repellents are safe for children, and were aware of potential risks connected with the use of these products for children.

Knowledge of the risks and the risk-eliminating measures practised by the respondents in the current study can be classified as sufficient; however, gaps can still be found in both knowledge and behaviour that could be eliminated by appropriate education (limited knowledge of the tick-borne diseases spectrum, low vaccination status, prophylactic behaviour based mainly on easily available methods irrespective of their effectiveness, etc.). Aenishaenslin et al. [18] concluded that risk perception of tick borne diseases differs between populations, and the monitoring of knowledge and risk perception in local populations may result in better prevention efficacy. Moreover, it can be expected that the knowledge of the general (lay) public of this issue is rather limited in comparison with the students participating in this study, who are systematically educated in the field. Further investigation among the general public or further similar studies (such as e. g. [19]) are necessary. The authors are strongly in agreement with the statement by Beaujean et al. [20], that 'it is our challenge to take the findings of such studies and translate them into appropriate prevention strategies.'

CONCLUSION

Based on the presented data, it can be summarized that differences in preferences between the two nations appeared in many fields: the Czechs felt more threatened by all kind of risks arising from tick bites; they have suffered more frequently from LB, and are more often vaccinated against TBE. The Czechs also believe in the effectiveness of repellents more often than the Polish respondents, and more often preferred synthetic anti-tick products; the Poles, on the other hand, preferred repellents based on natural ingredients than the Czechs. Attitudes and knowledge of the threats arising from tick bites may differ between local groups, further investigation among the general public is therefore necessary.

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