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Epidemiological studies on peste des petits ruminants

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ABSTRACT

PPR is a highly contagious viral disease affecting mainly goats, sheep and wild ruminants and considered as a major obstacle in small ruminants production. Five migratory flocks of sheep and goats in Giza governorate (Moatamadia village, Zenien, Saft El-Labn and Kafrberak El-Khiam) and 5 sheep admitted to the clinic of faculty of veterinary medicine, Cairo University were suspected to be affected with PPR based on field diagnosis (case history, clinical examination and P.M. examination) during the period from October 2014 to November 2014. A total number of 40 samples (21 buffy coats, 18 nasal swabs and one spleen tissue) were obtained from affected animals for confirmation of this suspicion by virus isolation on Vero cells and RT-PCR using primers directed to the highly conserved sequence in nucleoprotein gene of PPRV. The total number of samples which gave positive results was 15 and 37 samples by VI and RT-PCR, respectively. These results confirmed that causative agent of these case series was PPRV. Also it was hypothesized that the disease is endemic in Egypt with regular flourishment in the period around Al-Adha festival and this hypothesis required further analysis.In another study a survey on PPR antibodies in sheep and goats in Giza governorate, Egypt, during the period from May 2014 to July 2015 to determine the period prevalence by SNT and c-ELISA (descriptive epidemiological study). A total number of 316 animals (200 sheep and 116 goats) were randomly selected for this study and 316 blood samples were obtained from these animals for laboratory examination The overall seroprevalence in both animal species was determined as 67.4 % (95% CI, 62.2%-69.9%) and 65.3 % (95% CI, 62.6%-68%) by SNT and c-ELISA, respectively. The prevalence was higher in sheep than in goats as follow: 71 % and 61 % in sheep and goats, respectively by SNT and 68 % and 51.7 % in sheep and goats, respectively, by c-ELISA, but this difference was statistically non-significant. The prevalence was higher in males than in females in goats by both SNT (84.2 % for males and 56.7% for females) and c-ELISA (68.4% for males and 48.5% for females) while in sheep there was a slight difference in prevalence between males and females as it was higher in males than in females by SNT (71.6% for males and 70.6% for females) and higher in females than in males by c-ELISA (67.7 % for males and 68.2 % for females) however, this difference was statistically non-significant. The survey study also analyzed a hypothesis (analytical epidemiological study) about association between individual animal's PPR seroposisitivity and some selected time independent risk factors (animal's species, age and sex and some mangemental factors as flock size, flock composition, flock type, veterinary supervision and introduction of new animals). The data regarding these risk factors were collected by personal interviewing questionnaire (close format), entered into SPSS sheet and analyzed by two levels of statistical analysis included a univariate chi-square test and risk factors which showed significant effect were further analyzed by a multivariate logistic regression model to exclude the confounders. Regular Introduction of new animals without qaurantine and migration were the only risk factors had significant effect with p value= 0.0409 and 0.0037, respectively. The results of this survey indicated a widespread distribution of PPR antibodies in the study area which may attributed to old infection or new infections which should be differentiated by active surveillance. Also it was concluded that a quarantine period at least 2 weeks should be maintained before introduction of new animals to flocks.**Key words:** PPR, seroprevalence, small ruminants, Giza governorate, SNT, c-ELISA, risk factors, viral isolation, RT-PCR.

DEDICATION

I dedicate this work to my late father and my mother for the all the support she lovely offered during my post graduate studies.

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LIST OF ABBREVIATIONS

µg	microgram
µl	microliter
µM	Micromolecule
AGPT	agar gel precipitation test
BHK	Baby hamster kidney cells
BT	Blue tongue
CD	Canine distemper
cDNA	complementary DNA
c-ELISA	Competitive enzyme kinked immunosorbent assay
CFT	Complement fixation test
FAO	Food and Agriculture Organization
FMDV	Foot and mouth disease virus
GOVS	General organization of veterinary services
Ic-ELISA	Immunocapture enzyme linked immunosorbent assay
MDBK	Madenderby bovine kidney cells
MV	Measles virus
OIE	World organization of animal health (office international des epizootics)
OR	Odds ratio
P.M.	Post mortem examination
P.S.R.	Peste of small ruminant
Pen-strep	Penicillin and streptomycin

PPR	Peste des petits ruminants
PPRV	Peste des petits ruminants virus
p-value	Propability value
RP	Rinder pest
rpm	Revolution per minute
rRT-PCR	Real time reverse transcriptase polymerase chain reaction
RT-PCR	Reverse transcriptase polymerase chain reaction
RVFV	Rift valley fever virus
SLAM	Signaling lymphocyte activation molecule
SNT	Serum neutralization test
TCID 50	Tissue culture infective dose 50
UK	United Kingdom
VI	Virus isolation

INTRODUCTION

Peste des petits ruminants is an acute highly contagious viral disease mainly affecting both domesticated and wild small ruminants **(Kumar *et al.*, 2014)** whereas cattle, Pigs and rats undergo subclinical infection **(Sen *et al.*, 2014, Nawathe and Taylor 1979 and Komolafe *et al.*, 1987)** with some reports considering the camel as a victim to this virus **(Khalafalla *et al.*, 2010)**.The diswasw is caused by peste des petitsruminants virus (PPRV) which is together with rinderpest virus (RPV), measles virus (MV), and canine distemper (CDV) constitute the morbillivirus genus that belongs to the family *Paramyxoviridae***(Gibbs *et al.*, 1979*)***.*

The disease characterized by high morbidity and mortality rates in susceptible flocks which may reach 100 % and >90%, respectively **(Gibbs *et al.*, 1979)**.

The clinical signs include fever, anorexia, pneumonia and diarrhea while postmortem changes including consolidation of lungs, stomatitis, zebra marking of colon and rectum **(Chauhan *et al*., 2011).**

PPRV is currently considered as one of the main animal transboundary diseases. The disease has a global distribution along West African countries (Burkina Faso, Ghana, Nigeria, Senegal, Guinea, Ivory Coast and Mali), North African countries (Egypt, Morocco and Tunisia), East African countries (Ethiopia, Sudan, Kenya, Uganda and Somalia) and Central African countries (Congo, Chad, Cameroon and Gabon). The disease is endemic in most Asian countries (Arabian Peninsula, Iraqi, Iran, Afghanistan, India, Pakistan, China, Tajikistan, Kazakhstan, Vietnam, Bangladesh and Nepal). In recent years outbreaks of PPRV have occurred in the European part of Turkey which increased the possibility of further spread into the European Union and may

threaten further regions across the globe in the future **(Banyard *et al.*, 2010)**. Algeria also was hit by PPR recently in 2010 **(De Nardi *et al.*, 2012).**

Small ruminants serve as investment for farmers due to their high fertility, short generation interval, ability to produce under limited feed resources and adaptation to harsh environment **(Tsedeke 2007)**.

Viral diseases of sheep and goats including peste des petits ruminants (PPR) could cause tremendous losses of animals and imposing major burden on economic activity and therefore require intensive control measures **(Boshra *et al.*, 2013)**.

Therefore our present study was designed to investigate PPR epidemiology in some flocks of sheep and goats in Giza governorate, Egypt.

The study included:

1. A case series study of sheep and goats showed oculonasal discharge, respiratory and digestive disorders in Giza governorate, Egypt.

2. A descriptive study (cross sectional study) to determine the period seroprevalence of PPR in sheep and goats at Giza governorate from May 2014 to July 2015.

2.An analytical study (cross sectional study) to test a hypothesis about association between PPR seropositivity and some risk factors related to animals and management.

LITERATURES

1. Historical review

Gargedennec and lalanne (1942) investigated a previously unreported syndrome in sheep and goats in Côte d'Ivoire. Because of its clinical and pathological resemblance to rinderpest (RP) or peste bovine in French, they called the disease 'Peste des Petits Ruminants' (PPR).

Mornet *et al.,* (1956) reported that PPR is similar to RP as far as epizootiology, clinical signs, pathology, and immunity are concerned. It was sporadic or enzootic every year in the Ivory Coast, Dahomey and Southern Provinces of Senegal.

Whitney *et al.,* (1967) studied a syndrome that occurred primarily in goats in Nigeria and variously named stomatitis-pneumoenteritis-complex, pseudo-rinderpest, or kata. It was considered to be distinct from PPR because of the crusty labial lesions commonly found in convalescent cases.

Hamdy *et al.,* (1976) concluded that the causative agent of stomatitis pneumoenteritis complex 'kata' was immunologically and morphologically identical with peste des petitsruminants virus. Recovered goats were protected against a challenge with rinderpest virus that was lethal to control goats.

Asmar *et al.,* (1980) reported severe outbreaks of a new disease in sheep in Saudi Arabia during July 1977 and July 1979. The clinical and PM features of these outbreaks suggested that PPRV is the causative agent.

Hedger *et al.,* (1980) detected antibodies to PPR virus in sheep in the Sultanate of Oman during a local survey carried out in 1978.

El Hag Ali and Taylor (1984) recorded that RP was diagnosed in two outbreaks in goats in central Sudan during 1971 and 1972. Isolated viruses

were later re-examined serologically and by inoculation of experimental cattle, sheep and goats and found to be PPRV.

Taylor (1984) described that PPR occurs in a belt across Africa immediately south of the Sahara and extends in to the Arabian Peninsula. Countries are ranked according to the reliability of the evidence of PPR in four categories. Countries where there has been a good description of the disease and virus has been isolated from clinical material can be regarded as being definitely infected. In this category Ivory Coast, Senegal, Nigeria, Ghana and Sudan may be placed. Specific neutralizing antibody to PPR may be regarded as slightly less; nevertheless, sound evidence for the presence of PPRV within a country and on this basis Oman must be regarded as being infected. In other instances workers have identified a PPR-like disease in sheep or goats with a relationship to rinderpest based on (a) demonstration of a precipitinogen with rinderpesthyperimmune rabbit antisera and/or (b) protection by use of attenuated rinderpest vaccine and/or (c) the demonstration of rinderpest antibody in the sera of convalescent animals. Both rinderpest and PPR would fulfil all these criteria and, although it is more than likely that where such tests have been applied they have been detecting PPR, while any doubt exists that RV might also be present such results must be interpreted with caution. Countries where this sort of evidence has been assembled include Benin (formerly Dahomey), Chad, Ethiopia, Niger, Saudi Arabia and the Yemen. The least reliable evidence for the presence of PPR is that which rests on nothing more than a clinical description and in this category we have Togo, Mali and Upper Volta.

Furley *et al.*, (1987) declared that peste des petits ruminant virus was isolated during an outbreak of PPR in a zoological collection at Al-Ain region, United Arab Emarates (UAE).

Shiala *et al.*, (1989) reported an outbreak of PPR affecting only sheep in Tamil Nadu, India. PPRV was isolated from this outbreak and confirmed by

hybridization using PPR nucleoprotein specific cDNA probe. This is considered as the first report of PPR in India.

Lefevre *et al.,* (1991) detected the presence of PPR antibodies in the year 1987/88 in Jordan after the examination of sheep and goats serum samples by ELISA.

Roeder *et al.,* (1994) diagnosed PPR for the first time in Ethiopia by using specific cDNA probes.

Wamwayi *et al.,* (1995) noted the presence of PPR antibodies in sheep and goats in Kenya and Uganda. These results suggested that the geographical range of PPRV has extended south from Sudan and Ethiopia.

Amjad *et al.,* (1996) confirmed the responsibility of PPRV in the induction of an outbreak in Pakistan. The samples were examined at Pirbright, UK. The isolated strain of PPRV is extremely similar to those circulating in neighboring countries but distinct from the widely studied African strain, Nigeria 75/1.

FAO (1999) reported that PPR is present in the Near East and the Arabian Peninsula, including Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, the United Arab Emirates and Yemen, and there is serological evidence from the Syria and Turkey. Outbreaks of PPR are now known to be common in India, Nepal, Bangladesh, Pakistan and Afghanistan.

Barhoom *et al.,* (2000) recorded the first outbreak of PPR in Iraq which characterized by high morbidity and low mortality.

Lundervold *et al.,* (2004) carried out a serological survey of some viral diseases of livestock in Kazakhstan in 1997-1998 where PPR positive sera were detected.