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Poziom wiedzy studentów na temat wybranych zagrożeń pasożytniczych występujących w miejscach zabaw dzieci w okresie letnim

Streszczenie

Wstęp. W odchodach pozostawionych w piaskownicach przez psy i koty oraz dzieci mogą znajdować się jaja i inne formy rozwojowe pasożytów: *Giardia lamblia, Toxoplasma gondii, Toxocara canis, Toxocara cati, Enterobius vermicularis, Ascaris lumbricoides*.

Cel. Celem było poznanie wiedzy studentów UM w Łodzi na temat ryzyka zarażenia dzieci formami rozwojowymi pasożytów podczas zabaw w piaskownicach publicznych.

Materiał i metody. Materiał do badań stanowiły dane pochodzące z ankiet wypełnionych przez 200 losowo wybranych studentów studiów zaocznych UM w Łodzi.

Wyniki. Problem występowania parazytoz u ludzi najlepiej był znany respondentom z dużych miast. Na place zabaw jako źródło zarażenia dzieci pasożytami wskazywali najczęściej studenci z małych miast. Według respondentów, nieprzestrzeganie zasad higieny osobistej to najczęstsza przyczyna parazytoz przewodu pokarmowego. Około 30% studentów wiedziało, że podczas zabaw w piaskownicach dzieci mogą zarazić się glistą psią i kocią. Więcej niż połowa nie wiedziała, że w piaskownicach dzieci mogą zarazić się również lamblią. Natomiast 2/3 badanych zdawała sobie sprawę, że odchody kota zawierające oocyty *T. gondii* mogą być przyczyną zarażenia się toksoplazmą; tylko nieliczni wiedzieli, że niedosmażone lub surowe mięso może zawierać formy rozwojowe *T. gondii*. Niewielu studentów z obszarów wiejskich – 13,4%, 12,6% z małego miasta i 12,0% z dużego miasta wiedziało, jak zapobiegać chorobom odzwierzęcym u dzieci, a odpowiednio: 84,6%, 83,3% i 92,2% – że borelioza, babeszjoza i kleszczowe zapalenie mózgu mogą być przenoszone przez kleszcze, ale tylko 1/3 badanych – jak należy chronić skórę przed ugryzieniem.

Wnioski. Wiedza badanych studentów na temat ryzyka zarażenia się dzieci formami rozwojowymi pasożytów w piaskownicach pozostawała na niskim poziomie. Badani prezentowali niską świadomość w kwestii profilaktyki parazytologicznej. Studentki okazały się bardziej świadome konsekwencji pozostawienia odchodów zwierząt w piaskownicy. Respondenci z obszarów wiejskich wiedzieli najmniej o możliwości zarażenia się dzieci toksoplazmozą po zjedzeniu niedosmażonego lub surowego mięsa.

Słowa kluczowe: zdrowie dzieci, parazytozy, miejsca zabaw, wiedza studentów.

Assessment of students' knowledge on selected parasite risks occurring in playgrounds in summer

Abstract

Introduction. Public sandboxes are defiled by dog, cat and children's faeces that can contain ova and other developmental forms of parasites: *Giardia lamblia, Toxoplasma gondii, Toxocara canis, Toxocara cati, Enterobius vermicularis, Ascaris lumbricoides*.

Aim. The aim of the study was to assess the state of knowledge regarding the risk of infestation with developmental forms of parasites in children, which may occur in public playgrounds in the aestival season, in students of the Medical University of Lodz.

Material and methods. Data from questionnaires filled in by 200 randomly drawn extramural students of the Medical University of Lodz comprised the material for the study.

Results. The problem of parasitic diseases occurrence in humans was better known in respondents living in big cities. The playgrounds were indicated most frequently by students from small towns. As the majority of respondents indicated, the parasitic diseases of the intestinal tract were caused by the lack of personal hygiene. Only 30% out of the students knew that children in the sandboxes could be infested with *Toxocara canis* and *Toxocara cati*. More than half were aware of the risk of *Giardia lamblia* infestation within the sandbox. However, two thirds of them knew that the cat faeces contain *Toxoplasma gondii* oocysts, which can cause toxoplasmosis. Few students remembered that undercooked or raw meat can comprise developmental forms of *Toxoplasma gondii*. Out of the surveyed students 13.4% from rural areas, 12.6% from small towns, and 12.0% from big cities were cognizant of the zoonotic disease prevention in children. Respectively, 84.6%, 83.3% and 92.2% knew that babesiosis and tick-borne encephalitis can be transmitted by ticks, though only 1/3 of them were acquainted with methods of protecting the skin from tick bites.

Conclusions. The students' knowledge on the risk of infestation with developmental forms of parasites in children playing in the sandbox was mediocre. The respondents presented a low awareness of parasitic disease prevention. Female students were more aware of the consequences of leaving the animal faeces in the sandboxes. The respondents from rural areas showcased inferior knowledge of the possibilities of infestation with *T. gondii* in children consuming undercooked or raw meat.

Keywords: children's health, parasitoses, playgrounds, students' knowledge.

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INTRODUCTION

One of the biological factors affecting the quality of life and human health are the parasites occurring in the natural environment. Public places such as sandboxes, beaches, sports fields, soil in parks, lawns, playgrounds and greens may quite often be the habitats of many parasites, which are particularly dangerous for young children. Dogs and cats can also be seen in the aforementioned places and leave their faeces there. The faeces of cats and dogs, as well as children, may contain ova and other developmental forms of such parasites as *Giardia lamblia* – lamblia (giardia), *Toxoplasma gondii* – toxoplasma, *Toxocara canis* – dog roundworm, *Toxocara cati* – feline roundworm, *Enterobius vermicularis* – threadworm and *Ascaris lumbricoides* – giant roundworm. Children's activities in sandboxes, parks, playgrounds or lawns contaminated with faeces may often result in the development of different parasitic diseases. Among parasitic diseases ascariasis and enterobiasis caused by the nematodes of gastrointestinal tract are most common in children. In recent years toxocarosis has been more commonly diagnosed, however, infections caused by protozoa i.e. *Giardia lamblia*, *Toxoplasma gondii* have also occurred [1-3].

The following factors contribute to the development of parasitic diseases in children:

- ignoring rules of personal hygiene i.e., not washing hands before eating and after returning from playgrounds or after contact with animals,
- lack of deworming of dogs and cats,
- avoiding protection of sandboxes and playgrounds from cats and dogs,
- avoiding collecting of animal droppings from public areas (parks, sidewalks, lawns),
- lack of regular changing of sand in sandboxes,
- nail-biting by children,
- consuming food by children in playgrounds,
- consuming raw or half-cooked meat,
- avoiding washing of toys after their being used by children in playgrounds.

Apart from protozoa and intestine parasites also arthropods can be a reservoir of viruses and pathogenic bacteria. Lyme borreliosis is one of the dangerous diseases transmitted by arthropods. Infection occurs during direct contact of a tick containing spirochetes of Borrelia burgdorferi with child's skin, which can result in the development of Lyme borreliosis [4-6].

The Act of the 5th of December 2008 on the Prevention and Fighting Infections and Infectious Diseases in People (published in the Journal of Laws of 2008, No 234, item 1570, as amended) imposes the obligation to report parasitic diseases to Sanitary-Epidemiological Stations.

AIM

The aim of the study was to assess the state of knowledge of the extramural students of the Medical University of Lodz on the risk of children infection with developmental forms of parasites, which may occur in public playgrounds in summer. The study was based on surveys.

MATERIAL AND METHODS

Data from 200 randomly chosen students of extramural studies at the Medical University of Lodz (Public Health and Emergency Medicine Departments) comprised the material for the study.

Diagnostic opinion poll with the use of an anonymous survey previously validated on a random group of 18 students of the Department of Physiotherapy was applied. The questionnaire contained 26 questions, 3 of them were demographic questions and 23 were checking the respondents' knowledge regarding selected parasitic infection risks for children in public sandboxes, playgrounds and parks in summer.

Respondents filled out the survey themselves with no time limit after having read a short instruction, which was an integral part of the survey. The questions aroused no doubts of the students.

The responses were encoded and entered into electronic database of Microsoft Office Excel 2007 program. In order to perform statistical analysis these data were transferred into Stata/SE 12.1 for Windows program. The missing data were subjected to casewise deletion. To verify the statistical hypotheses the x^2 independence test for two- and polytomous variables data was used. Results were found statistically significant at a level of $p<0.05$.

RESULTS

Two hundred randomly chosen students of Medical University of Lodz, including 117 women (58.5%) and 83 men (41.5%) participated in the survey. Most respondents were younger than 30 years – 152 (76%), including 91 women (45.5%) and 61 men (30.5%); students older than 30 and younger than 40 years constituted 40 (20%) respondents, whereas persons older than 40 years comprised only 8 (4%) respondents (Table 1).

TABLE 1. The study group characteristics in terms of gender and age.

Gender	Age (years)						Total	
	≤30		30-40		>40			
	n	%	n	%	n	%	n	%
Females	91	45.5	21	10.5	5	2.5	117	58.5
Males	61	30.5	19	9.5	3	1.5	83	41.5
Total	152	76.0	40	20.0	8	4.0	200	100.0

Students from big cities (45%), including 24.5% women and 20.5% men comprised the largest group of respondents. The second group covered students from small cities – 35.5%, including 22.5% women and 13% men. Respondents living in rural areas constituted the smallest group of 19.5%, including 11.5% women and 8% men (Table 2). Level of knowledge of Medical University of Lodz students on the risk of infection with parasites, which may occur in sandboxes, playgrounds, parks and lawns was evaluated according to sex and place of residence (city with more than 100,000 inhabitants, small city and rural areas under 5,000 inhabitants).

TABLE 2. Characteristics of the study group according to gender and place of residence.

Gender	Residence						Total	
	Big city BC		Small town ST		Rural area RA			
	n	%	n	%	n	%	n	%
Females	49	24.5	45	22.5	23	11.5	117	58.5
Males	41	20.5	26	13.0	16	8.0	83	41.5
Total	90	45.0	71	35.5	39	19.5	200	100.0

While comparing the respondents' answers to Question no.1 on the common occurrence of parasitic diseases in humans according to the place of living, inhabitants of big cities – 60 (66.7%) were most frequently familiar with this problem. The inhabitants of small towns – 38 (53.5%) were less familiar with the problem and inhabitants of rural areas – 18 (46.2%) had the smallest knowledge (differences statistically significant p=0.019). While answering Question no. 2 on the risk of infection with intestine parasites in children in 5 different places of children's activities, the respondents most frequently chose answer no. 3 (public sandboxes, greens, lawns and playgrounds). Inhabitants of small towns recognized this source of infection most frequently (41.4%); the respondents from big cities – less frequently (39.0%) and the respondents from rural areas recognized it least frequently (33.7%) (NS). According to the respondents, pre-school children suffer from intestinal parasitic diseases most commonly because they do not always obey the rules of personal hygiene – they forget about washing hands after using bathroom and after returning home from backyards: 40.5% of respondents from the rural areas, 40.3% from big cities and 35.6% from small towns (Question no. 3 – NS). Most of the enquired students knew that animal faeces left in the soil, lawns and public sandboxes could be the basic source of zoonotic diseases (transmitted from animals to humans). The correct answer was given by 70.4% respondents from small towns, 70.0% from big cities and 66.7% from the rural areas (Question no. 4 – NS). Similarly, definite majority of respondents were aware of the fact that public sandboxes could be a source of parasitic ova and larvae. The correct answer to Question no. 5 was most frequently given by 82.2% respondents from big cities, 74.6% from small towns and 71.8% from the rural areas (NS). Approximately half of the respondents knew that children infected with parasites could leave parasites' ova and larvae in backyards: 42.2% students from big cities, 46.5% from small towns and 56.4% from the rural areas (Question no. 6 – NS)

While comparing the answers to the question: "Which parasites can children playing in sandboxes get infected with?", the respondent students pointed to – dog roundworm and feline roundworm (*Toxocara canis, Toxocara cati*): 31.0% from big cities, 27.3% from small towns and 25.6% from rural areas (Question no. 7 – NS). Most commonly the respondents thought that children could get infected with parasites while playing in sandboxes, playgrounds, etc. through dirty hands (sucking fingers, nail-biting) – 28.3% respondents from small towns pointed to this route of infection, 26.3% from big cities and 25.0% – from the country (Question no. 8 – NS). Most frequently, students considered dogs (32.5%) and cats (32.5%) as major carriers of developmental forms of parasites, which can cause parasitic diseases in children. Students from big cities chose mainly dogs 35.1%, whereas students from the country – cats 36.3% (Question no. 9 – NS).

When asked about symptoms of oxyuriasis, the respondents most commonly chose the answer no. 3 (scratching the perianal area by the infected child because of itching sensations): 46.3% respondents from big cities, 36.8% from a small town and 36.7% from the rural area (Question no. 10 – NS). As far as Question 11 is concerned, more than half of the respondents selected the answer no.1 (stool examination for worm eggs) as a diagnostic test for oxyuriasis in children: 61.2% of persons from big cities, 56.1% from small towns and 54.4% from the country (NS).

More than half of the students were not acquainted with the fact that a child could get infected with lambliosis while playing in a sandbox, playground lawns. The answer "YES" was given by only 46.2% of the respondent students from the country, 42.3% from small towns and still fewer, i.e. 35.5% from big cities (Question no. 12 – NS). As regards Question no. 13 concerning symptoms associated with lambliosis, the respondents most frequently chose "nausea, abdominal pains (often after eating), and loss of appetite": 47.0% from small towns, 46.3% from the country and only 40.5% from big cities (NS).

While answering Question no. 14: "Could cats' droppings containing *Toxoplasma gondii* oocysts be the cause of toxoplasmosis as a result of contact with food, soil or water?", the proper answer was given by approximately 2/3 of the respondents: 67.8% of respondents from big cities, 64.8% – from small towns and 64.1% – from the country (NS). Less than 1/3 of the respondents were able to identify clinical symptoms, which could occur in the course of acquired toxoplasmosis, i.e. "enlargement of lymph nodes, liver and spleen". Those symptoms were recognized by only 32.1% of the respondents from big cities, 30.3% – from the country and 26.0% – from small towns (Question no. 15 – NS). Similarly, fewer than half of respondent students were acquainted with the fact that a child could get infected with toxoplasmosis after consumption of rare or raw meat (pork, beef, poultry) containing developmental forms of the parasite: 42.3% small town respondents, 41.0% – from the country and 40.0% – from big cities (Question no. 16, p=0.018).

While answering Question no. 17, more than half of the respondents had the knowledge of the fact that soil and food contaminated with dogs' or cats' faeces or infected animals themselves could be the sources of infestation with *Toxocara sp* which causes toxocariasis. That answer was most frequently chosen by respondents from big cities – 58.9%, less frequently by those from small towns – 52.1% and from the country – 51.3% (NS). Fewer than half of the respondents were acquainted with the clinical symptoms, which can be associated with toxocariasis (abdominal complaints, headaches, rash and cough); the proper answer was given by 44.0% of students from the country, 39.4% – from big cities and 37.3% from small towns (Question no. 18 – NS).

The knowledge of the preventive means to control spreading of zoonotic diseases in children in pre-school age was at a low level in the respondents. Most frequently, students chose the answer no. 1 (periodic deworming of dogs and

cats 4 times a year with preparations recommended by veterinary physicians): 13.4% of respondents from the country, 12.6% from small towns and 12.0% of students from big cities. They also selected the answer no. 6 (washing hands before eating and after playing in playgrounds, working in the garden and after contact with animals): 13.1% of students from small towns, 12.3% – from big cities and 10.8% – from the country (Question no. 19 – NS).

As much as 82.0% of students from the country, 73.2% – from small towns and 60.0% from small towns owned pets. The respondents from the country areas owned dogs and cats significantly more frequently than their colleagues from big cities and small towns (Question no. 20, p=0.029). Respondents from small towns (39.4%) declared that they clean pets' faeces regularly significantly more frequently than students from big cities (26.7%) and those from the country area (20.5%) (Question no. 21, p=0.018).

A large part of the respondents knew that Lyme borreliosis, babesiosis and tick-bone encephalitis could be transmitted by ticks. The correct answer to that question was given by 92.2% respondents from big cities, 87.3% – from small towns and 84.6% – from the country (Question no. 22 – NS). Approximately1/3 of the respondents from big cities chose "protecting the body with appropriate clothing (long sleeve shirts, trousers, shoes), particularly in a wooded area" as a protective means against extension of diseases transferred by ticks: 33.6% of students from big cities, 33.1% – from small towns and 29.4% from the country area (Question no. 23 – NS).

Results of the survey are presented in Figure 1 and 2 as comparisons of correct answers to yes/no questions or most frequent answers to multiple-choice questions.

Analysis of responses given by the students to 23 questions included in the survey according to the respondents' sex demonstrated that 21 answers showed no statistically significant differences between males and females (NS). Answers to Questions 20 and 21 showed statistically significant differences between males and females. Analysis of answers to Question no. 20 showed that females 90 (76.9%) owned dogs or cats more often than males 48 (57.8%) (p=0.004). While answering Question no. 21, forty two women (35.9%) and 18 men (21.7%) reported cleaning always their dogs' or cats' droppings. Forty-two ((35.9%) women and 45 (54.2%) men had never cleaned their pet wastes (p=0.026) (Figure1).

Analysis of answers given by the students to 23 questions included in the questionnaire, conducted according to the place of living, showed no statistically significant differences among inhabitants of big cities, small towns and the country areas (fewer than 5,000 inhabitants) in 19 answers (NS); whereas statistically significant differences were noted in 4 answers, i.e. given to Questions no. 1, 16, 20 and 21.

DISCUSSION

Parasitic diseases, which include giardiasis, toxoplasmosis, toxocariasis, oxyuriasis, ascariasis among others, are considered as significant infectious diseases in Poland. The Act of December 5th 2008 on Prevention and Combating Infections and Infectious Diseases in People reflects the rank of this problem [6]. Reports on studies assessing the level of knowledge of the society regarding risks of infections with parasites that occur in the natural environment have not been available in the literature so far. However, reports concerning the following problems have been published:

- contamination of soil, sandboxes, playgrounds, parks in cities and rural areas with parasites [1,2],
- occurrence of intestine parasites and disease symptoms in children and epidemiology of these diseases [3-12].

Examination of soil conducted in 1998 in Kraków and suburban villages – Grodkowice and Łężkowice (approximately 20 km eastward) by the Chair of Biology and Nature Conservation, Academy of Physical Education in Poznań demonstrated the presence of *Toxocara* spp eggs in soil. In the area of Kraków *Toxocara* spp eggs were found in 30% of samples (25% of soil samples from urban backyards and 5% of samples from parks). In the area of Grodkowice, contamination with *Toxocara* spp eggs was found in 11% of samples and in 5% from Łężkowice [7].

Studies on contamination of playgrounds with parasites' eggs and their presence in dogs' and cats' faeces were conducted in Gdańsk in 2002-2004. Rokicki et al. examined 162 samples of sand from 3 sandboxes, among which in 3 parasites ova were found. Fifty-four samples of cats' and

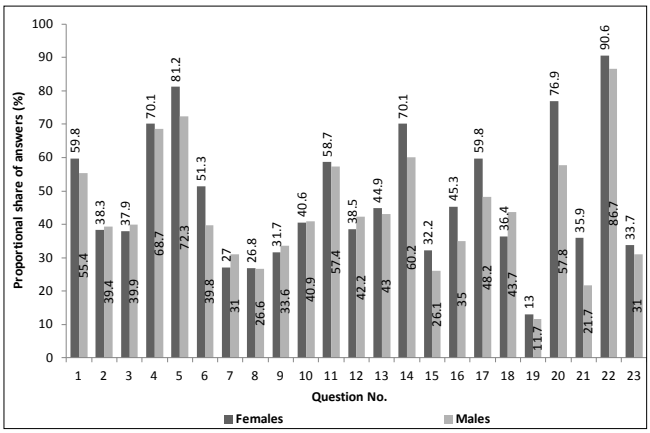

FIGURE 1. The proportional share of correct responses given to single choice questions and responses the most often selected from multiple choice questions with the repartition of respondents on the sex.

* – means statistically significant difference at p<0.05

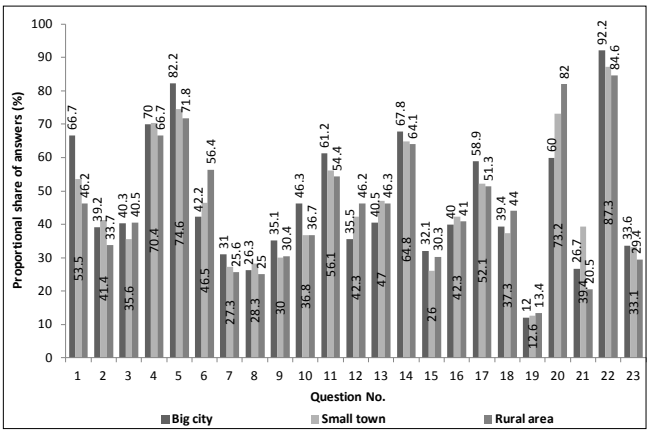

FIGURE 2. The proportional share of correct responses given to single choice questions and responses the most often selected from multiple choice questions with the repartition of respondents on the residence.

* – means statistically significant difference at p<0.05

dogs' faeces drawn from 3 sandboxes were also examined. Presence of parasites was discovered in 23 (46.2%) samples. *Toxocara* spp dominated in 10 (6.2%) samples of sand and in 6 (11%) samples of the examined faeces. Presence of *Toxocaris leonina, Uncinarisa stenocephala, Ancylostoma caninum, Giardia intestinalis* and *Dipylidium caninum* were also noted [8].

Between 2000 and 2005, Mizgajska-Wiktor and Jarosz compared contamination of soil with T*oxocara canis, Toxocara cati* and *Toxocara* spp eggs in Poznań and in 3 villages of Wielkopolska Province: Grzebienisko, Kołaczków and Lusowo. In the area of Poznań, 368 samples of soil were drawn from backyards and recreational areas in spring and autumn of 2002 and 2005 and were tested for presence of parasites ova. In 2000-2002, 538 samples of soil were drawn from backyards and recreational areas in rural areas. Contamination of soil with parasite eggs was greater in Poznań (19.8%) than in Grzebienisko, Kołaczków and Lusowo villages (15.6%). Both in the urban environment and in rural areas most ova occurred in soil of house backyards. Soil in city backyards was most frequently contaminated with *Toxocara cati* ova (96.4-97.7%), whilst soil in rural areas – with *Toxocara canis* ova (69.8-93.2%) [9].

Apart from assessing the level of contamination of soil with parasite eggs, research on the occurrence of intestinal parasites in children has also been conducted in Poland. The Department of Medical Parasitology and the Department of Medical Statistics, National Department of Hygiene have conducted analysis of the occurrence of intestinal parasitic diseases in 7-year-old children every 5 years since 1988. Taking statistical data into account, occurrence of intestinal parasites has decreased in years 1992-93, 1997-98, 2002-03 to 13,605 (22.6%), 6,489 (21.55%) and 4,584 (14.55%), respectively. The most common parasites in children were *Enterobius vermicularis* (18.4%, 16.45% and 12.15%, respectively), *Ascaris lumbricoides* (0.85%, 2.8%, and 0.83%, respectively) and *Giardia intestinalis* (1.56%, 1.02% and 0.69%, respectively). The highest percentage of infected children was found in the period 2002-2003 in the Provinces of Warmia-Masuria (29.6%) and Lublin (20.8%), whereas it was the lowest in the Provinces of Silesia (8.8%) and Lubuskie (8.9%). Infections with intestine parasites in 2002-2003 were most common in children in cities and villages of Warmia-Masuria Province (19.7% and 41.1%, respectively), West Pomerania Province (16.3% and 26.6%, respectively) and Podlasie Province (14.3% and 17.6%, respectively). In 2002-2003 Polish children were most frequently infected with the following intestinal parasites:

1. *Enterobius vermicularis*: mostly in Warmia-Masuria Province (613 children), Lublin Province (484 children) and Mazovia Province (423 children); least frequently in Opole (84 children) and Lubuskie Provinces (91 children);
2. *Ascaris lumbricoides*: most frequently noted in Świętokrzyskie (82 children), Podkarpacie (71 children) and Małopolska Provinces (54 children); no infections in 4 Provinces – Łódź, Warmia-Masuria Wielkopolska and West Pomerania;
3. *Giardia intestinalis*: most frequently observed in the Provinces of Wielkopolska (70 children), Mazovia (48 children), and Lower Silesia (20 children), no infections were noted in Opole Province [1].

Cats' faeces left in public places may also be a source of protozoa *Toxoplasma gondii* infection, especially in the form of invasive oocyst. Infection with these protozoa of people at any age is common in Poland and worldwide. To prevent *Toxoplasmosis versatile* preventive means to control the possibility of the protozoa's expansion should be undertaken [10].

Infection with borreliosis caused by *Borrelia burgdorferi* spirochete, which is transferred on children and animals by ticks (in Poland *Ixodes ricinus* and *Ixodes persulcatus*) may occur after playing in parks and lawns. Prevention of borreliosis is based on non-specific methods only that include avoiding exposure to ticks and using repellants, that is substances deterring ticks [11,12].

Apart from actions of regular deworming of dogs and cats, also widespread education concerning prevention of parasitic diseases, particularly conducted among parents of pre-school and school children, pregnant women and blood donors seems necessary to reduce the prevalence of zoonoses, especially in children.

CONCLUSIONS

1. Respondents' knowledge on the risk of infection with developmental forms of parasites during activities in sandboxes, parks and squares was on average at a low level, despite their being medical university students.
2. Respondents presented low awareness of preventive means to control the expansion of parasitic diseases.
3. Female students, who often owned domestic animals (dogs and cats), were more aware of the dangers caused by faeces in public playgrounds than their male colleagues, since they cleaned their animals' faeces more frequently.
4. Respondents from the country areas more frequently owned cats and dogs than inhabitants of big cities and small towns; however they were characterized by lower awareness than their colleagues, since they cleaned their animals' faeces significantly less frequently.
5. Respondents from the country areas had worse knowledge regarding the possibility of getting infected with toxoplasmosis after consumption of rare and raw meat in children than the respondents from big cities and small towns, despite the fact they more frequently contacted with various livestock and their slaughter.

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