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KNOWLEDGE AND ATTITUDES OF VETERINARY STUDENTS IN SERBIA TOWARD FARM ANIMAL WELFARE

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Abstract

In this study, veterinary students from the Faculty of Veterinary Medicine, University of Belgrade and Department of Veterinary Medicine, Faculty of Agriculture, University of Novi Sad were surveyed to evaluate their knowledge and attitudes toward farm animal welfare. Data were collected from 431 students by survey consisting of 39 closed-ended questions divided into two parts (demographic characteristics and a five-point Likert scale). Results showed that female students, students aged 18 to 21 years, from veterinary high schools, from urban areas, with mixed diets, who own pets, were predominated. Younger students and students from the Faculty of Veterinary Medicine, University in Belgrade agree significantly higher ($p<0.001$) that animal welfare is necessary for sustainable agriculture, food safety, biological functioning, emotional state, and natural behavior, as well as zootechnical procedures and rearing systems impairing the welfare of farm animals compared with students of the final year of studies, and from Department of Veterinary Medicine, Faculty of Agriculture in Novi Sad. Female students, and younger students, from urban areas, who own pets, have more concerned attitudes regarding farm animal welfare ($p<0.001$). The findings of this study confirm that attitudes toward farm animal welfare are not homogeneous and are associated with students' demographic char-

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acteristics. Also, results suggest that more attention should be paid to the curriculum and program to indirectly improve the welfare of farm animals.

Keywords: attitudes, farm animals, students, welfare

ZNANJE I STAVOVI STUDENATA VETERINE U SRBIJI PREMA DOBROBITI FARMSKIH ŽIVOTINJA

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Kratak sadržaj

U ovom istraživanju, student veterine sa Fakulteta veterinarske medicine, Univerziteta u Beogradu i Departmana za veterinarsku medicine, Poljoprivrednog fakulteta Univerziteta u Novom Sadu su anketirani kako bi se ispitalo znanje i stavovi o dobrobiti farmskih životinja. Podaci su prikupljeni od 431 studenata anketom koja se sastojala od 39 pitanja zatvorenog tipa podeljenih u dva dela (demografski podaci i Likertova skala). U istraživanju su dominirali student ženskog pola, studenti od 18 do 21 godine, poreklom iz srednjih veterinarskih škola, iz urbane sredine, sa mešovitom ishranom i koji poseduju kućnog ljubimca. Mlađi studenti i studenti Fakulteta veterinarske medicine Univerziteta u Beogradu se značajno više ($p<0.001$) slažu da je dobrobit životinja bitna za održivu poljoprivredu, bezbednost hrane, emotivno stanje životinja, prirodno ponašanje, kao i da zootehničke procedure i sistem gajenja životinja narušavaju dobrobit farmskih životinja u poređenju sa studentima starijih godina i studentima Departmana za veterinarsku medicine, Poljoprivrednog fakulteta Univerziteta u Novom Sadu. Studenti ženskog pola, mlađi studenti, studenti iz urbanih sredina, koji poseduju kućnog ljubimca imaju zabrinutije stavove o dobrobiti farmskih životinja u odnosu na ostale studente ($p<0.001$). Rezultati ovog istraživanja potvrđuju da stavovi prema dobrobiti farmskih životinja nisu homogeni i da su povezani sa demografskim karakteristikama. Takođe, rezultati sugerišu

da bi više pažnje trebalo posvetiti nastavnom planu i programu kako bi se indirektno poboljšala dobrobit domaćih životinja.

Ključne reči: stavovi, farmske životinje, studenti, dobrobit

INTRODUCTION

Public opinion is the strongest driving force for improving animal welfare, but veterinarians are expected to adequately present the problem of breeding farm animals based on scientific facts, taking into account animal welfare. In addition to the multitude of scientific studies that have been conducted in recent decades, increasing public concern has led to stricter legislation on the conditions of farm animal breeding.

Public concern about animals used by humans is not a new phenomenon and has increased significantly over the last century. This began with the British Animal Welfare Acts of the nineteenth century (Buller et al., 2018), continued with the publication of Ruth Harrison's book "Animal Machines" in 1964, and was followed by the development of philosophical arguments in defense of animal welfare (Singer, 1975) and animal rights (Regan, 1985). As the veterinary profession has increasingly focused on animal welfare, scientific interest in the attitudes of veterinarians and veterinary students towards animals has increased, as they can influence public opinion on animal welfare. For example, entire systems of animal production are now considered unacceptable if they are adverse to animal welfare (Ryan, 1997).

Considering the physiological and behavioral needs of animals at the state level, changes in the educational and legislative system can positively impact the improvement of welfare. Students, especially those in veterinary medicine, agriculture, and natural sciences represent future generations of professionals who will closely collaborate with stakeholders in the animal industry, thus influencing how animals will be bred and treated (Phillips et al., 2012). Understanding the attitudes of students toward animals and their knowledge of their welfare is crucial. Analyzing these variables in samples of veterinary medicine students could lead to a better understanding of how future veterinarians perceive the welfare of different species, which should be a prerequisite for successfully enhancing animal welfare (Pirrone et al., 2019)

Veterinary medicine students have an ethical and professional obligation to respect, preserve, and improve animal welfare. In Serbia, veterinarians take a professional oath of allegiance, pledging to use their skills and knowledge for the benefit of animal health and welfare. The attitudes of veterinarians toward

animal welfare stem, at least partially, from their training (Crook, 2000), and veterinary students are expected to demonstrate a high level of professional interest in animal welfare. Therefore, understanding the perspectives, attitudes, and perceptions of students on these issues is fundamental, as they can serve as an indirect measure of educational adequacy and effectiveness (Heleski et al., 2005). Resolving animal welfare issues on farms is not simple, as it involves many aspects of a complex nature. The purpose of this study was to determine the knowledge and attitudes of veterinary students in Serbia toward farm animal welfare.

MATERIAL AND METHODS

The study protocol was approved by the Animal Ethical Committee of the Faculty of Veterinary Medicine, University of Belgrade, Serbia (Approval number, 03-12/2022).

During the period from December 2022 to January 2023 a total of 431 students from the Faculty of Veterinary Medicine, University of Belgrade (FVM) and the Department of Veterinary Medicine, Faculty of Agriculture, University of Novi Sad (DNS), were surveyed online using the Google Forms platform. The research covered students from all years of the integrated academic program. Participants were informed that participation in the survey was voluntary and anonymous and that the survey results would be used for scientific research and animal welfare improvement.

The survey consisted of 39 closed-ended questions divided into two parts. The first group of questions related to the demographic characteristics of the respondents (gender, age, education level, area of residence, dietary habits, pet ownership, farm animal ownership, year of study and study location). The second part of the survey contained a series of fifteen statements presented using a five-point Likert scale (1 - strongly disagree to 5 - strongly agree), where higher numbers indicated a higher level of empathy between students towards farm animals (Ostović et al., 2016). The survey focused on the welfare of farm animals in Serbia.

Statistical analysis

For statistical data analysis SPSS v17.0 software was used. To determine the frequency of students' responses and their attitudes, the mean value ($\bar{x}$) and standard error (SE) were calculated from the Likert scale. The differences in attitudes between different demographic characteristics of students as well as

different study years were analyzed using the nonparametric Mann-Whitney U-test and Kruskal-Wallis test on the equality of the medians, adjusted for ties. When significant differences were found, the Dunn-Bonferroni post hoc test was performed. The level of significance for which results were considered statistically significant in these studies was set at $p<0.05$.

RESULTS

The demographic characteristics of the respondents (gender, age, education level, area of residence, dietary habits, pet ownership, farm animal ownership, year of study and study location) are present in Table 1. As shown in Table 1, predominated the female students (73.09% - 315/431), aged 18 to 21 years (48.26% - 208/431), from veterinary high schools (46.40% - 200/431), and urban areas (78.42% - 338/431). Students who consume mixed diet were the most represented (89.56% - 386/431), those who have pets (86.77% - 374/431), and those who do not own farm animals.

Table 1. Demographic characteristics of students from the Faculty of Veterinary Medicine, University of Belgrade (FVM), and the Department of Veterinary Medicine, Faculty of Agriculture, University of Novi Sad (DNS)

Demographic characteristic		Faculty					
		FVM (n=357)		DNS (n=74)		Total (n=431)	
		N	%	N	%	N	%
Gender	Male	90	25.21	17	22.97	107	24.83
	Female	262	73.39	53	71.62	315	73.09
	Other	5	1.40	4	5.41	9	2.09
Age	18-21	175	49.02	33	44.59	208	48.26
	22-24	110	30.81	30	40.54	140	32.48
	Over 24	72	20.17	11	14.86	83	19.26
Education	Gymnasium	121	33.89	35	47.30	156	36,19
	Veterinary school	177	49.58	23	31.08	200	46.40
	Other	59	16.53	16	21.62	75	17.40
Living area	Urban	286	80.11	52	70.27	338	78.42
	Rural	71	19.89	22	29.73	93	21.58

Demographic characteristic		Faculty					
		FVM (n=357)		DNS (n=74)		Total (n=431)	
Diet	Mixed	317	88.80	69	93.24	386	89.56
	Vegetarian	32	8.96	4	5.41	36	8.35
	Vegan	8	2.24	1	1.35	9	2.09
Pet ownership	Yes	312	87.39	62	83.78	374	86.77
	No	45	12.61	12	16.22	57	13.23
Farm animal ownership	Yes	89	24.93	24	32.43	113	26.22
	No	268	75.07	50	67.57	319	74.01
Year of study	I	86	24.09	23	31.08	109	25.29
	II	66	18.49	6	8.11	72	16.71
	III	50	14.01	7	9.46	57	13.23
	IV	45	12.61	10	13.51	55	12.76
	V	47	13.17	8	10.81	55	12.76
	VI	63	17.65	20	27.03	83	19.26

Female students from FVM and DNS were the most present (73.39% - 262/357; 71.26% - 53/74), as well as students aged 18 to 21 years (49.58% - 177/357; 43.24% - 32/74), with mixed diet (88.80% - 317/357; 93.24% - 69/74), from gymnasium (49.58% - 177/357) and veterinary high school (47.30% - 35/74), students who own pets (87.39% - 312/357; 83,78% - 62/74), and those who do not own farm animals (75.07% - 268/357; 67.57% - 50/74) (Tables 2 and 3).

Table 2. Demographic characteristics of students from the Faculty of Veterinary Medicine, University of Belgrade (FVM)

FVM / year of study		I (n=86) N (%)	II (n=66) N (%)	III (n=50) N (%)	IV (n=45) N (%)	V (n=47) N (%)	VI (n=63) N (%)	Total (n=357) N (%)
Gender	Male	14 (16.28)	19 (28.79)	10 (20)	10 (22.22)	15 (31.91)	22 (34.92)	90 (25.21)
	Female	72 (83.72)	46 (69.70)	39 (78)	34 (75.56)	32 (68.09)	39 (61.90)	262 (73.39)
	Other	0	1 (1.52)	1 (2)	1 (2.22)	0	2 (3.17)	5 (1.40)
Age	18-21	85 (98.84)	61 (92.42)	28 (56)	3 (6.67)	0	0	177 (49.58)
	22-24	0	5 (7.58)	18 (36)	34 (75.56)	37 (78.72)	16 (25.40)	110 (30.81)
	over 24	3 (3.49)	0	4 (8)	8 (17.78)	10 (21.28)	47 (74.60)	72 (20.17)
Education	Veterinary school	30 (34.88)	27 (40.91)	15 (30)	13 (28.89)	15 (31.91)	21 (33.33)	121 (33.89)
	Gymnasium	41 (47.67)	29 (43.94)	27 (54)	22 (48.89)	23 (48.94)	35 (55.56)	177 (49.58)
	Other	15 (17.44)	10 (15.15)	8 (16)	10 (22.22)	9 (19.15)	7 (11.11)	59 (16.53)
Diet	Mixed	80 (93.02)	52 (78.79)	45 (90)	37 (82.22)	43 (91.49)	60 (95.24)	317 (88.80)
	Vegetarian	4 (4.65)	12 (18.18)	4 (8)	6 (13.33)	3 (6.38)	3 (4.76)	32 (8.96)
	Vegan	2 (2.33)	2 (3.03)	1 (2)	2 (4.44)	1 (2.13)		8 (2.24)
Pet ownership	Yes	80 (93.02)	62 (93.94)	38 (76)	42 (93.33)	38 (80.85)	52 (82.54)	312 (87.39)
	No	6 (6.98)	4 (6.06)	12 (24)	3 (6.67)	9 (19.15)	11 (17.46)	45 (12.61)
Farm animal ownership	Yes	20 (23.26)	20 (30.30)	10 (20)	11 (24.44)	8 (17.02)	20 (31.75)	89 (24.93)
	No	66 (76.74)	46 (69.70)	40 (80)	34 (75.56)	39 (82.98)	43 (68.25)	268 (75.07)

Based on the overall mean values (Table 4), veterinary students in Serbia agree that animal welfare is necessary for sustainable agriculture, food safety, biological functioning, the emotional state of animals, and natural behavior. However, older students as well as DNS students agreed significantly less ($p<0.001$, $p<0.05$) with the above statements compared to younger students and FVM students (Table 4).

Table 3. Demographic data of students from the Department of Veterinary Medicine, Faculty of Agriculture, University of Novi Sad (DNS)

DNS / year of study		I (n=23) N (%)	II (n=6) N (%)	III (n=7) N (%)	IV (n=10) N (%)	V (n=8) N (%)	VI (n=20) N (%)	Total (n=74) N (%)
Gender	Female	15 (65.22)	4 (66.67)	4 (57.14)	8 (80)	7 (87.50)	15 (75)	53 (71.26)
	Male	4 (17.39)	2 (33.33)	3 (42.86)	2 (20)	1 (12.50)	5 (25)	17 (22.97)
	Other	4 (17.39)	0	0	0	0	0	4 (5.41)
Age	18-21	22 (95.65)	6 (100)	4 (57.14)	0	0	0	32 (43.24)
	22-24	1 (4.35)	0	3 (42.86)	10 (100)	7 (87.50)	10 (50)	31 (41.89)
	over 24	0	0	0	0	1 (12.50)	10 (50)	11 (14.86)
Education	Veterinary school	8 (34.78)	4 (66.67)	5 (71.43)	4 (40)	7 (87.50)	7 (35)	35 (47.30)
	Gymnasium	9 (39.13)	1 (16.67)	1 (14.29)	2 (20)	1 (12.50)	9 (45)	23 (31.08)
	Other	6 (26.09)	1 (16.67)	1 (14.29)	4 (40)	0	4 (20)	16 (21.62)
Diet	Omnivores	22 (95.65)	6 (100)	7 (100)	10 (100)	7 (87.50)	17 (85)	69 (93.24)
	Vegetarian	1 (4.35)	0	0	0	1 (12.50)	3 (15)	5 (6.76)
	Vegan	0	0	0	0	0	0	0
Pet ownership	Yes	21 (91.30)	5 (83.33)	6 (85.71)	6 (60)	8 (100)	16 (80)	62 (83.78)
	No	2 (8.70)	1 (16.67)	1 (14.29)	4 (40)	0	4 (20)	12 (16.22)
Farm animal ownership	Yes	6 (26.09)	3 (50)	4 (57.14)	2 (20)	3 (37.50)	6 (30)	24 (32.43)
	No	17 (73.91)	3 (50)	3 (42.86)	8 (80)	5 (62.50)	14 (70)	50 (67.57)

Table 4. Mean values (±SE) of student attitudes regarding the role of animal welfare in agricultural sustainability, food safety, biological functioning, emotional state, and expression of natural behaviors

Year of study / Questions		I	II	III	IV	V	VI	In total
I	FVM	4.61±0.0^{9***}	4.44±0.10	4.44±0.11	4.37±0.13	4.38±0.13	4.32±0.14***	4.43±0.04
	DNS	3.98±0.15	4.50±0.22	4.43±0.30	4.30±0.21	4.63±0.18	3.83±0.17	4.28±0.13
	Total	4.63±0.06$^{ab\ CdE}$	4.44±0.10^{a}	4.44±0.10^{b}	4.36±0.10^{C}	4.42±0.11^{d}	4.33±0.11^{E}	4.44±0.04
II	FVM	4.78±0.06	4.76±0.06	4.62±0.09	4.64±0.12	4.51±0.14	4.60±0.11	4.65±0.04
	DNS	4.87±0.10	4.33±0.33	5.00	4.60±0.22	5.00	4.75±0.16	4.76±0.11
	Total	4.79±0.05	4.72±0.06	4.67±0.08	4.64±0.10	4.58±0.12	4.64±0.09	4.67±0.03
III	FVM	4.72±0.07	4.61±0.08	4.76±0.08	4.69±0.09	4.57±0.12	4.71±0.09	4.68±0.03
	DNS	4.35±0.22	4.00±0.63	4.86±0.14	4.50±0.34	4.88±0.13	4.65±0.18	4.53±0.11
	Total	4.64±0.07	4.56±0.09	4.77±0.07	4.66±0.09	4.62±0.11	4.70±0.08	4.65±0.03
IV	FVM	4.77±0.06	4.77±0.09	4.98±0.02	4.82±0.07	4.77±0.10	4.73±0.11	4.83±0.03
	DNS	4.52±0.20	5.00	5.00	4.80±0.20	5.00	4.70±0.22	4.74±0.09
	Total	4.73±0.06	4.79±0.09	4.98±0.02	4.82±0.06	4.80±0.09	4.72±0.10	4.81±0.03
V	FVM	4.68±0-06*	4.64±0-10	4.88±0-07^{A}	4.89±0-05	4.43±0-14^{b}	4.67±0.10^{Ab}	4.72±0.04
	DNS	4.39±0.19	4.50±0.34	4.86±0.14	4.60±0.22	4.88±0.13	4.80±0.09	4.64±0.08
	Total	4.73±0.06	4.63±0.10	4.88±0-06^{A}	4.84±0-06^{b}	4.49±0.12^{Ab}	4.70±0.08	4.71±0.03

*** and capital letters - p<0.001; * and lowercase letters - p<0.05; an asterisk denotes significance between different faculties while letters denote significance within one faculty; I – Farm animal welfare role in sustainable agriculture, II – Farm animal welfare role in food safety and quality, III – Farm animal welfare role in biological functioning, IV – Farm animal welfare role in emotional state, V – Farm animal welfare role in expression of natural behaviors.

In Table 5 the results of the attitudes of students toward cognitive abilities in animals. Among first-year FVM students, the average values of attitudes regarding the awareness of farm animals were significantly higher (p<0.05; p<0.001) compared to the attitudes of first-year DNS students (Table 5). FVM, DNS, and first-year students believe that poultry is significantly less capable of thinking (p<0.05; p<0.001) compared to other farm animals (Table 5).

Table 5. Mean (±SE) of student attitudes regarding the cognitive abilities of farm animals

Year of study / Questions			I	II	III	IV	V	VI	In total
VI	Cattle	FVM	4.65±0.07***	4.38±0.13	4.66±0.09*	4.49±0.14*	4.53±0.10	4.44±0.14	4.53±0.05***
		DNS	4.13±0.20	4.67±0.21	4.14±0.26	3.70±0.37a	4.88±0.13a	4.40±0.28	4.27±0.12
		In total	4.54±0.07	4.40±0.12	4.60±0.09	4.35±0.14	4.58±0.08	4.43±0.12	4.49±0.04
	Pigs	FVM	4.56±0.07***	4.47±0.12	4.64±0.08	4.47±0.15	4.53±0.12	4.41±0.14	4.51±0.05*
		DNS	4.04±0.20	5.00	4.29±0.29	3.90±0.38	4.75±0.16	4.45±0.28	4.31±0.12
		In total	4.56±0.07	4.51±0.12	4.59±0.08	4.36±0.15	4.56±0.10	4.42±0.12	4.50±0.04
	Poultry	FVM	4.33±0.11**	4.06±0.14	4.30±0.13	4.20±0.18*	4.30±0.13	3.92±0.16	4.18±0.06*
		DNS	3.52±0.27a	4.17±0.40	3.86±0.40	3.40±0.34a	4.63±0.18a	4.10±0.30	3.86±0.14
		In total	4.16±0.11	4.07±0.13	4.25±0.12	4.06±0.16	4.35±0.12	3.96±0.14	4.13±0.05
	Sheep	FVM	4.57±0.09***	4.29±0.14	4.62±0.09*	4.47±0.14***	4.40±0.12	4.30±0.14	4.44±0.05***
		DNS	3.91±0.23a	4.50±0.34	4.00±0.38	3.60±0.34a	4.75±0.16e	4.30±0.28	4.12±0.13
		In total	4.43±0.03	4.31±0.10	4.54±0.05	4.31±0.07	4.46±0.03	4.30±0.02	4.39±0.05
	Goats	FVM	4.62±0.08*	4.35±0.13	4.62±0.09**	4.53±0.14*	4.47±0.12	4.32±0.14	4.48±0.05*
		DNS	4.00±0.23a	4.67±0.21b	4.00±0.37a	3.60±0.34a.b	4.88±0.13E	4.35±0.27	4.19±0.12
		In total	4.49±0.08	4.38±0.12	4.54±0.10	4.36±0.14	4.53±0.11	4.33±0.13	4.43±0.04
VII	Cattle	FVM	4.71±0.07	4.64±0.10	4.60±0.09	4.36±0.17	4.50±0.12	4.37±0.13	4.55±0.04
		DNS	4.48±0.13	4.67±0.21	4.14±0.44	4.20±0.47	4.88±0.13	4.20±0.30	4.39±0.12
		In total	4.66±0.06	4.64±0.09	4.54±0.10	4.33±0.16	4.55±.0.11	4.33±0.13	4.52±0.04
	Pigs	FVM	4.65±0.07	4.58±0.11	4.46±0.13	4.33±0.17	4.47±0.12	4.32±0.14	4.48±0.05
		DNS	4.30±0.18	4.83±0.17	4.14±0.45	4.00±0.47	4.88±0.13	4.20±0.30	4.32±0.13
		In total	4.59±0.07	4.60±0.10	4.42±0.12	4.27±0.16	4.53±0.10	4.29±0.13	4.46±0.05
	Poultry	FVM	4.38±0.11	4.24±0.12	4.37±0.15	4.04±0.18	4.26±0.16	3.97±0.16	4.22±0.06
		DNS	3.96±0.22	3.50±0.56	4.00±0.49	3.30±0.54	4.63±0.26	3.95±0.34	3.91±0.15
		In total	4.29±0.12	4.18±0.12	4.32±0.14	3.91±0.18	4.31±0.14	3.96±0.14	4.17±0.06
	Sheep	FVM	4.63±0.07	4.53±0.10	4.48±0.13	4.31±0.16	4.38±0.13	4.35±0.13	4.46±0.05
		DNS	4.44±0.16	4.50±0.34	4.14±0.46	4.00±0.47	4.88±0.13	4.10±0.30	4.31±0.13
		In total	4.59±0.07	4.53±0.10	4.44±0.12	4.26±0.16	4.46±0.11	4.29±0.13	4.41±0.05
	Goats	FVM	4.63±0.07	4.53±0.11	4.50±0.12	4.38±0.16	4.36±0.13	4.33±0.14	4.47±0.05
		DNS	4.48±0.15	4.50±0.34	4.14±0.45	4.00±0.47	4.88±0.13	4.10±0.30	4.32±0.13
		In total	4.59±0.06	4.53±0.11	4.46±0.12	4.31±0.16	4.44±0.12	4.28±0.13	4.45±0.05

*** and capital letters - p<0.001; * and lowercase letters - p<0.05; an asterisk denotes significance between different faculties while letters denote significance within one faculty; VI - Are animals sentient beings. VII - Do animals have feelings.

As shown in Table 6, first-year students and students of FVM significantly more ($p<0.05$; $p<0.001$) considered that zootechnical procedures and rearing systems impaired the welfare of farm animals compared to students of older years and students of DNS. FVM students in Serbia believed that dehorning cattle without anesthesia (4.49±0.05) and unenriched cage housing systems (4.37±0.05) most negatively influenced the welfare of farm animals.

Table 6. Mean (±SE) of student attitudes regarding zootechnical procedures on farms

Year of study / Questions		I	II	III	IV	V	VI	In total
VIII	FVM	4.60±0.08^{A**}	4.12±0.16A	4.38±0.15**	4.16±0.15A	3.72±0.18A	3.95±0.17A	4.11±0.06**
	DNS	3.87±0.26	4.00±0.26	3.43±0.30	3.80±0.39	3.88±0.23	3.60±0.30	3.78±0.13
	Total	4.46±0.09^{Aa}	4.11±0.14^{a}	4.26±0.14	4.09±0.14^{A}	3.74±0.16^{A}	3.87±0.15^{A}	4.05±0.06
IX	FVM	4.55±0.11$^{A\,a}$	4.36±0.14	4.56±0.13^{C}	4.38±0.13	4.13±0.16^{AC}	4.21±0.15$^{a\,c}$	4.38±0.06
	DNS	4.34±0.23	4.51±0.50	4.00±0.38	4.20±0.33	4.75±0.16	4.20±0.24	4.31±0.12
	Total	4.50±0.11^{A}	4.37±0.13	4.49±0.12	4.34±0.13	4.21±0.14^{A}	4.20±0.13^{A}	4.37±0.05
X	FVM	4.68±0.08^{A**}	4.41±0.14	4.32±0.16	4.33±0.16	4.04±0.17^{A}	3.95±0.18^{A}	4.32±0.06**
	DNS	4.00±0.28	3.83±0.65	4.42±0.30	3.80±0.44	4.00±0.46	3.90±0.32	3.96±0.15
	Total	4.53±0.09^{A}	4.36±0.14	4.33±0.15	4.24±0.15	4.04±0.16^{A}	3.94±0.15^{A}	4.26±0.06
XI	FVM	4.50±0.10^{A**}	4.09±0.14^{b**}	3.60±0.18^{Ab}	3.84±0.18^{A}	3.23±0.18^{Ab}	3.49±0.17^{Ab}	3.87±0.07*
	DNS	3.69±0.30	2.50±0.56^{c}	4.14±0.40^{c}	3.20±0.42	3.37±0.55	3.45±0.32	3.47±0.16
	Total	4.33±0.1.070^{A}	3.96±0.15^{ab}	3.67±0.17^{A}	3.73±0.17^{A}	3.26±0.18^{Ab}	3.48±0.15^{A}	3.80±0.06
XII	FVM	4.62±0.07^{A**}	4.00±0.16^{A}	3.58±0.20^{A}	3.82±0.18^{A}	3.74±0.19^{A}	3.89±0.16^{A}	4.01±0.06*
	DNS	3.74±0.27	3.67±0.61	3.43±0.48	3.40±0.42	3.63±0.53	3.70±0.30	3.64±0.15
	Total	4.44±0.09^{A}	3.97±0.15	3.56±0.18^{A}	3.74±0.17^{A}	3.73±0.17^{A}	3.84±0.14^{A}	3.95±0.06
XIV	FVM	4.81±0.06^{Aa**}	4.54±0.12	4.40±0.11	4.76±0.10^{d**}	4.17±0.16^{Ad}	4.32±0.15^{a}	4.53±0.05*
	DNS	4.08±0.25	4.33±0.66	4.85±0.14	4.00±0.37	4.63±0.26	4.30±0.23	4.28±0.13
	Total	4.66±0.08^{A}	4.53±0.12^{b}	4.45±0.11	4.62±0.11^{D}	4.23±0.14^{ADb}	4.31±0.13^{AD}	4.49±0.05
XV	FVM	4.65±0.07^{Aa***}	4.32±0.12	4.06±0.16^{A}	4.22±0.17^{a}	4.04±0.16^{A}	4.11±0.16^{A}	4.28±0.06***
	DNS	3.78±0.25	3.50±0.56	4.43±0.30	3.60±0.50	4.37±0.18	4.15±0.25	3.96±0.14
	Total	4.46±0.09^{A}	4.25±0.13	4.11±0.15	4.11±0.16	4.09±0.14^{A}	4.12±0.14	4.22±0.05

*** and capital letters - $p<0.001$; * and lowercase letters - $p<0.05$; an asterisk denotes significance between different faculties while letters denote significance within one faculty; VIII - tie-stall housing system without access to exercise is cruel, IX - conventional cage housing system of hens affect welfare, X – piglet castration without anesthesia affect welfare, XI - Teeth-clipping in piglets affect welfare. XII - tail docking in piglet affect welfare. XIV - dehorning cattle without anesthesia affects welfare. XV - tail docking in lambs affects welfare.

A statistically significant difference in attitudes was found between different demographic groups of students (Table 7). Female, and younger students significantly more ($p<0.001$) agree that animal welfare is essential for sustainable agriculture, food safety, biological functioning, emotional state, and natural behavior, as well as that zootechnical procedures and housing systems compromise the welfare of farm animals, compared to other students. Students aged 18 to 21, from veterinary and other high schools, from urban areas, who own pets, significantly more ($p<0.05$; $p<0.001$) believed that zootechnical procedures and housing methods compromise the welfare of farm animals compared to other students. A significant difference ($p<0.05$) in attitudes about zootechnical procedures and housing systems was found between FVM and DNS students. No significant difference was found between different demographic groups of students regarding the cognitive abilities of farm animals ($p>0.05$) (Table 7).

Table 7. Influence of student demographic characteristics on the role of animal welfare, cognitive abilities of animals, and zootechnical procedures on farms

Demographic characteristic		Role of animal welfare	Cognitive abilities of animals	Zootechnical procedures on farms
Gender	Female	4.77±0.02^{A}	3.630.03	4.34±0.04^{A}
	Male	4.49±0.06	3.51±0.07	3.57±0.10
Age	18-21	4.72±0.03	3.63±0.04	4.31±0.06^{a}
	22-24	4.67±0.05	3.56±0.04	4.08±0.0733^{a}
	over 24	4.68±0.06	3.57±0.062	3.99±0.10^{a}
Education	Gymnasium	4.62±0.05	3.57±0.05	3.91±0.08^{AB}
	Veterinary school	4.73±0.05	3.59±0.03	4.30±0.06^{B}
	Other	4.76±0.05	3.68±0.06	4.40±0.08^{A}
Living area	Urban	4.73±0.03^{A}	3.60±0.03	4.29±0.04^{A}
	Rural	4.57±0.06	3.57±0.06	3.74±0.11
Diet	Mixed	4.68±0.03^{ab}	3.58±0.03	4.12±0.05^{AB}
	Vegetarian	4.83±0.06^{a}	3.67±0.10	4.59±0.10^{B}
	Vegan	4.95±0.04^{b}	3.60±0.05	4.89±0.07^{A}
Pet ownership	Yes	4.72±0.03^{a}	3.62±0.03	4.21±0.05^{a}
	No	4.53±0.08	3.50±0.09	3.90±0.13
Farm animal ownership	Yes	4.60±0.06	3.63±0.06	3.78±0.10
	No	4.73±0.03^{a}	3.58±0.04	4.31±0.05^{A}
Year of study	I	4.74±0.04^{a}	3.62±0.04	4.49±0.07^{A}
	II	4.66±0.06	3.68±0.05	4.25±0.12^{b}
	III	4.79±0.04^{b}	3.62±0.08	4.13±.09^{A}
	IV	4.70±0.05	3.49±0.09	4.10±0.10^{A}
	V	4.59±0.08^{ab}	3.67±0.07	3.90±0.11^{Ab}
	VI	4.66±0.07	3.50±0.07	3.98±0.11^{A}
Place of study	FVM	4.70±0.03	3.60±0.03	4.23±0.05^{a}
	DNS	4.68±0.05	3.56±0.07	3.91±0.11

Capital letters - $p<0.001$; lowercase letters - $p<0.05$.

DISCUSSION

Teaching veterinary students does not only imply professional education but also plays a significant role in shaping and educating these professionals on how to deal with emotionally challenging aspects of veterinary work, as well as in developing their attitudes and opinions on animal welfare as the primary task of every veterinarian (Main et al., 2009). Veterinarians are expected to promote positive attitudes towards animals and advocate for their welfare (Hernandez et al., 2018). However, previous studies have shown that veterinary students' attitudes differ concerning animal species (Magnani et al., 2017; Mariti et al., 2018; Pirrone et al., 2019) and demographic data (Izmirli and Phillips, 2012; Pirrone et al., 2019). The results of this research are the first to address the attitudes of Serbian veterinary students towards the welfare of farm animals. Animal welfare is essential for sustainable agriculture (Keeling, 2005; Broom, 2021), food safety and quality (Viegas et al., 2011), biological functioning, emotional states, and expression of natural behaviors (Fraser, 2008; Mellor, 2016). In this study, veterinary students in Serbia agree that animal welfare is important for farm animals. However, first-year students consider animal welfare more critical for sustainable agriculture and food safety compared to older students, which is the line with the results of other researchers (Ostović et al., 2016). Animal welfare is a complex concept that includes three elements: the animal's normal biological functioning (health, productivity), its emotional state (absence or presence of pain, fear, boredom), and its ability to express certain normal behaviours (Fraser et al., 1997). Each of these elements has its own merits but none of them fully depict the animal's welfare independently; it cannot fully present the state of the animal welfare. Therefore, it is accepted that animal welfare encompasses all three areas: physical health, behavior and emotions (Duncan and Fraser, 1997; Mendl, 2001). In line with this, students in this study highly rated that animal welfare affects emotional states, biological functioning, and expression of natural behaviors. Scientific studies on veterinary students' attitudes towards animal welfare have been conducted at several British universities (Paul and Podberscek, 2000) and have shown a correlation between the year of study and students' feelings towards social and farm animals. Specifically, final-year students showed lower levels of empathy than those in the early years of study (Pollard-Williams et al., 2014). The results of this research are in line with the previous research that older students, as well as students from the Department of Veterinary Medicine, Faculty of Agriculture in Novi Sad, significantly less agreed with the statements about farm animal welfare and showed less empathy compared to younger students and students from the Faculty of Veterinary Medicine, Uni-

versity of Belgrade. The lower empathy for higher years of study seems counterintuitive regarding veterinary education. Physiology, anesthesia, pharmacology and many other subjects within the veterinary program are filled with information about physiological pain and stress. Lower empathy in higher years of veterinary students could be a mechanism to cope with disturbing events manifested in veterinary practice (Paul and Podberscek, 2000; Batchelor and McKeegan, 2012). Animal welfare is based on ethical principles that animals are conscious and sentient beings, capable of experiencing pain, stress, fear, frustration and other unpleasant and positive emotions (Duncan, 2006). Regarding the cognitive abilities of animals, this study found that veterinary students (from DNS compared with FVM) believe that poultry has fewer cognitive abilities and feelings compared to other farm animals, while cattle and pigs are ranked with the highest cognitive abilities. These results are in line with other research (Levine et al., 2005; Ostović et al., 2017; Shtylla Kika et al., 2023) who found that students were more likely to agree that cattle and pigs are more intelligent compared to poultry. Animal welfare protection is one of the main tasks of the veterinary profession. One of the deontological principles, the principle of equality, refers to the obligation to treat each vertebrate fairly and equally since has been established that all vertebrates can experience pain (National Research Council, 2009). According to Viñuela-Fernández et al. (2011), zootechnical procedures performed on farm animals, usually without the use of anesthesia and analgesia, are the most striking examples of inducing pain in animals. In this study, veterinary students believe that pig's castration, and cattle dehorning without anesthesia were zootechnical procedures that most disrupt animal welfare. Also, first-year students significantly inre agree that these zootechnical procedures compromise animal welfare compared to final-year students, which is following other research (Paul and Podberscek, 2000; Pollard-Williams et al., 2014; Ostović et al., 2017). In many veterinary faculties, including in Serbia, where a decline in overall empathy of students towards animals has been observed, and the curse of animal welfare is taught in the first year (Abood and Siegford, 2012). Because of that, it could be considered to include this subject in the final years of study. Additionally, students who own farm animals are less empathic towards zootechnical procedures compared to other students. Previous research has found that students who own farm animals and have farm experience have a reduced concern for animal rights and welfare own farm animals (Serpell, 2005, Herzog et al., 1991; Bjerke et al., 1998). Also, this result could be a consequence of the knowledge of zootechnical procedures by the students, and thus they are more acceptable to them compared to students who do not own farm animals. Gender distribution

among students in this study revealed female predominance across all study years, consistent with the global trend of increased female presence in the veterinary profession (Lofstedt, 2003; Irvine and Vermilya, 2010). In this study, female students significantly agreed that animal welfare is essential for sustainable agriculture, food safety and quality, biological functioning, emotional state and natural living, as well as the zootechnical practices and rearing systems on farm animals compared to male students and others. These results are in agreement with those recorded by Paul and Podberscek, 2000; Serpell, 2005; Hazel et al., 2011; Van der Weijden, 2013; Ostović et al., 2017) who conducted concerning attitudes of veterinary students, veterinarians, members of veterinary faculties and consumers regarding animal welfare, indicates that female respondents tend to hold more positive attitudes compared to males. Kendall et al. (2006) reported that females' are primarily family caretakers, engaged in household tasks, and have more contact with animals; they are more likely to understand animal needs and have a more positive attitude. According to Ormandy and Schuppli (2014), the difference in attitudes towards animal welfare between genders can also be ascribed to the "moralistic" attitude of females toward the animals, while men express more "dominionistic" attitudes. In this study, the male respondents were less likely to believe that animals can experience emotions such as love, boredom, depression and anxiety. The males show more skepticism (Walker et al., 2014), since unlike females, they are also less likely to believe that animals can exhibit certain changes in behavior when experiencing suffering. As the trend of enrolling female veterinary students increases in many countries (Irvine and Vermilya, 2010; Ostović et al., 2016), it could potentially lead to improvements in animal welfare in the future. However, female veterinary graduates are more likely to focus on social rather than farm animals (Lofstedt, 2003), which means that the agriculture sector, which is covered by predominantly male veterinarians, will not benefit.

In our study, students aged 18 to 21, as well as those who graduated from veterinary secondary schools and other secondary schools, were significantly more likely to believe that zootechnical procedures and methods of keeping harm the welfare of farm animals compared to students aged 22 to 24 and over 24, and those who finished high school. These results could be ascribed that attitudes towards animal welfare become more positive from childhood to adolescence, but after that, attitudes tend to become more negative (Kendall et al., 2006; Binngiesser et al., 2013; Martens et al., 2019). These results suggest that attitudes towards animal welfare depend on age, tradition, and educational approach in a particular region. In this study, predominated students who consumed mixed diet, while significantly fewer identified as vegetarians,

whose diet consists mainly of plant-based foods, while a small number declared themselves vegan, meaning they do not consume any animal products in their diet and do not use items made from fur, leather or any other animal-derived materials.

In this study, students from veterinary medicine high school have significantly higher attitudes toward zootechnical procedures compared with other secondary schools. This result can be ascribed to the fact that students who attended veterinary medicine high school had more exposure to farm animals, their breeding practices and the implementation of zootechnical procedures on farms throughout their education and practice compared to students who completed gymnasium. For these reasons, they are more informed about how poor zootechnical procedures, usually without the use of anesthesia and analgesia, and housing can disrupt the welfare of farm animals. Students who were raised in rural areas were found to be less empathic toward farm animal welfare than those with urban backgrounds. This finding could be explained by different opportunities for contact and relationship with animals offered by rural and urban environments. People from urban areas are less likely to have contact with animals they eat and are spared from watching the animal slaughter. Instead, in urban areas, animals are perceived as companions and family members, given names, and attributed human characteristics (anthropomorphism) and this could contribute to urban individuals expressing a higher level of concern for the welfare of farm animals (Pifer et al., 1994; Ormandy and Schuppli, 2014).

CONCLUSION

The attitudes of veterinary students in Serbia express a high level of empathy towards farm animals. They mostly associate animal welfare with biological functioning. The research results indicate that students do not perceive different species of animals equally in terms of cognitive abilities and zootechnical procedures. Generally, the attitudes of first-year students were more positive than those of final-year students, indicating a lower level of empathy towards animals. The results of this study raise the question of whether these future generations of veterinarians can promote animal welfare in Serbia and what their level of competitiveness will be in the international labor market. These results suggest that more attention should be paid to the curriculum and programs to indirectly improve the welfare of farm animals. Specifically, it is necessary to "convince" students that today's animal husbandry is not only about the survival of animals, but above all about the quality of their lives. Differences among universities should be investigated further.

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Author's contributions

K.N. designed the investigation, interpreted the results, performed the statistical analysis and drafted the manuscript. D.V. performed investigation and drafting of the manuscript. M.Đ. and M.V. revised the manuscript critically and together with D.V. prepared the final draft of the manuscript. M.Đ.S. made contributions to the conception and design of the study. All authors read and approved the final manuscript.

Competing interest

The author(s) declare that they have no competing interests

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