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Original article

Knowledge, attitudes, and practices regarding ticks and tick-borne diseases, Finland

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ABSTRACT

Tick-borne encephalitis (TBE) and Lyme borreliosis (LB) are endemic in Finland, with tens and thousands of cases, respectively, reported annually. We performed a field survey to investigate people's knowledge, attitudes and practices (KAP) regarding ticks, tick-borne diseases, and prevention strategies.

The KAP were assessed using a pre-validated anonymous questionnaire consisting of 39 questions and statements. On two consecutive days in July 2016, convenience sampling was used in the cities of Parainen and Kotka, located in high-risk areas of tick-borne diseases, particularly of TBE. In attitudes and practices sections, each question was scored and analysed with ordered logistic regression model.

In total, 101 individuals responded. The TBE vaccination rate among respondents was 40%. The best known preventive measures were having vaccination against TBE (88%), and wearing long sleeves and pants against ticks (81%). Two-thirds incorrectly identified the ring-like rash as a symptom of TBE. Of all respondents, 78% could not exclude that TBE can be treated with antibiotics; 55% that vaccine protects against LB; and 46% that it protects against ticks. The minority (14%) believed tick repellents to be effective. Among preventive behaviour, the quick removal of an attached tick was most frequently applied (97%). Repellents were used by 21% when visiting tick-infested areas. Significant associations were found between the vaccination status and having a correct belief that the vaccine protects against TBE ($P < 0.001$) but not against ticks ($P < 0.05$), or LB ($P < 0.001$).

KAP is a quick and easy tool to get a rough estimation on people's awareness regarding ticks and tick-borne diseases. We identified gaps in knowledge and misbeliefs. Our results can be used in public health communication tools on tick-borne diseases, especially those on intervention strategies.

1. Introduction

Tick-borne encephalitis (TBE) occurs in endemic areas across large areas of Europe and Asia (Lindquist and Vapalahti, 2008). Its main vectors, the ticks *Ixodes ricinus* and *I. persulcatus,* coexist in Finland (Lindquist and Vapalahti, 2008). Humans are dead-end hosts of the TBE virus (TBEV) and usually infected through the bite of an infected tick, or by consuming infected raw milk and other dairy products (Charrel et al., 2004). Lyme borreliosis (LB), caused by human-pathogenic genospecies of the *Borrelia burgdorferi* sensu lato complex (Stanek et al., 2012), is also transmitted by *Ixodes* ticks.

Thousands of cases of neuro-invasive TBE occur in humans annually across Europe and Asia, while LB is the most common human tick-borne infection in the northern hemisphere (Lindquist and Vapalahti, 2008; Stanek et al., 2012). In the recent decades, case numbers of both diseases have increased in endemic regions of Europe, and risk areas expanded in line with tick spreading northwards and to higher altitudes (Lindgren et al., 2000; Daniel et al., 2003; Jaenson et al., 2012). TBE has also become an international health issue due to increased travel to endemic areas (ECDC, 2012).

TBE is endemic in the Nordic countries, notably in Sweden, where cases occur around southern lakes, and along the coastal regions (Lundkvist et al., 2011). Other risk areas include southern Norway (Skarpaas et al., 2004), and Bornholm island in Denmark (Skarpaas et al., 2006). LB is also endemic in Finland and more widely spread than TBE (Sormunen et al., 2016; Sajanti et al., 2017). Approximately 40 cases of TBE, and thousands of LB cases are reported annually and the high risk areas include South Western and Eastern Finland. In the past 20 years, the number of notified cases of both diseases increased. The spatial distribution of ticks and cases have also expanded (Tonteri et al., 2015; Jääskeläinen et al., 2016).

No studies on people's knowledge, attitudes and practices (KAP)

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regarding ticks and tick-borne diseases have been conducted in Finland and only a few studies exist in the literature (Shadick et al., 1997; Butler et al., 2016; Valente et al., 2015; Arıkan et al., 2010; Bayles et al., 2013).

We performed a KAP field survey targeting at-risk populations in endemic areas in Finland in order to assess awareness on ticks, tick-borne diseases with special focus on TBE, and the respective prevention practices.

2. Material and methods

Laboratory-confirmed TBE and LB cases have been reported to the National Infectious Disease Register by microbiological laboratories since 1995. Furthermore, enhanced surveillance of TBE is conducted in order to determine the most likely place of exposure and to collect detailed information on clinical picture and long-term symptoms. TBE risk assessment based on detailed incidence data and published annually by the National Institute for Health and Welfare, guides immunisation strategies in identifying risk profiles of different areas (THL, 2017). TBE vaccines have been provided free of charge for the inhabitants on Åland island, and will be available for both permanent and summer residents in Parainen from spring 2017.

2.1. Study design and settings

A KAP survey was conducted in the cities of Parainen (located in the Turku archipelago with an estimated resident population of 15,500 plus 10,000 summer residents) and Kotka (the centre of the Kotka archipelago with an estimated resident population of 54,000). In Kotka, where the risk areas are located in the archipelago, ferry travellers to Kuutsalo island were a particular target and the survey was conducted on board. Survey locations were selected based on high annual TBE incidence rates; however, both areas also have high LB incidence (Sajanti et al., 2017).

2.2. Study sample

A convenience sampling was performed. Individuals in Parainen (around the harbour and city centre) and Kotka (harbour area, and ferry travellers) were approached and invited to participate in the survey. For groups of two or more, only one member was asked to participate. We collected the responses anonymously. Only respondents aged 14 and above were included in the study. The interviewer explained the purpose of the survey, and asked for the respondent's oral consent to be interviewed. Following the preference of the respondent, questionnaires were either self-administered, or were presented in an interview. The number of those rejected the interview was not recorded hence we were not able to calculate the response rate.

2.3. Study instrument

The questionnaire (available from the authors on request) consisted of 39 questions and statements, which were related to demographics (age, sex, residency, duration of stay during summer etc.), TBE vaccination status, and knowledge, attitudes and practices on ticks, tick-borne diseases and prevention. Attitudes were assessed by thirteen statements, with only one selected answer from the possible three (agree; unsure; disagree). Practices were assessed by six questions, with only one selected answer from the possible three (always or almost always; sometimes; never).

Interviewers were trained to use the questionnaire in order to standardize the interviewing techniques.

2.4. Variables associated to attitudes and practices

Descriptive statistics were used to illustrate the distribution of answers. Among knowledge questions, only one could be scored for the analysis; 1 was given to the only correct answer, otherwise 0 was given. In attitudes and practices sections, each question was scored. A score of 1 was given to attitudes and practices which are unfavourable or ineffective in prevention, 2 was given to 'unsure' and 'sometimes' answers, while 3 was given to attitudes and practices in line with common recommendations in tick-borne diseases prevention. The X^2 test, or the Fisher's exact test were performed to analyse respondent characteristics (type of residence, sex, and level of education) associated with each of the scored knowledge, attitudes and practices questions, and status of TBE vaccination (all as dichotomous variables). Univariate, ordered logistic regressions were used to identify factors associated with attitudes outcome ordered as 'agree', 'unsure', and 'disagree', and with practices outcome ordered as 'always or almost always', 'sometimes', and 'never'.

Data from the questionnaires were entered manually using Webropol 3.0 (Webropol Oy, Helsinki, Finland). Statistical analyses were performed using Stata 14 (Stata Corporation, Texas, US).

3. Results

A total of 101 respondents participated in the study in Parainen and Kotka. The median age of the respondents was 52 years (ranged 14–85). Women accounted for 56% of the respondents. There were no significant differences in responses between those who responded themselves and those interviewed. Educational background, in terms of lower and higher levels, was almost equally distributed among the respondents (lower level 53%, higher level 47%) (Table 1). Most respondents were either permanent residents (58%) or summer residents (14%) at the respective study location. The remaining were occasional visitors with no permanent or summer residence in the area. Approximately half of the respondents (47%) reported having experienced tick bites in the area, while 15% reported having been diagnosed with a tick-borne disease (most commonly, LB) and more than a half (55%) reported they personally knew somebody with such a disease. Dog and cat owners (n = 42) reported nearly universally (95%) having found

Table 1
Respondent demographic characteristics.

	Number of congruent answers (%)	Median (range)
Male	43 (44)	
Age, years		52 (14–85)
Education		
Primary school	10 (10)	
Secondary school	29 (30)	
Vocational training	12 (13)	
Bachelor's degree	22 (23)	
Master's degree	23 (24)	
Type of residence at the respective study location		
Permanent resident	59 (58)	
Summer resident	14 (14)	
Other (e.g. tourist, occasional visitor)	28 (28)	
Other		
Had tick bite(s) in the same area	46 (47)	
Diagnosed by a tick-borne disease ever	15 (15)	
Know personally anyone diagnosed by a tick-borne disease	56 (55)	
Having a pet	42 (42)	
Dog	25 (60)[a]	
Cat	9 (21)[a]	
Both	8 (19)[a]	
They often have ticks on them	40 (95)[a]	

[a] Percentage among those having a pet.