A SELF-EVALUATION SURVEY: ATTENTION TO BRUCELLOSIS AMONG LAST SEMESTER STUDENTS IN VETERINARY FACULTIES, IN TURKEY

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ABSTRACT

This survey was conducted among last semester students in veterinary faculties of Turkey with the aim of identifying the perceptions of the students about the competency of their knowledge regarding brucellosis. Moreover, influences of certain demographic characteristics of the awareness and knowledge of the veterinary students about brucellosis were also investigated. Approximately 98% of the respondents consider that brucellosis is important in veterinary medicine and an important occupational disease among vets in Turkey. On the other hand, it has been determined that little more than half of the students (52.85-61%) were considered themselves as having adequate knowledge on legal regulations and liabilities, notification to animal owner and vaccines and vaccine programs against to brucellosis. "Gender" and "career plan on farm animals" of the students had no significant influence on their self-evaluation about "adequacy of technical knowledge" and "importance of brucellosis". The results of the questionnaire indicated that the students who contacted with suspected animals or suffered from brucellosis of his/herself or family members gave higher scores to the questions of the importance of brucellosis. Moreover, additionally, University of the students had also a significant influence on responses to both "adequacy of technical knowledge" and "importance of brucellosis".

Keywords: veterinary students, competency, knowledge, brucellosis

1. INTRODUCTION

Health is a multidisciplinary issue. Human, environmental health and preventive medicine come naturally to veterinary medicine. Many opportunities exist within a veterinary curriculum to

strengthen this perspective, and to bring depth and new meaning to the understanding of the disease and the role of animals in ecosystem health. Veterinary education is an ambitious profession to teach students who will work for controlling animal health, animal welfare and public health (Kaufman et al. 2004).

Zoonoses are human diseases caused by infectious agents transmitted from animals and vice versa. Brucellosis, which is endemic in the animal population in Turkey and other Mediterranean countries, is one of the importantzoonoses worldwide (Osoro et al. 2004, Deniz et al. 2015). It is a disease of major health importance, causing significant economic losses to the animal industry because of abortion and infertility, and chronic morbidity in humans (Mombeni et al. 2014, Abdou 2005). The Animal Brucellosis Control and Eradication Project were initiated in Turkey in 1984. The strains S19 and Rev.1 vaccines are used for control of brucellosis in cattle and small ruminants; however, brucellosis is still endemic in Turkey (Kutlu et al. 2014, Yumuk and O'Callaghan 2012). In a nationwide survey, brucellosis herd prevalence was reported 7.8% in cattle and while 22.5% in sheep.It has been found that in a survey carried out in 2014, 11.8% of the veterinarian and veterinary technicians had occupational brucellosis (Kutlu et al. 2014). The veterinarians play a major role not only in livestock animals but also in public health for brucellosis in worldwide where the disease is endemic. For this reason, brucellosis is one of the important teaching subjects in the curriculum of Veterinary Faculties in Turkey suitable with the European Association of Establishments for Veterinary Education (EAEVE) objectives and European Union Directive 2005/36 (EAEVE 2011).

The awareness amongst agencies, which fund veterinary research, professionals in the scientific, health care communities and at ministerial level about the public health consequences of the zoonotic disease, is important. The awareness can be partly gained in education during ungraduated education(Cripps 2001). Zoonosis-awareness among veterinarians and veterinary medicine students has to increase worldwide. In veterinary medical education, it is necessary to design competency frameworks (CFs) that list expected competencies at graduation. Three different CFs with different formats and contents have been published in Europe, such as the Day One Skills (DOS), the recommendations of the World Organization for Animal Health (OIE), and the Veterinary Professional (Vandeweerd et al. 2014, OIE 2012, RCVS 2011). All the expected competencies regulatewell-designed education of zoonoses including Brucellosis. Without a doubt, zoonoses are also the most basic building block of one health approach.

In Turkey, duration of veterinary faculty is five years consisting of 10 Semesters. The 10th semester has only practical education which is called last semester (veterinary medicine maturation practice training).

This survey was conducted among last semester students in veterinary faculties of Turkey with the aim of identifying the perceptions of the students about the competency of their knowledge regarding brucellosis. Moreover, influences of certain demographic characteristics on the awareness and knowledge of the veterinary students about brucellosis were also investigated.

2.MATERIAL AND METHODS

Participants: The questionnaire was appliedto 320 of 499 last semester students from 6 different veterinary faculties from different geographical and socioeconomically regions of Turkey. Demographic information of respondents is shown in Table 1.

Table 1. Demographic information of respondents.

Items		Frequency, n	Percentage, %
Gender	Male	216	67.5
	Female	104	32.5
Experiences of living on sheep, goat or cattle farms	Yes	125	39.1
	No	195	60.9
Contact with suspected animals	Yes	72	22.5
	No	248	77.5
Suffering from brucellosis	Yes	9	2.8
	No	311	97.2
Suffering from brucellosis of family members	Yes	48	15.0
	No	272	85.0
Career plan on farm animals	Yes	173	54.1
	No	67	20.9
	Undecided	80	25.0
University	Istanbul Univ.-Cerrahpasa	90	28.1
	Uludaguniv.	64	20.0
	Dicle Univ.	39	12.2
	Firat Univ.	62	19.4
	Ataturk Univ.	42	13.1
	Erciyes Univ.	23	7.2
Total		**320**	**100.0**

Questionnaire: The questionnaire consisted of two parts. Part 1 covered demographic variables including age, gender, experiences of living on sheep, goat or cattle farms (Yes/No), contact with suspected animals (Yes/No), suffering from brucellosis (Yes/No), suffering from brucellosis of family members (Yes/No), career plan on farm animals (Yes/No/Undecided) and University of students (Istanbul-Cerrahpasa, Uludag, Dicle, Firat, Ataturk and Erciyes Universities). According to the results, it has been realised that only nine students havebeen sufferedfrom brucellosis. Five of these students have also reported brucellosis history in their family members. Therefore, independent variables "Suffering from brucellosis" and "Suffering from brucellosis of family members" were integrated and evaluated as "Suffering from brucellosis of his/herself or family members" for statistical analyses.

Part two of the questionnaire consisted of 12 questions, which examine the importance of brucellosis in veterinary medicine and the adequacy of technical knowledge. Each question was

assessed using a 5-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree).

In order to evaluate the appropriateness and clearness of the questionnaire items, the initial version of the questionnaire was applied to 18 students. The final version of the questionnaire was developed by taking into account the results of the pilot questionnaire.

Data handling and statistical analyses: The demographic characteristics of veterinary students were presented with frequencies and percentages. In order to describe the responses of the students to Likert-type questions, median, mean and standard deviation values for each item were calculated, as well as frequency and percentage values for each Likert item.

Shapiro-Wilk test was performed to verify the normality of data for responses to Likert-type questions. As data did not satisfy the condition of normality, non-parametric statistical tests were selected to determine the effects of demographic characteristics on responses to Likert type items. Mann-Whitney U test was used for demographic variables with two levels (i.e. gender, experiences of living on sheep, goat or cattle farms, contact with suspected animals, suffering from brucellosis of his/herself or family members), whereas Kruskal Wallis test was utilized when demographic characteristics had three or more levels (i.e. career plan on farm animals, University).

Reliability of the Likert scale was assessed with Cronbach's alpha by examining the internal consistency of the 12 Likert-type items. The overall reliability of the 12 items was 0.849, which indicate a high degree of internal consistency. In order to assess the suitability of the respondent data for factor analysis, Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericitywere performed.KMO value of > 0.5 and significant results ($p < 0.05$) for Bartlett's Test of Sphericitywere considered threshold levels (20). KMO value of 0.861 indicated that the data of the questionnaire was suitable for factor analysis. Bartlett's Test of Sphericity was significant ($p < 0.001$; Chi-Square=1403.4, df=66), which suggested that data matrix had sufficient correlation to factor analysis.

After the approval of sampling adequacy and factorability of the correlation matrix with KMO and Bartlett's tests, factor analysis was conducted to assess the dimensionality of 12 Likert type items. A criterion of eigenvalue $>1$was used in the determination of factors. The extraction method of principal component analysis and rotation method of Varimax with Kaiser Normalization were utilised for factor analysis. Finally, two factors were extracted.

Attitude scale scores for factors of "adequacy of technical knowledge" and "importance of brucellosis" were calculated by averaging of answers to multiple Likert items by each respondent. A Mann-Whitney U test was conducted to evaluate if there were any significant difference in terms of students' attitude scale scores between levels of gender (Male/Female), experiences of living on sheep, goat or cattle farms (Yes/No), contact with suspected animals (Yes/No), suffering from brucellosis of his/herself or family members (Yes/No). Kruskal Wallis test was used to compare differences among career plan on farm animals and University

subgroups for attitude scale scores. If statistical significance was detected, the Mann-Whitney U test was used for pairwise comparisons.

3.RESULTS

Descriptive statistics (frequency, percentage, mean, SD and median) for responses to individual Likert-type items are presented in Table 2. Approximately 98% of the respondents consider that brucellosis is important in veterinary medicine and an important occupational disease among vets in Turkey. The rates of the students who choose the answers of "agree or strongly agree" to questions 3-9 that investigated their self-evaluation of knowledge on transmission, diagnosis and prevention of brucellosis, were varied between 71.9% and 89.1%. On the other hand, it has been determined that little more than half of the students (52.85-61%) were considered themselves as having adequate knowledge on legal regulations and liabilities (Q10), notification to the animal owner (Q11) and vaccines and vaccine programs against to brucellosis (Q12).

Table 2. Descriptive statistics related to responses of students to questions.

Questions	Disagree strongly n (%)	Disagree n (%)	Undecided n (%)	Agree n (%)	Agree strongly n (%)	Mean Score (SD)	Median
Q1- I consider that brucellosis is important in veterinary medicine	1 (0.3)	2 (0.6)	6 (0.6)	50 (15.6)	265 (82.8)	4.80 (0.50)	5
Q2- Brucellosis is an important occupational disease among vets in Turkey	-	1 (0.3)	5 (1.6)	75 (23.4)	239 (74.7)	4.73 (0.50)	5
Q3- I consider that I have enough knowledge about transmission routes from animal to human beings	2 (0.6)	9 (2.8)	25 (7.8)	151 (47.2)	133 (41.6)	4.26 (0.77)	4
Q4- I know which animal products have risks in transmission to human beings	1 (0.3)	3 (0.9)	31 (9.7)	133 (41.6)	152 (47.5)	4.35 (0.72)	4
Q5- I know which samples should be send to the laboratory in suspected cases of brucellosis	1 (0.3)	10 (3.1)	64 (20.0)	159 (49.7)	86 (26.9)	4.00 (0.79)	4
Q6- I have enough knowledge about transmission routes among animals	-	9 (2.8)	42 (13.1)	150 (46.9)	119 (37.2)	4.18 (0.76)	4

Q7- I have enough knowledge about the contamination routes of infected animals (from animal to environment)	-	6 (1.9)	39 (12.2)	149 (46.6)	126 (39.4)	4.23 (0.73)	4
Q8- I consider that I have enough knowledge about prevention of animals in terms of brucellosis	2 (0.6)	15 (4.7)	73 (22.8)	135 (42.2)	95 (29.7)	3.96 (0.88)	4
Q9- I consider that I have enough knowledge about prevention of myself in terms of brucellosis	2 (0.6)	12 (3.8)	42 (13.12)	134 (41.9)	130 (40.6)	4.18 (0.84)	4
Q10- I know the legal regulations and liabilities of myself as a vet in terms of brucellosis.	8 (2.5)	28 (8.8)	89 (27.8)	102 (31.9)	93 (29.1)	3.76 (1.04)	4
Q11- I consider that I can give satisfactory information to animal owner about their statutory rights.	10 (3.1)	39 (12.2)	102 (31.9)	95 (29.7)	74 (23.1)	3.58 (1.07)	4
Q12- I have enough knowledge about brucellosis vaccine and vaccine programs in Turkey	16 (5.0)	48 (15.0)	79 (24.7)	112 (35.0)	65 (20.3)	3.51 (1.12)	4

Effects of gender, experiences of living on sheep, goat or cattle farms (ELF), contact with suspected animals (CSA), suffering from brucellosis of his/herself or family members (SB), career plan on farm animals (CP) and University of students on responses to questions were presented in Table 3. Gender of the student had no significant influence on all of the Likert type items, while the effect of CP was only significant for Q12. Responses of students to Q3, Q6, Q9 and Q12 were significantly affected by ELF. University of the student had a significant influence on responses to questions, except Q1. The effect of CSA was also significant for requested questions, except Q2, Q10 and Q11. The effect of SB was significant for Q4, Q5, Q6 and Q8.

Table 3. Significance levels for effects of demographic characteristics on questions.

Items	p-Value[a]											
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Gender	0.355	0.909	0.361	0.862	0.492	0.212	0.161	0.144	0.977	0.803	0.755	0.129

Experiences of living on sheep, goat or cattle farms	0.247	0.297	**0.020**	0.995	0.572	**0.009**	0.052	0.104	**0.039**	0.472	0.562	**<0.001**
Contact with suspected animals	**<0.001**	0.094	**<0.001**	**0.029**	**0.017**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.071	0.121	**<0.001**
Suffering from brucellosis of his/herself or family members	0.096	0.055	0.060	**0.003**	**0.047**	**0.019**	0.295	**0.005**	0.133	0.558	0.389	0.271
Career plan on farm animals	0.862	0.561	0.568	0.055	0.597	0.554	0.703	0.416	0.432	0.373	0.560	**0.002**
University	0.100	**0.045**	**0.002**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**

aMann Whitney U test for two subgroups and Kruskal-Wallis test for more than two subgroups were used for statistical comparisons.

Table 4 presents a component matrix with factor loadings for a dataset of 12 questions. The principal component analysis produced a two-factor solution. Factor 1 contains questions 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. The factor loadings for these questions ranged from 0.783 to 0.555. The highest three loadings were observed for Q6 (I have enough knowledge about transmission routes among animals), Q8 (I consider that I have enough knowledge about prevention of animals in terms of brucellosis) and Q7 (I have enough knowledge about the contamination routes of infected animals (from animal to environment). These questions are associated with self-assessment of the students related to the adequacy of technical knowledge on transmission and prevention of the disease. Therewithal, Q3 and Q4 (transmission), Q5 (diagnose), Q9 and Q12 (prevention), Q10 and Q11 (associate regulations) examine their self-evaluations of the competence of the students on related technical knowledge.

Therefore, Factor 1 was labelled as "adequacy of technical knowledge". This factor explained 39.59% of the total variance. The second factor enclosed Q1 (I consider that brucellosis is important in veterinary medicine) and Q2 (Brucellosis is an important occupational disease among vets in Turkey). Higher scores for these questions indicate that students are aware of the importance of brucellosis.

For this reason, this factor was labelled as "importance of brucellosis". Factor 2 was explained 13.70% of the total variance. These two factors jointly accounted for 53.29% of the total variance. Cronbach's alpha value for the whole questionnaire was 0.849. There was quite high level of consistency for Factor 1 (adequacy of technical knowledge, α=0.864), whereas

Cronbach's alpha value of 0.584 was observed for second factor (importance of brucellosis), which may indicate adequate levels of consistency.

Table 4. Component matrix with factor loadingsa

Item	Factors	
	1 (Adequacy of technical knowledge)	**2** (Importance of brucellosis)
Q1	0.296	**0.550**
Q2	0.159	**0.682**
Q3	**0.618**	0.284
Q4	**0.675**	0.306
Q5	**0.675**	-0.072
Q6	**0.783**	0.101
Q7	**0.727**	0.055
Q8	**0.758**	0.031
Q9	**0.695**	0.166
Q10	**0.616**	-0.522
Q11	**0.676**	-0.482
Q12	**0.555**	-0.389
Internal consistency	α=0.864	α=0.584
Eigen values	4.751	1.644
Percentage of variance, %	39.588	13.701

[a]extraction method was principal component analysis, and rotation method was Varimax with Kaiser Normalization

Effects of demographic variables on attitude scale scores for "adequacy of technical knowledge" and "importance of brucellosis" are given in Table 5. "Gender" and "career plan on farm animals" of the students had no significant influence on their self-evaluation about "adequacy of technical knowledge" and "importance of brucellosis". In addition, it has been observed that the students who had experiences of living on a farm ($p < 0.05$), contacted with suspected animals ($p < 0.001$) and suffered from brucellosis of his/herself or family members ($p < 0.05$), were perceived themselves more informed on technical knowledge about brucellosis. The results of the questionnaire indicated that the students who contacted with suspected animals or suffered from brucellosis of his/herself or family members gave higher scores to the questions on the importance of brucellosis.

Table 5. Effects of demographic characteristics on averages of Likert-type responses concerning the adequacy of their technical knowledge (Factor 1) and importance of brucellosis (Factor 2).

Item	Adequacy of technical knowledge				Importance		
	Subgroup	Median	Mean Score (SD)	*p*-Value	Median	Mean Score (SD)	*p*-Value
Gender	Male	4.00	4.01 (0.57)	0.765	5	4.75 (0.41)	0.501

	Female	4.10	3.97 (0.63)		5	4.78 (0.40)	
Experiences of living on farms	Yes	4.20	4.09 (0.60)	**0.018**	4	4.70 (0.50)	0.313
	No	4.00	3.94 (0.59)		4	4.80 (0.33)	
Contact with suspected animals	Yes	4.40	4.27 (0.49)	**<0.001**	5	4.89 (0.26)	**0.002**
	No	4.00	3.92 (0.60)		5	4.73 (0.43)	
Suffering from brucellosis of his/herself or family members	Yes	4.20	4.17 (0.51)	**0.021**	5	4.88 (0.26)	**0.033**
	No	4.00	3.97 (0.60)		5	4.74 (0.43)	
Career plan on farm animals	Yes	4.10	4.02 (0.61)	0.428	5	4.76 (0.42)	0.771
	No	3.90	3.95 (0.50)		5	4.78 (0.36)	
	Undecided	4.10	4.00 (0.64)		5	4.74 (0.41)	
University	Istanbul Univ.-Cerrahpasa	3.85	3.80[cd] (0.53)	**<0.001**	5	4.74[ab] (0.44)	**0.020**
	Uludag Univ.	4.15	4.14[b] (0.57)		5	4.85[a] (0.33)	
	Dicle Univ.	4.40	4.40[a] (0.41)		5	4.87[a] (0.27)	
	Firat Univ.	3.95	3.80[cd] (0.61)		5	4.66[b] (0.49)	
	Ataturk Univ.	4.45	4.29[ab] (0.50)		5	4.69[b] (0.40)	
	Erciyes Univ.	3.60	3.73[d] (0.63)		5	4.80[ab] (0.36)	
	Overall	4.05	4.00 (0.59)		5	4.76 (0.41)	

Mean scores were compared between subgroups using the Mann Whitney U test for two subgroups or the Kruskal-Wallis test for more than two subgroups.

University of the students also hada significant influence on responses to both "adequacy of technical knowledge" and "importance of brucellosis".

4.DISCUSSION AND CONCLUSION

Human and animal medicine have many commonalities and interface at many points (RCVS 2011). Brucellosis is one of the most considerable infectious diseases in an animal with economic impacts and also important occupational diseases among vets, farmers and laboratory workers in Turkey and other Mediterranean countries as well as other parts of the world where the infection is endemic. Human brucellosis is an important indicator of disease in animal populations and humans are infected with Brucella spp. originating from animals (Kutlu et al. 2014). The World OrganisationcategorisesBrucella spp. as a risk group III pathogen, meaning that it poses a high risk to individuals (Ergonul et al. 2004). Thus, giving special attention to brucellosis is unavoidable in veterinary medicine education.

In this study, very most of the last semester students (98%) consider that brucellosis is important in veterinary medicine and an essential occupational disease among vets in Turkey. It is indicated that the awareness of the students is high on the importance of brucellosis. The

responses of the students on Q3 to Q9 indicate that students consider they have enough knowledge about transmission, diagnosis and prevention of brucellosis. On the other side, 39% and 47.2% of the students qualified themselves as inadequate or undecided for Q10 and Q11, respectively. These results pointed that more notifying on legal regulations and legislation is necessary forthe curriculum. For Q12, the rate of the students who qualified themselves as inadequate was 20% while as undecided was 24.7%.

44.7% of the students do not qualify themselves as adequate on vaccines and vaccine programs against brucellosis applied in Turkey. These results emphasise that the students who consider themselves sufficient on theoretical issues such as transmissions and prevention of brucellosis had less confidence on practical issues such as current vaccines and vaccine programs applied from veterinary services in the country. Moreover, these results pointed out that the students need more experiences on field applications.

In this study, gender, experiences of living on farms, contact with suspected animals, suffering from brucellosis of his/herself or family members, career plan on farm animals and universities were consideredfactors, which may influence on student perceptions about brucellosis.

According to our results, 67.5% of the respondents were male, 32.5% of themwere female and the effect of gender was not significant on individual 12 items and also on two scales of the adequacy of technical knowledge and importance. No Influence of the gender is considered a positive result since the gender has not importance against to zoonoses in professional veterinary practice.

The result of this study was pointed that the respondents who had grown up on farms have evaluated themselves that they have more knowledge on the issues of transmission (Q3, Q6), protection (Q9) and vaccines (Q12) than the respondents those from other backgrounds. These results reveal that spending time with farm animals was efficient on success in their education.

It was also concludedthat veterinarians should be aware and careful when

they are in contact with suspected animals, concerning the importance ofzoonoses. In this study, 22.5% of the respondents have reported that they were contacted with suspected animals. However, the effect of contact with suspected animals on individual questions and also scales were significant except items of Q2, Q10 and Q11. Suffering from brucellosis of his/herself or family members was also a significant influence on the adequacy of technical knowledge and importance. This significance may be related with the student's attitude of updating their knowledge when they faced with suspected cases or may be pointed out that permanent learning can be achieved when faced with a concrete case. Since many authors have reported that practical education increase the learning success and also students are encouraged to experience and observation (Kang 2010, Levine 1987, Roderick and Stephens 1976).

Although, many young veterinarians undergo important changes in career direction over the first few years after graduation; career path switching begins early in the student's veterinary

education (Heath 1998, Jelinski et al. 2009). In the current study, the effect of career plan on farm animals was only significant for the respondent's knowledge among individual items about brucellosis vaccine and vaccine programs which have the critical roles for protection of both animals and human beings. Whilethe career plan does not have a significant effect on the adequacy of technical knowledge and importance. As a result of these data, we can be pointed out that the students did not focus to their future working area and create knowledge.

The universitiesof student respondents have a significant influence on responses to individual questions, except Q1 and also attribute scales. Regardless of the university, the majority of the students indicate the importance of the brucellosis. Nevertheless, self-evaluations of the students on other questions including technical knowledge are varied among the universities.

In conclusion, although detailed theoretical knowledge has been taught to veterinary students, it has been achieved that the students who included the real cases and field applications felt themselves more adequate. According to our results, the fundamentals of practical education has been emphasised.

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