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KNOWLEDGE, ATTITUDE AND PRACTICES (KAP) OF RUMINANT LIVESTOCK FARMERS RELATED TO ZOONOTIC DISEASES IN ELASSONA MUNICIPALITY, GREECE.

ΜΟΥΤΟΣ ΑΘΑΝΑΣΙΟΣ

ΚΤΗΝΙΑΤΡΟΣ

ΤΡΙΜΕΛΗΣ ΣΥΜΒΟΥΛΕΥΤΙΚΗ ΕΠΙΤΡΟΠΗ:

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ΔΟΞΑΝΗ ΧΡΥΣΟΥΛΑ

ΣΤΕΦΑΝΙΔΗΣ ΙΩΑΝΝΗΣ

ΛΑΡΙΣΑ

ΣΕΠΤΕΜΒΡΙΟΣ 2021

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Γνώσεις, Στάσεις και Πρακτικές των εκτροφέων μηρυκαστικών του δήμου Ελασσόνας, σχετικά με τις ζωονόσους.

Περίληψη

Εισαγωγή

Οι ζωονόσοι είναι ένα σημαντικό υγειονομικό και οικονομικό εμπόδιο για τις χώρες που βασίζονται στην παραγωγή γάλακτος μικρών μηρυκαστικών, όπως η Ελλάδα. Στην Ελλάδα πολλές ζωονόσοι είναι ενδημικές, κάποιες από τις οποίες εμφανίζουν και μία τάση για κάποια επαγγέλματα.

Στόχοι

Στόχος μας ήταν να εκτιμήσουμε τις γνώσεις, στάσεις και πρακτικές των ελλήνων εκτροφέων μηρυκαστικών ζώων, σχετικά με τις ζωονόσους.

Μέθοδοι

Αυτή η μελέτη πραγματοποιήθηκε ως μία διαστρωματική έρευνα, χρησιμοποιώντας ένα ημι-δομημένο ερωτηματολόγιο. Συμμετείχαν εκτροφείς μηρυκαστικών (n=204) από 33 οικισμούς μίας περιοχής με έντονη κτηνοτροφική δραστηριότητα. Κατασκευάστηκαν τρείς δείκτες, σκορ γνώσεων, σκορ στάσεων και σκορ πρακτικών. Οι συσχετίσεις μεταξύ των επεξηγηματικών μεταβλητών και των τριών δεικτών εκτιμήθηκαν με μία σειρά μονοπαραγοντικών και πολυπαραγοντικών γραμμικών παλινδρομήσεων.

Αποτελέσματα

Από τους συμμετέχοντες, 201 είχαν ακούσει τον όρο ζωονόσος. Σχετικά με τις πρακτικές, 23 (11,3%) καταναλώνουν απαστερίωτο γάλα ή προϊόντα από απαστερίωτο γάλα, μόνο 7 (3,4%) ελέγχουν για ζωονοτικούς παράγοντες και βάζουν σε καραντίνα τα ζώα που αγοράζουν και κανένας δεν παίρνει προστατευτικά μέτρα όταν βοηθά τα ζώα στον τοκετό ή χειρίζεται τα υλικά του τοκετού. Επιπλέον, άλλες επικίνδυνες πρακτικές και κενά γνώσεων εντοπίστηκαν. Το μορφωτικό επίπεδο συσχετίστηκε θετικά με καλύτερες γνώσεις και πρακτικές. Επίσης, η στενή παρακολούθηση της εκτροφής από κτηνίατρο συσχετίστηκε με καλύτερες πρακτικές σχετικά με την πρόληψη ζωονόσων.

Συμπέρασμα

Τα αποτελέσματα καταδεικνύουν την ανάγκη για διαρκή επαγρύπνηση και δράσεις επιμόρφωσης, ιδιαίτερα επειγόντως για τους εκτροφείς με χαμηλό μορφωτικό επίπεδο. Η στενή επαφή με έναν κτηνίατρο μπορεί να αξιοποιηθεί ως εργαλείο κλειδί με το τρέχων πρόγραμμα εμβολιασμού της βρουκέλλωσης και στο σχεδιασμό εκστρατειών επαγρύπνησης σχετικά με τις ζωονόσους, σε συνεργασία με το υγειονομικό προσωπικό.

Λέξεις κλειδιά: Γνώσεις, Στάσεις, Πρακτικές, Ζωονόσοι, Ελλάδα, Εκτροφείς μηρυκαστικών ζώων, Επικίνδυνες πρακτικές

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Knowledge, attitude and practices (KAP) of ruminant livestock farmers related to zoonotic diseases in Elassona municipality, Greece.

Abstract

Background

Zoonotic diseases are a significant health and economic burden in countries that rely on small ruminant milk production such as Greece. Greece is endemic for many zoonotic diseases some of which have an occupational tendency.

Objectives

Our aim was to evaluate knowledge, attitude and practices of livestock ruminant farmers concerning zoonoses.

Method

This study was performed as a cross-sectional study, using a semi-structured questionnaire. We interviewed ruminant farmers (n=204) from 33 settlements of an area with intense agrarian activity. Three index variables, namely knowledge score, attitude score and practice score were constructed. The relations between the explanatory variables and the three indexes were assessed based on univariate and multivariate linear regression analyses.

Results

Out of the participants, 201 had heard the term “zoonoses”. Regarding practices, 23 (11,3%) consume unpasteurized milk or products from unpasteurized milk, only 7 (3,4%) quarantine and test the animals they buy for zoonotic diseases and no one takes precautionary measures when assisting animals in parturition or during handling birth material. Several other high risk practices and knowledge gaps were also unveiled. The education level was positively associated with better knowledge and practices. Hence, the close veterinary supervision of the farm was associated with better practices regarding the zoonotic diseases prevention.

Conclusion

The results indicate the need for continuous awareness and education actions, urgently aiming at farmers with low education level. The close contact with a veterinarian can be utilized as a key tool both with the current brucellosis vaccination program and in the design of awareness campaigns regarding zoonoses in collaboration with other public health personnel.

Key words: Knowledge, Attitude, Practice, Zoonoses, Greece, Ruminant livestock farmers, Risk practices

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1. Introduction

Small ruminant milk production is of high significance for developed Mediterranean countries, being an important portion of the rural income and boosting national economy (Haenlein et al., 2001). Greece is among the leading countries with 840.140 tones of milk per year (ELGO, 2020). Zoonotic diseases have a tremendous impact on livestock production, public health and consequently to the economy (FAO 2002).

Almost 60% of currently known infectious diseases and up to 75% of emerging infectious agents are of zoonotic origin (Woolhouse et al., 2005; Jones et al., 2008). Zoonotic infections account for devastating epidemics, with the COVID-19 pandemic being the most noteable. However, endemic and neglected zoonoses represent a more insidious and chronic treat for global health and national economies (Welburn et al., 2015).

Many zoonoses are thought to be occupational health hazards (Batteli, 2008). Livestock farmers are at risk, since different type and intensity of contacts may lead to zoonotic infections (Klous et al., 2016). In the US and Italy, zoonotic agents are considered as an occupational hazard and health risk for livestock workers (Lejune and Kersting, 2010; Tabibi et al. 2013). In Greece, despite of many unreported cases, brucellosis remains an occupational disease (Fouskis et al., 2018).

Elassona area is an agrarian municipality of Larisa division consisting of 102.5 Km^2 with a human population of 32.121, the majority of which resides in rural areas (Census of 2011, ELSTAT). In Elassona, 302.917 sheep, 96.907 goat and 26.876 cattle (OPEKEPE, 2019) are reared under various traditional farming systems. The area has the highest per capita milk availability, Larisa being the first greek division in terms of small ruminant milk production (ELGO, 2020), and a very high density of animals. Elassona located in the southwest of mount Olympus, is also home of a rich in diversity fauna.

Greece is endemic for many zoonotic diseases including brucellosis, Q fever, echinococcosis/hydatidosis, leishmaniasis, food-borne zoonoses and others which have tremendous economic and public health consequences (Sotiraki et al., 2010; EFSA, ECDC 2019; Vranakis et al., 2020). Larisa has the highest prevalence value of human brucellosis from the regions under the ruminants' vaccination program (Fouskis et al., 2018). In addition, a rabies case of a dog was confirmed in Elassona on February 2014, during the 2012-2014 outbreaks (Giannakopoulos et al., 2016). The extent of the connection among humans, domestic animals and wildlife in this area reveals a high potential for zoonoses transmission.

Knowledge, Attitudes and Practices (KAP) surveys provide crucial information to explore risk factors and potential intervention strategies for disease management. Hence, farmers' behavior is strongly affected by their knowledge and attitude (Dernberg et al., 2007). Poor knowledge of a disease correlates with disease

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prevalence and can fire a vicious cycle between underdiagnosis-underreporting and awareness deficit (Govindaraj et al., 2016; Mahmoodabad et al., 2008). Studies from Egypt (Holt et al., 2011), Turkey (Cakmur et al., 2015), India (Singh et al., 2019) and other countries have mentioned the necessity for zoonotic diseases education and KAP surveys asset to grasp country specific circumstances.

The objectives of this study are to assess the knowledge of zoonoses with high risk potential for livestock keepers and identify attitudes and practices trends in the greek rural areas. The information gathered can aid in effective policy development and guide local awareness programs as well as educational actions in the concept of one health medicine for the control of zoonotic diseases.

2. Methods

This study was performed as a cross-sectional study between November 2020 and February 2021, and extended a couple of months beyond expected because of the COVID-19 pandemic.

2.1. Study area

Municipality of Elassona consists of 52 settlements and belongs to Larisa division in Thessaly region (Census of 2011). The area of Elassona is dominated by small ruminant dairy farming. In addition, dairy and beef cattle keepers as well as small-scale household breeders mark the area as agricultural.

The target population was the livestock farmers of the 52 settlements. 33 out of the 52 villages were selected based on convenience, defined as the interviewer performing veterinary practice concurrently, and purpose, to cover the whole area geographically. The sample size of 204 livestock farmers was selected conveniently with some snowball sampling also.

This area was selected because of the high density of animals, the history of brucellosis high prevalence and the presence of endemic zoonotic diseases with high transmission potential. Moreover, the large-scale livestock operations and by extension the many immigrants working positions in these farms, is an important feature of the area.

2.2. Questionnaire Design

A semi-structured questionnaire consisted of 6 sections and 43 questions with several subquestions, was developed in the greek language. The questionnaire contained binary, multiple-selection, open-ended and likert-scale questions.

Demographic and farm associated information included age, gender, education, years of farming practice, ownership of other domestic animals, rodents quantity/number on farm and veterinary supervision. Knowledge questions were based on the endemic zoonoses history and transmission potential. Attitudes and

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practices formation took into account the historical problem of brucellosis in this area and health guidelines for zoonotic disease prevention. Finally, a medical history section for zoonotic infection was included.

Before the onset of the interviews, the objectives of the study, willingness of results information after the end of the study and anonymity, were explained to the livestock farmers and an informed consent document was filled.

2.3. Statistical analysis

The questionnaires were checked for completeness before entering the data into IBM SPSS Statistics for Windows Version 25.0 statistical software (released 2017). There were scarce missing replies, because the interviews were performed face-to-face by a trained veterinarian, and these were identified as missing data in the analysis.

We used the previous mentioned demographic and farm characteristics as explanatory variables. A knowledge score (range 0-7) was prepared adding up farmer's knowledge regarding specific questions and subquestions. A score 1.0 was awarded if the participant could choose the correct answer and no score granted for an incorrect reply. For question 1 the score 1.0 was awarded if the farmer could identify brucella as a zoonotic agent, at least all its ruminant hosts and three brucellosis symptoms, and its abortifacient potential for a pregnant woman, at the same time. In this rationale score 1.0 was awarded if the participant could identify the zoonotic agent and at least one primary host for questions 2, 3 and 4. The attitude score (range 0-2) and the practice score (range 0-13) followed the same score system. Data were then entered into SPSS and descriptive analyses were carried out.

The unconditional association between each explanatory variable and knowledge score was searched through a series of univariable linear regression analyses. After the preliminary analysis with knowledge score as the outcome variable, the same series of univariable analyses was followed with attitude score as the outcome variable, including knowledge score with the previous independent variables this time. Lastly, the same univariable analyses with practice score as outcome variable and knowledge and attitude scores as independents together with the previous explanatory variables were made. The explanatory variables with p-value<0.25 were selected for inclusion in the multivariable model building.

A forward stepwise method of multivariable linear regression analysis was performed for each of the three scores, by adding foremost the variable that had the smallest p-value in the univariable analyses. Explanatory variables with p- value<0.05 were retained in the final model. The adjusted R^2 was used to assess how well the model accounts for the outcome of the data.

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3. Results

3.1. Sociodemographic and farming characteristics

A total of 204 ruminant farmers were interviewed during the study period, with a 100% response rate. The mean age of participants was 49,36 years (range 18-77 and standard deviation 13,57) and 83,3% were male. In terms of education, 30,9% reported some level of primary school attendance and 8,8% had completed university or college education. The 59,8% of participants were sheep farmers while 10,8% breed mixed ruminant species, either sheep and goats, or cattle and small ruminants. The veterinary supervision was further divided into two categories for the statistical analyses because only one farmer reported no veterinary attendance on farm and one indicated constant supervision. The detailed profile of the participants is presented in Table 1.

3.2. Knowledge on zoonotic diseases

Out of the 204 participants, 201 had heard the term ‘zoonoses’, but all of them could understand the meaning when explained. Besides, the detailed information used in the building of knowledge score that is mentioned in Table 2, the respondents were asked if they knew the zoonotic potential of some microbe agents. Of the farmers, 127 (62,3%) were aware of the zoonotic nature of mycobacterium tuberculosis, 161 (78,9%) about anthrax, 163 (79,9%) about salmonella, 112 (54,9%) about west nile virus, 70 (34,3%) about tetanus, 79 (38,%) about H1N1 virus, 30 (14,7%) about leptospira, 10 (4,9%) about E. coli strains, 3 (1,5%) about cryptosporidium, 1 (0,5%) about coxiella (Q fever) and campylobacter. Regarding dermatitis problems 22,1% of the farmers could identify the zoonotic potential of some agents mainly dermatofytes and hardly anyone had heard of orf virus ability to colonize human skin.

3.3 Attitude and practices on zoonotic diseases

Among the farmers, 181 (88,7%) believed that an animal died because of a disease should be buried and disinfectants should be used and 195 (95,6%) replied that animals have to be dewormed for zoonotic disease prevention. Nevertheless, they admitted that in practice usually they do not burry dead animals with disinfectants and they omit regular deworming of their domestic pet animals. Also, 85,3% considers from very possible to absolutely certain a future infection from their animals, 90,2% finds from very good to perfect the implementation of the brucellosis vaccination program and 88,2% believes that it can lead to the extinction of the disease. Some objections concern the illegal animal trafficking, vaccine ineffectiveness, possible incomplete vaccination of some flocks and inadequate veterinary service due to staff deficit.

Regarding practices, 23 (11,3%) consume raw milk or products from raw milk despite the brucellosis problem until today in the area, 152 (74,5%) smoke during farm works, 195 (95,6%) consume food or drinks, mainly coffee while working on

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farm, only 7 (3,4%) quarantine and test the animals they buy for zoonotic diseases and no one takes precautionary measures when assisting animals in parturition or in the handling of birth material. Moreover, 63 (30,9%) had been vaccinated for tetanus the last decade but it is questionable if some participants could differentiate between a tetanus serum infusion after an injury and a tetanus vaccine. The detailed information and questions involved in the construction of attitude and practice score are depicted in Table 3.

3.4. Medical history on zoonotic diseases

This sector findings confirm the area's high zoonotic dynamics, with 29,4% of farmers have been infected from at least one zoonotic disease. Thoroughly, out of the 204 farmers, 54 (24,5%) have been infected from brucella, 2 (1%) from anthrax, 2 (1%) from both brucella and anthrax, 1 (0,5%) from E. coli strains and 1 (0,5%) have suffered dermatitis most possible due to dermatophytes. Farmers having suffered a zoonotic disease reported 112,7 mean days for full recovery (range 6-700) and 18,9 mean days out of labor (range 0-180), while 6 (2,9%) reported having acquired permanent complications from the disease.

3.5. Univariable analyses

Increase in farmer's age ($p<0.001$) and years of livestock farming ($p<0.001$), having a significant correlation (Pearson coefficient = 0.835), were negatively associated with the zoonotic knowledge score. On the contrary, a higher education level ($p<0.001$) and a more consistent veterinary supervision ($p=0.005$), were found to be positively associated with the zoonoses knowledge. Concerning attitude score, age ($p=0.018$) was negatively and knowledge score ($p<0.001$), was positively associated. In addition, age ($p<0.001$) and years of livestock farming ($p=0.001$) were also negatively associated with practice score. This time, higher education level ($p<0.001$), more frequent veterinary supervision ($p=0.003$) and a better knowledge score ($p=0.005$), were positively associated with the practice score. The detailed results of univariable analyses are displayed in Table 4.

3.6. Multivariable analyses

The education level ($p=0.001$) which was positively associated with the zoonotic disease knowledge score, and the years of livestock farming ($p=0.038$) which was negatively associated, were the significant parameters. Regarding attitude score, knowledge score ($p<0.001$) was the only important parameter, positively correlated. Lastly, the education level ($p<0.001$) and the degree of veterinary supervision ($p=0.032$), both positively associated, were retained in the final model for practice score. The detailed results of multivariable analysis are presented in Table 5. We can conclude that education level is a significant factor and higher education is correlated with better knowledge and practices. On the other hand, the increase in

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farmers years of farming correlates with poor knowledge of zoonotic diseases. Another critical factor, is the close veterinary supervision of the farm, which results in adoption of better practices regarding zoonosis prevention.

4. Discussion

In this study, we made the first attempt in Greece to assess the knowledge, attitude and practices of ruminant farmers regarding zoonotic diseases in an area of high agricultural interest. The results indicate that despite of an overall good knowledge about specific zoonotic diseases used in the construction of knowledge score, there are some serious knowledge and awareness shortcomings.

One of the most important finding is the identification of several high risk practices, with negligence of protective equipment during assisting an animal's parturition and handling birth material, being universal among the participants. Globally, brucellosis KAP studies have also revealed high-risk activities as the handling of birth material without protective equipment and consumption of cheese from unpasteurized milk in Egypt (Holt et al., 2011) and in Jordan (Musallam et al., 2015). In our study, the consumption of unpasteurized milk or products from unpasteurized milk, is not factoid given the brucellosis situation in Elassona area (Fouskis et al., 2018).

Furthermore, common practices such as the introduction of animals to farms from flocks of unknown health status without test and quarantine can possibly explain the continuation of brucellosis problem until today. The high-risk self-reported practices imply a knowledge gap towards zoonotic disease transmission or/and disease prevalence. A similar pattern of increased awareness due to high endemicity and high risk practices due to knowledge lack of the transmission modes was found in Egypt (Hegazy et al., 2016)

Brook and McLachan (2006) indicated that the level of disease awareness among farmers in North America is associated to prevalence of the disease. In our study, the zoonotic nature of some agents as coxiella, cryptosporidium and E. Coli remains unknown for the majority of the participants, despite of an important documented prevalence in ruminant farms (Kalaitzakis et al., 2021; Tzanidakis et al., 2014; Dontorou et al., 2004). This can possibly be explained because of the low number of human infections until today or unreported cases due to low disease severity.

The education of farmers has been associated with better zoonotic disease knowledge and practices. In addition to this, the increase in years of farming correlates with poor knowledge about zoonosis. These findings can be attributed to the improvement of education system across the years and the introduction of training courses for the education of new farmers in this field. Such training courses can play a more active role in zoonotic disease awareness.

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Moreover, the current brucellosis vaccination and testing program in Elassona area represents a good opportunity to promote zoonotic diseases awareness and to communicate helpful information especially in the crucial part of zoonotic disease prevention. Studies from South Africa (Cloethe et al., 2019) and India (Deka et al., 2020) have shown that veterinary consultation plays a crucial role in farmer's knowledge about brucellosis. Also, the absence of collaboration with a veterinarian has also been linked with knowledge gaps and risky practices about bovine brucellosis in Portugal (Diez and Coelho, 2013). Our findings indicate that veterinary supervision is associated with better practices for prevention of zoonotic diseases. The role of the veterinarian in the communication of knowledge and training of farmers seems to be very crucial for the public health.

Our study has many limitations, as an observational study. The response bias because of the utilization of multiple choice answers is inevitable, although it might have been mitigated in the construction of knowledge score because of some strict requirements. Attitude replies clearly do not correspond to practices, because many farmers admitted that despite of knowing the proper action, they do not implement it either due to cost or to handwork required. This is further comprehensible taking into account the high risky behaviors uncovered through the self-reported practices. Furthermore, the findings have weak external validity because of convenience and purposive sampling.

Conclusively, our study highlighted the specific areas in Greek ruminant farmers KAPs that must be utilized for design of zoonotic disease awareness and prevention programs. The farmer's education and veterinary supervision of the farm are two significant factors that must be in the core of any program oriented towards the improvement in the zoonotic disease KAPs of the farmer.

Similar KAP studies could be used for the rest of the country, with priority to regions of similarly intense agrarian activity, so as to establish baseline KAP for different agricultural communities. Afterwards, the gathered information could be utilized to design purposeful awareness and education campaigns. The cooperation between veterinarians and public health officers is essential to design and implement an education program for farmers under the prism of one health approach.

Confict of interest

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Ethical approval: Not required

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