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Multivariable binary logistic regression model to predict risk factors of peste des petits ruminants in goat and sheep

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Abstract

Peste des petits ruminants (PPR) highly contagious illness that affects domestic and wild small ruminants, causing significant economic losses. The goal of this study was to use a multivariable logistic regression model to determine risk factors for PPR. A total of 113 healthy non-vaccinated goats and sheep (63 goats and 50 sheep) more than five months (1st group from 5-12 months,2nd group above 12 months), subject to a seroprevalence study by competitive ELISA which was used to detect antibodies against PPRV antibodies in serum sample during the period between April 2018 and March 2019. The incidence of PPR in autumn was significantly increased compared with the spring. Additionally, animals had a 4.08 more likelihood of being infected with PPR in the autumn compared with the spring season. There was a significant difference between male and female groups; The female group had 5.236 times increased odds of being infected with PPR than the male group. Moreover, the old age group had 2.771 times higher odds of being infected with PPR than the young age group. On the other hand, the test model found no evidence to support any significant differences between sheep and goat species. According to finding, PPR is common in females and mature small ruminants. Furthermore, throughout the spring season, the incidence of PPR was significantly reduced. Indeed, the current study may help plan an effective vaccination program against the PRP disease in Egypt.

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Introduction

Peste des petits ruminants (PPR), which affects domestic and wild ruminants, is a highly contagious illness that spreads rapidly irrespective of country borders. Infection is spread primarily through the secretions and excretions of infected animals (1). Goat plague, kata, syndrome of stomatitis-pneumoenteritis, and ovine rinderpest are all synonyms for PPR (2). Peste des petits ruminants were originally defined in 1942 in the West African Republic, of Côte-d'Ivoire (1). The disease occurs due to Peste des petits ruminant's virus (PPRV) which causes acute, highly contagious, and economically critical diseases in domestic, wild small ruminants, and camels (1). PPRV, like other paramyxoviruses, is an enveloped virion with a single-stranded RNA genome with opposing polarity and a diameter of 400-500 nm. It has the second-longest genome among morbilliviruses, with a genomic length of 15 948 nucleotides (3). Furthermore, the PPRV genome is divided into six transcriptional units, each encoding for at least six structural and two nonstructural proteins (4). There is historical information available that reveals the prevalence of PPRV considerably earlier. The shortage of in advance diagnoses was possible because of the clinical similarity to ruminant plague (RP) and the use of diagnostic tests, which could not differentiate among them. Therefore, the PPR defined in small ruminants probably became a PPRV infection (5). The disease has been assured in most geographical locations in West Africa, including Nigeria**,** Senegal, Togo, and Benin. At the same time, in 1982, the disease was recognized in Sudan, an eastern African country (6). Goats/sheep pox (SGPX), peste des petits ruminants (PPR), contagious ecthyma (CPD or ORF), Rift Valley fever (RVF), bluetongue (BT), Foot and mouth (FMD), Nairobi sheep (NSD), and Border (BD) diseases are the most common viral infections of sheep and goats in Africa. (7). Most of the reported viral diseases of small ruminants in Egypt result in significant losses in sheep and goat husbandry (8). PPR symptoms are analogous to rinderpest in cattle, including an abrupt rise in body temperature to 40-41.3°C. Some infected animals have a cough, pneumonia, oral necrosis, mucopurulent nasal and ocular discharges, and copious catarrhal conjunctivitis with matting of the eyelids. Furthermore, the severity of the illness varies depending on the sheep's breed and initial immune condition, geographical location, season, and whether the infection is acute or chronic. Fever, along with either diarrhea or indications of mouth discomfort, is enough to rule out the diagnosis. Young animals have higher rates of morbidity and mortality than adults. However, mature animals frequently exhibit bronchopneumonia and abortion (9). As in Border disease usually show high rates of infertility, and production of underweighted-lambs in young animal, but in mature animal show abortion, stillbirth and lambs born weak, uncharacteristic body shapes and undersized, if occurs between the 50^{th} and 60^{th} day of gestation may lead to birth of immunotolerant lambs that will continue shedding the virus for their whole lifetime and be the most significant source of BDV among ruminants (10). In this context, Sick animals that recover from infection have an entire life of protective immunity, and there is no evidence of carrier status. Moreover, the virus can spread in animals with a weak form of the disease, causing disease outbreaks during which young susceptible populations mix with those infected and develop a mild form of the disease. Other host parameters, such as age, sex, species, monthly temperature, relative humidity, immune status, feeding pattern and geographical area (11), and season, may also influence disease progression (2). Because of a lack of epidemiological data and various management strategies in the herds where the problems emerge, infectious viral diseases are difficult to control (12). As a result, the current study attempted to create a multivariable statistical model to assess risk factors of PPR disease.

Materials and methods

The procedures followed the ethical norms and guidelines of the Institutional Animal Care and Use Committee of the Faculty of Veterinary Medicine at Zagazig University (ZU-IACUC-94/2021).

Study design and data description

A total of 113 healthy, non-vaccinated goats and sheep (63 goats and 50 sheep), more than five months (which were divided into young groups from 5-12 months and old group above 12 months), were subjected to a seroprevalence study by competitive ELISA (ID PPR competition kit) to detect antibodies against PPRV during the period between April 2018 and March 2019. Animals were subdivided according to species, age, gender, and season in the Al-Sharqia governorate.

Data collection and the explanatory variables

The current study concerned 113 animals that have been divided into two groups: the first group consists of 70 PPR positive animals, during the second group of 43 Healthy control animals. In this study, the possible predictor variables were: species (63 goats and 50 sheep), age (41 adults (>12 months) and 72 young (5-12 months), gender (51 male and 62 female), and season (winter, spring, summer, and autumn). All predictor variables were categorical and coded as follow: species (goat = 1, sheep = 2, sheep was considered as reference category), age (adult = 1, young = 2, young age was considered as reference category), gender (male = 1, female = 2, female was considered as a reference category), season (winter = 1, spring = 2, summer = 3, autumn = 4, the autumn was considered as reference category). In addition, the outcome variable was coded as ONE for positive PPR animals and ZERO for unrelated healthful controls.

Data management and statistical analysis

Using the SPSS statistical software package version 22 (13), all statistical methods were carried out. To choose the variables, the entry technique was used first, followed by multivariable binary logistic regression models. The following is a summary of the multivariable binary logistic regression model: $[\log(\frac{p}{1-p})] = \beta_0 + \beta_1X_1 + \beta_2X_2 + ... + \beta_kX_k$ Where; (P/1-P) is the odds, P is the probability of PPR, β0 is the Y-intercept of the model (y value when all X equal zero), β_1 is the first regression coefficient of X_1, also known as the first explanatory variable in the model, and β_k is the last regression coefficient of X_k, also known as the last explanatory variable in the model. The coefficient of regression (β), the coefficient's standard error (SE), the Wald value, and the related risk factor's odds ratio (OR) at a 95% confidence interval (CI), as well as the P-values, were used to illustrate the results. Wald value is a statistical measure that determines whether or not the explanatory variable is statistically significant in differentiating between the two categories in each binary logistic comparison depending on the relation between Wald's statistics and the standard error of the logistic coefficient of predictors. It is analogous to the t-test in linear regression and distributed as a Chi-square distribution (14): $W_k = (ß_k / \text{St error } (ß_k))^2$. Where β_K is the k-th estimated regression coefficient, each Wald statistic is compared to a chi-square distribution with one degree of freedom, and P-value less than 0.05 indicates that x has a significant effect on y. independent variables in logistic regression models are commonly represented as odds ratios (ORs), which reflect the magnitude of the independent variable's ability to contribute to the outcome. ORs are defined as the probabilities of the outcome occurring (p) vs. not occurring (1- p) for each independent variable. It is also the antilogarithm of the coefficient for the independent variable and is equal to exp(β) (exponentiation of logit coefficients). This equation's odds ratio is (15): $OR=e^{ß}$.

Where: e = 2.718 and β is the regression coefficient. Moreover, imply that a one-unit change in the independent variable multiplies the outcome odds by the amount contained in e^{β}. The absence of multicollinearity between the explanatory variables was ensured before the multivariable analysis. Multicollinearity is a statistical phenomenon in which two or more predictor variables in a regression model are highly correlated (r), with r values ranging from -1 to 1(16). Multicollinearity exists for every (r) greater than 0.7, implying highly correlated independent variables. This issue can be investigated by looking at the tolerance and variance inflation factors (VIF). Because we have categorical predictors, we performed spearman's rank correlations and the Chi-square test to determine multicollinearity. Multicollinearity is also considered when the VIF value reaches 10 (17) and the tolerance value equals or less than 0.1(18). The overall goodness of fit of the final selected model was tested using the Receiver Operating Characteristic curve (ROC curve) via the area under the curve (AUC). The model is considered fit to the current dataset if the AUC is more than 0.5 and has a significant probability value (P<0.05).

Results

To begin, test assumptions were made, and the results of the correlation matrix for independent variables were calculated. The spearman's rank correlations (r) were less than 0.20, indicating no significant correlations between the variables. In addition, the variance inflation factor (VIF) and tolerance values were calculated (Table 1). There is no multicollinearity between independent variables because none of the variables in the model have a VIF value over 2.0 or a tolerance value close to 0.95. The overall predicted percentage of correctly classified cases was 75.2 % (Table 2). The outputs of the Omnibus test and Hosmer and Lemshow goodness-of-fit test (Table 3). There is a significant difference between the Log-likelihoods (specifically the -2LL). The -2LL value equal 126.44 and the chi-square value was highly significant ($\chi^2 = 23.7$, P = 0.001). Regarding the Hosmer and Lemshow goodness-of-fit test, the chi-square value was non-significant ($\chi^2 = 7.009$, P = 0.536). The area under the curve (ROC curve) was also used to assess the model with used predictors (AUC = 0.77, P < 0.001), which is significantly considerable acceptable value for discrimination ability between diseased and non-diseased animals (Figure 1).

Table 1: Values of variance inflation factor (VIF) and tolerance computed for the explanatory variables

Variable	Tolerance	VIF
Species	0.998	1.002
Age	0.972	1.029
Season	0.986	1.014

Table 2: Validity and predictive ability of the incorporated binary logistic regression model

Observed		Predicted		
		Output		% Correct
		Negative	Positive	
Output	Negative	27	16	62.8
	Positive	12	58	82.9
Overall Percentage				75.2

Table 3: Evaluation criteria of the multivariable binary logistic regression model

Criteria		Value	P
-2log likelihood		126.437	
Nagelkerke's R^2		0.257	
Hosmer and Lemshow	Chi square	7.009	0.536
Omnibus Test	Chi square	23.7	0.001
Specificity		62.8%	
Sensitivity		82.9%	
Accuracy		75.2%	
Area under curve	AUC	0.77	<0.001

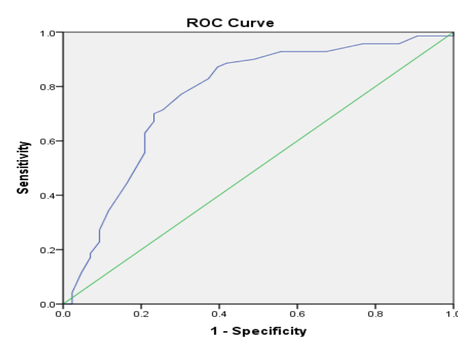

Figure 1: The ROC curve using the estimated probability denoted by the multivariable binary logistic regression model (AUC = 0.77, P<0.001).

The associations between risk factors and the outcome variable (incidence of PPR) are summarized in Table 4. For the season variable, autumn was considered as the reference category. The summer and winter seasons showed a non-significant effect on the incidence of PPR when compared with the autumn season (OR = 1.073 and 1.398, respectively). Meanwhile, the incidence of PPR in the spring season was significantly reduced compared with the autumn season (OR = 0.245). Additionally, animals had a 4.08 more likelihood of being infected with PPR in the autumn season when compared with the spring season.

On the other hand, young age was considered the reference category in the model when age is regarded. The results showed a significant difference between young and adult groups (OR = 2.771; 95% CI = 1.068 to 7.187). Hence, the adult group had 2.771 times increased the odds of being infected with PPR than the young age group. On the contrary, the test model did not detect a significant difference between sheep and goat species. The odds ratio for goats versus sheep was equal to 1.208. This value was estimated to be a close one.

Table 4: Multivariable binary logistic regression showing the association between risk factors and PPR disease

Explanatory variables	ß	Odds ratio	95% C.I. (OR)	P value
Species (goat), ref. = sheep	0.189	1.208	0.52- 2.83	0.664
Sex (male), ref. = female	-1.655	0.191	0.08 - 0.48	0.001**
Age (old), ref. = young	1.019	2.771	1.07 - 7.19	0.036*
Season autumn				0.077
Winter	0.335	1.398	0.42 - 4.61	0.582
Spring	-1.406	0.245	0.07 - 0.90	0.034*
Summer	0.071	1.073	0.37 - 3.16	0.898

*Significant at P<0.05. **Significant at P<0.01.

Discussion

The evaluation criteria of the model were reported as -2log likelihood with a chi-square value which reflects how much information remains unexplained after the model has been fitted and utilized to check the overall relationship between an explanatory variable and the outcome by comparing the likelihood of getting data when the parameter is zero to the likelihood of obtaining data evaluated at the maximum likelihood estimate of the parameter (19). The Omnibus test of model coefficients determines whether the new model (including explanatory variables) is superior to the baseline model. It applies chi-square tests to determine whether there is a statistically significant difference between the Log-likelihood value (specifically the -2LL). Its chi-square value is highly significant, indicating that the current model is significantly better at explaining more of the variance in the outcome. The other evaluation criteria are Hosmer and Lemshow goodness-of-fit tests, where small values of χ^2 with significant P-values indicate an excellent fit to the data, while large χ^2 values with P-values less than 0.05 indicate a poor fit (20). Meanwhile, the low Nagelkerke's R^2 value 0.257 may indicate that the model's efficiency is questionable as the logistic model explains only a 25.7% probability of the change in outcome.

There is no multicollinearity between independent variables because none of the variables in the model have a VIF value greater than 2.0 or a tolerance value less than 0.90 (18,21). A tolerance value close to 1 indicates little multicollinearity between predictors, whereas a value close to zero indicates much multicollinearity. A VIF value that is equal to 1 means no multicollinearity, while a VIF value >1 means moderate multicollinearity, and VIF between 5 and 10 means high multicollinearity, and if VIF value > 10 indicates serious multicollinearity (17).

In the current study, females were more likely affected by PRP, with an odds ratio than males. Consistent with these findings, the infection rate of PPR in females 74.7% was more significant than in males 54.1% (22). Because the sex of the animals did not affect the development of PPRV antibodies, this significance has no biological plausibility. This observation could be explained by the fact that producers of small ruminants keep more females for breeding purposes. As a result, females are more likely than males to be exposed to PPRV throughout their lives (23). On the other hand, Males are the most affected by PPR, which might be due to genetic variation of goats in Raj Shahi, Bangladesh (24).

For the sex variable, old animals more than 12 months were more likely affected by PRP, with an odds ratio than young animals 5-12 months. This agrees with the report's findings that showed a higher prevalence of PPR in animals older than two years of age (25). On the contrary, the prevalence of PPR was higher in young animals 61.8% than in adult animals 49.2% (26). It is possible. Sometimes, young goats require additional nutritional supplements to reach sexual maturity and gain body weight. As a result, they suffer from long-term malnutrition, making them susceptible to disease. Increased susceptibility of young goats may be due to malnutrition, poor immunity, and a poor management system. Saadullah (27), in disagreement with our result, showed that the age of animals was analyzed into three categories, adult (>1 year) and young (between 4 to 12 months). Sucklers (between 1 to 3 months) were 10.15%, 31.06%, and 13.14%, respectively. This is due to the loss of maternal (colostral) immunity in young animals beyond four months and the absence of PPR antibodies in the serum of older animals who have never been exposed to or vaccinated against the disease (24).

In the current trial, goats exhibited a higher incidence of PPR 56.5% than sheep 35.1%. However, the differences were non-significant. In another context, higher seropositivity of PPRV in goats 34.5% compared to sheep 11.2% (28). In northeastern Egypt, the prevalence of PPR was higher in goats 69.3% (104/150) than in sheep 48.5% (197/450) (26). The differences in PPRV seropositivity depend on species, sex, age, season, and geographical location. Although both goats and sheep are susceptible to infection and may show disease, they are not always affected concurrently; for example, in Africa, PPR is most commonly seen in goats, whereas sheep are usually among the most in western and south Asia visible victims (29).

The incidence of PPR in the spring season was significantly reduced compared with the autumn season. Additionally, animals had more likelihood of being infected with PPR in the autumn season when compared with the spring season. The dry season has a greater prevalence of PPR than the wet/rainy season (30). Others have suggested that seasons with solid wind speeds support PPR aerosol transmission significantly more than seasons with low wind speeds (31). Moreover, a significant association between the PPR prevalence and the winter season was noted due to the dusty and dry wind (22).

Conclusion

It could be concluded that PRP is more prevalent in female and adult Sheep and Goat. Moreover, the disease is relatively more prevalent in goats compared with sheep. The infection rate of PPR was significantly reduced in the spring season. Uncontrolled animal movements within and across borders pose a high risk for PPRV spread and warrant further studies to adopt standard prevention and control programs. Considering the current results, the present study may allow the planning of an effective vaccination program against PRP disease in Egypt. In addition, the study showed the applicability and effectiveness of the multivariable binary logistic regression to deal with veterinary datasets, denoting broad information as compared with the traditional Biostatistical methods.

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Conflict of interest

There is no conflict of interest.

References

1. Munir M. Role of wild small ruminants in the epidemiology of peste des petits ruminants. Transbound Emerg Dis. 2014;61(5):411-424. DOI: 10.1111/tbed.12052
2. Parida S, Muniraju M, Mahapatra M, Muthuchelvan D, Buczkowski H, Banyard AC. Peste des petits ruminants. Vet Microbiol. 2015;181(1-2):90-106. DOI: 10.1016/j.vetmic.2015.08.009
3. Bailey D, Banyard A, Dash P, Ozkul A, Barrett T. Full genome sequence of peste des petits ruminants virus, a member of the Morbillivirus genus. Virus Res. 2005;110(1-2):119-124. DOI: 10.1016/J.VIRUSRES.2005.01.013
4. Woo PC, Lau SK, Wong BH, Fan RY, Wong AY, Zhang AJ, Wu Y, Choi GK, Li KS, Hui J, Wang M, Feline morbillivirus, a previously undescribed paramyxovirus associated with tubulointerstitial nephritis in domestic cats. PNAS. 2012;109(14):5435-5440. DOI: 10.1073/pnas.1119972109
5. Baron MD, Parida S, Oura CL. Peste des petits ruminants: A suitable candidate for eradication. Vet Rec Open. 2011;169(1):16-21. DOI: 10.1136/vr.d3947
6. Banyard AC, Parida S, Batten C, Oura C, Kwiatek O, Libeau G. Global distribution of peste des petits ruminant's virus and prospects for improved diagnosis and control. J Gen Virol. 2010;91(12):2885-2897. DOI: 10.1099/vir.0.025841-0
7. Mahmoud MA, Khafagi MH. Detection, identification, and differentiation of sheep pox virus and goat pox virus from clinical cases in Giza governorate, Egypt. Vet World 2016; 9(12):1445-1449. DOI: 10.14202/vetworld.2016.1445-1449
8. Mahmoud MA, Ghazy AA, Shaapan RM. Diagnosis and control of foot and mouth disease (FMD) in dairy small ruminants; Sheep and goats. Int. J Dairy Sci. 2019; 14 (1): 45-52. DOI: 10.3923/ijds.2019.45.52
9. Taylor W. The global eradication of peste des petits ruminants (PPR) within 15 years - is this a pipe dream. Trop Anim Hlth Prod. 2016;48(3):559-567. DOI: 10.1007/s11250-016-0993-x
10. Hassan SD. Prevalence of border disease virus in sheep and goats in Mosul, Iraq. Iraqi J Vet Sci. 2021;35(2):257-262. DOI: 10.33899/ijvs.2020.126758.1372
11. Taylor WP, Barrett T. Rinderpest and peste des petits ruminants. 4th ed. UK: Blackwell; 2007. 450-469 p. [available at]
12. Mahmoud MA, Ghazy AA, Shaapan RM. Review of diagnostic procedures and control of some viral diseases causing abortion and infertility in small ruminants in Egypt. Iraqi J Vet Sci. 2021;35(3):513-521. DOI: 10.33899/ijvs.2020.127114.1461
13. IBM Corp. Statistics IS. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Google Search. 2013. [available at]
14. Aziz NA, Ali Z, Nor NM, Baharum A, Omar M. Modeling multinomial logistic regression on characteristics of smokers after the smoke-free campaign in the area of Melaka. AIP Conference Proceedings 2016;1750(1)060020. DOI: 10.1063/1.4954625
15. Hosmer DW, Lemeshow S, Cook ED. Applied logistic regression. 2nd ed. New York: Jhon Wiley and Sons Inc. 2000. [available at]

16. Jensen DR, Ramirez DE. Revision: Variance inflation in regression. Adv Dis Sci. 2013;23:23-33. DOI:10.1155/2013/671204
17. Akinwande MO, Dikko HG, Samson A. Variance inflation factor: as a condition for the inclusion of suppressor variable (s) in regression analysis. Open J Stat. 2015;5(07):754. DOI: 10.4236/ojs.2015.57075
18. Myers RH. Classical and modern regression with applications. 2nd ed. USA: Duxbury Press Belmont; 2000. 488 p.
19. Field A. Discovering statistics using IBM SPSS statistics. USA: Sage; 2013. 22 p. [available at]
20. Stoltzfus JC. Logistic regression: A brief primer. Acad Emerg Med. 2011;18(10):1099-104. DOI: 10.1111/j.1553-2712.2011.01185.x
21. Belsley DA, Kuh E, Welsch RE. Regression diagnostics: Identifying influential data and sources of collinearity. USA: John Wiley and Sons; 2005. 292 p. [available at]
22. Abdalla AS, Majok AA, El Malik KH, Ali AS. Sero-prevalence of peste des petits ruminants virus (PPRV) in small ruminants in Blue Nile, Gadaref and North Kordofan States of Sudan. JPHE. 2012;4(3)59-64. DOI: 10.5897/JPHE11.213
23. Ahmed N. Peste Des Petits Ruminants (PPR) in Sudan detection, virus isolation and identification pathogenicity and seros surveillance [PhD dissertation]. Sudan: UOFK. [available at]
24. Sarker S, Islam MH. Prevalence and risk factor assessment of Peste des petits ruminants in goats in Rajshahi, Bangladesh. Vet World. 2011;4(12):546. DOI: 10.5455/vetworld.2011.546-549
25. Abubakar M, Jamal SM, Arshed MJ, Hussain M, Ali Q. Peste des petits ruminant's virus (PPRV) infection; its association with species, seasonal variations, and geography. Trop Anim Hlth Prod. 2009;41(7):1197-202. DOI: 10.1007/s11250-008-9300-9
26. Elhaig MM, Selim A, Mandour AS, Schulz C, Hoffmann B. Prevalence and molecular characterization of peste des petits ruminants virus from Ismailia and Suez, Northeastern Egypt, 2014-2016. Small Rumin Res. 2018;1(169):94-8. DOI: 10.1016/j.smallrumres.2018.07.001
27. Saadullah M. Research and development activities and needs on small ruminants in Bangladesh. Res Devel Small Ruminant Asia. 19916:12-20. [available at]
28. Abubakar M, Rasool MH, Manzoor S, Saqalein M, Rizwan M, Munir M, Ali Q, Wensman JJ. Evaluation of risk factors for peste des petits ruminants virus in sheep and goats at the Wildlife-Livestock Interface in Punjab Province, Pakistan. Biomed Res Int. 2016;15. DOI: 10.1080/01652176.2020.1714096
29. Abubakar M, Ali Q, Khan HA. Prevalence and mortality rate of peste des petitis ruminant (PPR): Possible association with abortion in goat. Trop Anim Hlth Prod. 2008;40(5):317-21. DOI: 10.1007/s11250-007-9105-2
30. Khan A, Saleemi MK, Ali F, Abubakar M, Hussain R, Abbas RZ, Khan IA. Pathophysiology of peste des petits ruminants in sheep (Dorper & Kajli) and goats (Boer & Beetal). Microb Patho. 2018;117:139-147. DOI: 10.1016/j.micpath.2018.02.009
31. Kihu SM, Gitau CG, Bebora LC, Njenga MJ, Wairire GG, Maingi N, Wahoma RG, Ndiwa NN. Risk factors associated with spread of PPR in Turkana district, Kenya. In Third forum meeting Entebbe, Uganda, Research Application summary 2010;529-535. DOI: 10.29011/AVST-120/100020

نموذج الانحدار اللوجستي الثنائي متعدد المتغيرات للتنبؤ بعوامل الخطر بمرض طاعون المجترات الصغيرة في الماعز والخراف

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الخلاصة

طاعون المجترات الصغيرة هو مرض شديد العدوى قد يؤثر على كل من المجترات الصغيرة المستأنسة والبرية، مما قد يسبب خسائر اقتصادية كبيرة. كان الهدف من هذه الدراسة هو استخدام نموذج انحدار لوجستي متعدد المتغيرات لتحديد عوامل الخطر بالنسبة لتقرير أداء البرنامج .خضع ١١٣ من الماعز والأغنام غير المطعمة (٦٣ عنزة و ٥٠ خروفا)، عند عمر ٥-٦ أشهر، لدراسة حول الانتشار المصلي للكشف عن الأجسام المضادة ضد فيروس المجترات الصغيرة خلال الفترة بين أبريل ٢٠١٨ ومارس ٢٠١٩. انخفض معدل الإصابة بالفيروس في موسم الربيع انخفاضا كبيرا بالمقارنة مع موسم الخريف (OR = 0.245، P = 0.001). بالإضافة إلى ذلك، كان لدى الحيوانات ٤,٠٨ احتمال أكبر للإصابة بطاعون المجترات الصغيرة في موسم الخريف بالمقارنة مع موسم الربيع. وكان هناك فرق كبير بين مجموعة الذكور والإناث (OR =؛ 0.191 ٩٥٪ CI = 0.077 إلى ٠,٤٧٦). وقد زادت احتمال الخمج في الاناث ٥,٢٣٦ مرة من احتمالات الإصابة بمرض طاعون المجترات الصغيرة مقارنة بمجموعة الذكور (مع الذكور الخمجة). كما أن مجموعة البالغين زادت ٢,٧٧١ مرة من احتمالات الإصابة بالمرض من الفئة العمرية الصغيرة (OR= 2.771؛ ٩٥٪ CI = 1.068 إلى ٧,١٨٧). ومن ناحية أخرى، لم يجد نموذج الاختبار أي دليل يدعم أي اختلافات كبيرة بين أنواع الأغنام والماعز. يعد طاعون المجترات الصغيرة هو الأكثر شيوعا في المجترات الصغيرة الإناث الناضجة، وفقا للنتائج. وعلاوة على ذلك، انخفض معدل الإصابة بالمرض بشكل ملحوظ طوال فصل الربيع. والواقع أن الدراسة الحالية قد تساعد في التخطيط لبرنامج تطعيم فعال ضد هذا المرض الخمجي في مصر.