Serosurveillance of Bovine viral diarrhea virus in bovine at Fayoum Governorate of Egypt

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This study was supported financially by a grant project from the science and technology development fund (STDF), Egypt.

Abstract
A serological survey was carried out to determine the prevalence rate of Bovine viral diarrhea virus (BVDV) infection in unvaccinated cattle and buffaloes population in six centers of Fayoum Governorate (Atssa, Ebchowai, Senores, Fayoum, Tameya and Youssef Elsedik). Sera samples from the 26 farms of various centers were taken from1549 cattle and 122 buffaloes (dams and calves) in 2011 to 2013. Sera were tested via competitive ELISA technique to detect antibodies against BVDV. The results revealed that 668 cases out of the 1549 tested cattle (43.1%) and 59 out of 122 tested buffaloes (48.3%) were positive for the presence of antibodies against BVDV. Prevalence of seropositive percentages were 64%, 39.0%, 40.78%, 40.15%, 28.08% and 21.05% among Atssa, Ebchowai, Senores, Fayoum, Tameya and Youssef elsedik respectively. Differences in the percentage of BVDV infection among various centers are due to the difference in herd size, management and hygienic measures of the different farms.

Key words:
Bovine viral diarrhea virus, antibody, serosurveillance, Egypt.

Introduction

Bovine viral diarrhea virus (BVDV) is a single stranded RNA virus belonging to the *Pestivirus* genus of the family *Flaviviridae*. BVD is widespread and economically one of the most important diseases of cattle. Cattle of all age are susceptible to BVDV infection. It can result in poor reproductive performance, reduced milk yield, ill thrift, abortion and severe acute gastroenteritis followed by death. In addition, the virus suppresses the immune system and makes infected animals were susceptible to other diseases **(Lindberg, 2003)**. BVD infections are classified into three clinical syndromes; acute (transient) infection, foetal infection, and persistent infection (PI).

An acute transient form developed which may be subclinical or may present as fever, diarrhea and short-term immunosuppression **(Kabongo and Van vuuren, 2004).** Following transient infection animals will remain antibody positive for life, so antibody prevalence reflects the proportion of animals previously exposed to BVDV at any point in life **(Houe, 1995).** In the pregnant animal the virus can be transmitted vertically to the fetus **(Goens, 2002).** The timing of transmission is critical to the epidemiology of the disease; due to the infection occurring prior to the development of immune competence **(Potgeiter, 2004)**. The infection of pregnant cows during the first trimester of gestation could cause births of immunotolerant calves Persistently infected with BVDV **(Moennig and Leiss B 1995).** PI animals are the main source of new infections as they can pass the disease on to all susceptible animals they come into contact with. PI animals will remain BVD antigen positive and BVD antibody negative in most cases. Superinfection of PI with cytopathic BVDV strain may develop highly fatal mucosal disease characterized by severe erosive lesions in the oral and

intestinal mucosa, diarrhea and death **(Houe, 1995; Brownlie *et al.*, 1984).**

The herd diagnoses for the presence of PI animals are often based indirectly on an interpretation of serological test results for the detection of antibodies against BVDV. Reports from many countries indicated that the prevalence of BVDV antibodies in cattle varies from 28-90% in Denmark **(Houe, 1995),** 50- 70% in Slovaki Republic **(Vilcek *et al.*, 2003),** 86% in Turkey **(Tolga *et al.*, 2006).**

Several studies have demonstrated significant seroprevalence in African wildlife, although the role of sheep and wildlife in BVDV transmission is yet to be fully elucidated **(Soine *et al.*, 1992; Vilcek and Nettleton, 2006).** Reported seroprevalence of BVDV varies between different regions. There is evidence for infection in several African countries. It has been reported from a number of other African countries including South Africa **(Ferreira, *et al.*, 2000),** Zambia **(Ghirotti *et al.*, 1991)** and Ivory coast **(Couacy-Hymann *et al.*, 2007).**

Many investigators have reported incidences of BVDV among ruminants in different areas of Egypt previously **(Zaghawa, 1998; Aly *et al.*, 2003; Youssef, 2006; Ghazi, 2008)**. **Zaghawa (1998**) reported positive BVDV antibodies in cattle, buffalo, sheep, goats and camels (49.2%, 52.0%, 27.5, % 31.4 % and 52.5% respectively).

In Egypt we are lacking data regarding the impact of BVDV infection on cattle livestock. Fayoum is one of main governorate for raising cattle. The present study was performed to obtain knowledge on the status of BVDV infection in unvaccinated cattle and buffaloes through large-scale serological survey for the presence of antibodies against BVDV in various centers of Fayoum governorate.

Materials

Serological screening for the presence of antibodies against BVDV was carried out on sera samples collected from cattle and buffaloes (calves and dams). 1671 sera samples collected from 26 farms in six centers of Fayoum governorate, Egypt (Atssa, Ebchowai, Senores, Fayoum, Tameya and Youssef elsedik). The location and distribution of the examined animals among various centers are demonstrated in Figure (1).

Methods

Ingezim BVD compact 12.BVD.K3 (Competitive immunoenzymatic assay) Antibody detection against BVD was carried out as referred by **(Gonzalez *et al.*, 2013)** and the results were evaluated. The test is considered valid when the ODs for the positive control < 0.4 and the ODs for the negative control > 0.8, Positive cut off = negative control OD×0.5, Negative cut off = negative control OD×0.55.

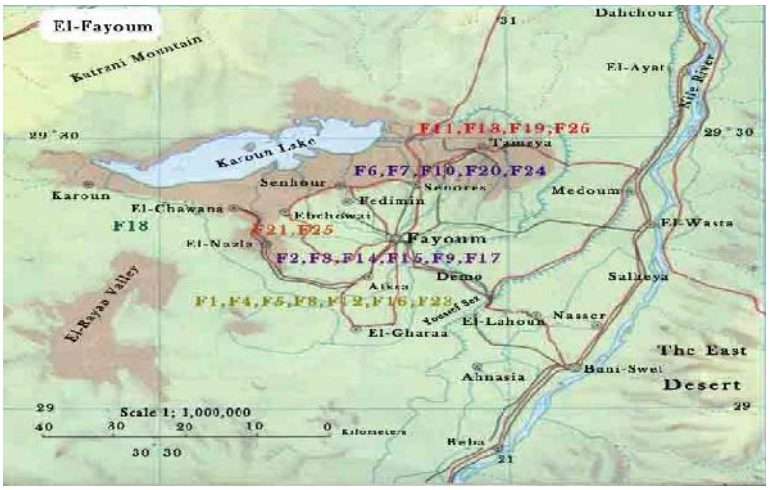


Figure 1. The location of the investigated farms at various Fayoum centers from which serum samples were collected

F. Farm

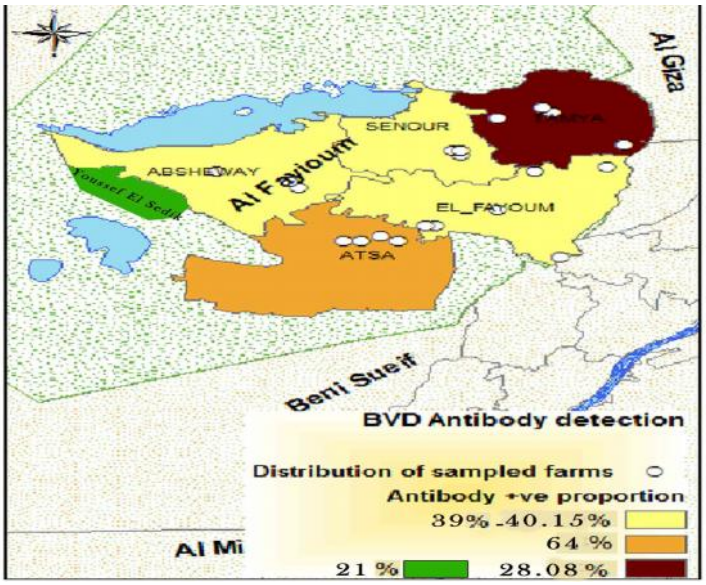


Figure 2. Fayoum map showing the distribution of BVD antibodies in different Fayoum centers

Results

The study revealed that 668 cases out of the 1549 tested cattle (43.1%) and 59 out of 122 tested buffaloes (48.3%) were positive for the presence of antibodies against BVDV. Table (1) and (2) showed that the number and the percentages of seropositive cases in Frizian calves, dams and buffalo calves, and dams were 40.8%, 44.5%, 75.5% and 32.46% respectively. However the overall seropositive percentage among cattle and buffaloes in the various centers of Fayoum were demonstrated as 64%, 39.0%, 40.78%, 40.15%, 28.08% and 21.0% among Atssa, Ebchowai, Senores, Fayoum, Tameya and Youssef Elsedik respectively (table 3).

Table (1). Numbers of samples and positive cases of cattle and buffaloes at various centers of Fayoum governorate.

	Frizian cattle				Buffaloes			
	Calves samples	AB +ve	Dams samples	AB +ve	Calves samples	AB +ve	Dames samples	AB +ve
Atssa	144	88	275	183	11	6	9	4
Ebchowai	33	20	79	29	4	0	9	0
Senores	134	47	155	61	22	21	47	17
Fayoum	143	50	226	98	6	5	6	0
Tameya	124	31	160	45	2	2	6	4
Youssef Elsedik	0	0	76	16	0	0	0	0
Total	578	236	971	432	45	34	77	25

Table (2). Incidence of serpositive cases of cattle and buffaloes

Frizian cattle						Buffaloes					
Calves			Dams			Calves			Dams		
Samples	AB +ve	% AB +ve	Samples	AB +ve	% AB +ve	Samples	AB +ve	% AB +ve	Samples	AB +ve	% AB +ve
578	236	40.8	971	432	44.5	45	34	75.5	77	25	32.46

Table (3). Percentage of positive antibody cases of cattle and buffaloes at various Fayoum centers

	Total tested samples	Number of positive samples	Percentage of Positive samples
Atssa	439	281	64 %
Ebchowai	125	49	39.0 %
Senores	358	146	40.78 %
Fayoum	381	153	40.15 %
Tameya	292	82	28.08 %
Youssef Elsedik	76	16	21.05 %
Total	1671	727	43.5%

Chart 1. Illustrating the total number of tested sera and the number of positive cases at different Fayoum centers

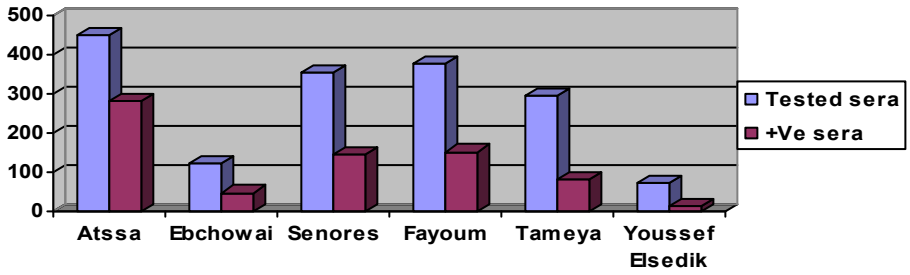
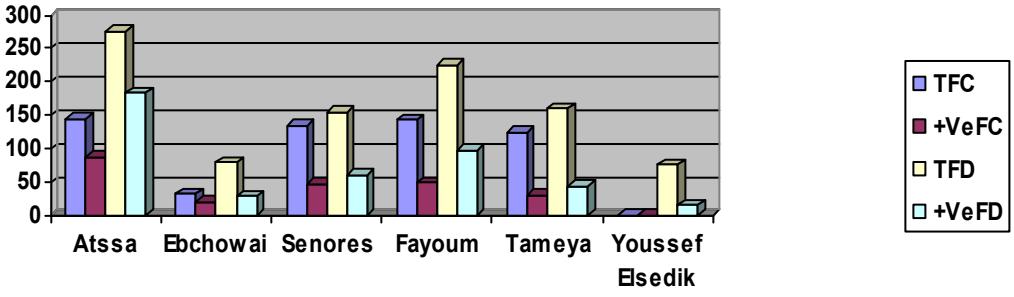
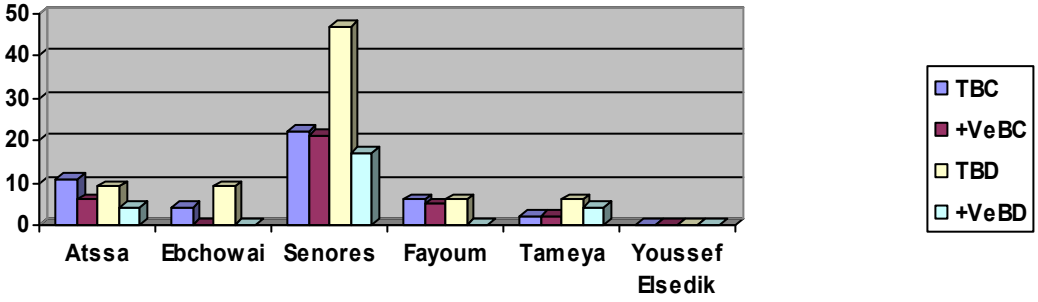


Chart 2. Illustrating the number of tested sera and positive sera of frezien cattle at different Fayoum centers



TFC tested frezien calves
FC frezien calves
frezien dams TFD tested
FD frezien dams

Chart 3. Chart illustrating the number of tested sera and positive sera of buffaloe cattle at different Fayoum centers



TFC tested buffalo calves
FC buffaloe calves
buffaloe dams TFD tested
FD buffaloe dams

Discussion

An indirect measure of virus infection is the detection of virus specific antibodies in the sera of unvaccinated animals. There are some serological techniques that are used to detect antibodies against BVDV ELISA technique was compared with SN test and the results of ELISA strongly correlated with those of serum neutralization test in detecting both seropositive and seronegative animals **(Haji Hajikolai, M.R. and Seyfiabad Shapouri, M.R. 2007).**

In the present study detection of antibodies against BVDV in sera samples of unvaccinated cattle and buffaloes using competitive ELISA technique was performed, The results revealed that 668 cases out of the 1549 tested cattle (43.1%) and 59 out of 122 tested buffaloes (48.3%) were positive for the presence of antibodies against BVDV. The percentages of seropositive cases among Frizian calves, dams and buffalo calves, and dams were demonstrated as 40.8%, 44.5%, 75.5% and 32.46% respectively. However the overall seropositive percentage among cattle and buffaloes in the various centers of Fayoum were demonstrated as 64%, 39.0%, 40.78%, 40.15%, 28.08% and 21.05% among Atssa, Ebchowai, Senores, Fayoum, Tameya and Youssef elsedik respectively. Reports from many countries indicated that the prevalence of BVDV antibodies in cattle varies from 18% and 86**% (Ferrari *et al.*, 1999; Castrucci et al 1996; Houe and Meyling, 1991 and Rnfenacht *et al.*, 2001).** In Egypt, **(Zaghawa, 1998**) reported positive BVDV antibodies in cattle, buffalo, sheep, goats and camels (49.2%, 52.0%, 27.5, % 31.4 %and 52.5% respectively). **Youssef (2006)** detected BVDV antibodies in 143 out of 240 calves blood samples (59.6%) in Alexandria and Behira governorates. The prevalence of BVDV infection differs between different countries and even between different provinces within a single country. This may be related to the differences in management, environmental variation, size of herds and existence of PI animals in the farms **(Hemmatzadeh *et al.*, 2001; Ferrari *et al.*, 1999; Grom, J., and Barlic Maganja, D 1999).**

The current work revealed that there was an increasing in the rate of seroprevalence with the increasing of ages of the cattle. The percentages of positive cases for the presence of antibodies against BVDV were 40.8 versus 44.5 for calves and cows respectively. These findings are in agreement with the study of previous authors **(Seyfiabad shapouri *et al.*, 2007; Harknes *et al.*, 1978).** On the other hand, the percentage of positive cases was

higher in buffalo's calves (75%) than in buffalo's dams, which is probably attributed to the small number of tested samples. Such results are contradict the report of **(Ghazi *et al.*, (2008)** who detected antibodies for BVDV in 65 % and 11 % out of 290 Frisian cattle and 210 buffaloes respectively.

Animals involved in this study were not vaccinated against BVDV and positive cases were thought to have been as result of natural BVDV infections due to the presence of PI animals among the herd plus passive immunity in calves less than 6 months. PI animals shed large amount of the virus in secretion and excretions through out their lifetime and can infect up to 90% of the herd before it has reached 3-4 months of age **(Houe, 1999).** Most cattle are exposed to BVDV will sereconvert and become positive for the BVDV antibodies for months. Calves that are born from cows that seroconvert gain antibodies from colostrums that will then be detected in tested sera. The level of these antibodies gradually decreases in the first six months of life **(Synge *et al.*, 1999)**.

In the present work, the highest number of bovine population was in Atssa and Fayoum, and the least number was found in Youssef Elsedik and Ebchowai. It was reported that there is correlation between population density and seroprevalence of the infection **(Houe, 1999)** That may explains the current finding of the high percentage of positive cases for BVDV antibodies in Atssa and Fayoum centers.

In conclusion, the present data indicated that incidence of BVDV infection in cattle and buffaloes in Fayoum are high and reflected the presence of Persistent infected animals among those farms and paying attention to that problem is a must. The presence of PI among the herds represents a great hazard for infection because PI animals are considered virus factories. Application of a national control program should be considered through the proper diagnosis of BVD infection, detection and elimination of Persistently infected animals in addition to proper vaccination.

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مسح سيرولوجى لفيروس الاسهال البقرى بالابقار و الجاموس بمحافظة الفيوم بمصر

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الملخص العربي

تم اجراء مسح سيرولوجى لاستبيان معدل انتشار فيروس الاسهال البقري بين القطعان الغير محصنة من الابقار و الجاموس بستة مراكز بمحافظة الفيوم المصرية و هى اطسا,ابشواى,سنورس,بندر الفيوم,طامية ويوسف الصديق.تم جمع العينات المصلية من 26 مزرعة بمراكز الفيوم المختلفة بعدد 1549 عينة من ابقار و122 عينة من جاموس(اعمار مختلفة)على مدار اعوام 2011 حتى 2013. تم اختبار الامصال عبر تقنية الاليزا التنافسية للكشف عن الأجسام المضادة لفيروس الاسهال البقري.و قد أظهرت النتائج أن 668 حالة من أصل 1549 عينة مصل من ابقار (43.1٪) و 59 من أصل 122عينة مصل من الجاموس (48.3٪) إيجابية لوجود أجسام مضادة لفيروس الاسهال البقري. وكانت النسب المئوية للعينات المصلية الايجابية لوجود الاجسام المناعية المضادة ضد فيروس الاسهال البقري هى 64٪، 39.0٪، 40.78٪، 40.15٪، 28.08٪ و 21.05٪ بالطسا,ابشواي ,سنورس,بندر الفيوم,طامية و يوسف الصديق. على التوالي. والاختلاف بمعدلات الاصابة بمرض الاسهال البقرى الفيروسى بمراكز الفيوم المختلفة يرجع الى اختلافات بحجم القطيع، والإدارة والتدابير الصحية بالمزارع المختلفة.

الكلمات الدالة :فيروس الاسهال البقرى,الاجسام المناعية,مسح مصلى, مصر