



## Sero-Epidemiological Study on Caprine Arthritis-Encephalitis Virus Infection in Goats in Two Localities in Egypt

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### ABSTRACT

Caprine Arthritis Encephalitis (CAE) is a chronic viral disease of domestic goats caused by a member of lentivirus of the family Retroviridae. In this study, the prevalence of caprine arthritis encephalitis virus in two governorates in Egypt was investigated. A total of 176 serum samples were collected from local (Egyptian Nubian, Egyptian Baladi which is the native breed) and foreign breeds (Barki and Shami) of goats from ten flocks from different localities in Behera and Alexandria governorates. Enzyme-linked-immuno-sorbent assay (ELISA) was employed for detection of anti -p28 antibodies directed against CAEV. Sero prevalence on the herd level was 30% (3/10 herds were positive). Sero prevalence on the individual level was 8.52%. All sero positive animals were from the breed Barki (15/106) at a percentage of 14.15%. Higher percentages of positive animals were recorded in females and at age between 4-5 years. All serologically positive cases (15) were in animals raised by open system (132), at a percentage of 11.36%. There was 100% correlation between the results of ELISA test in caprine serum and milk whey samples. In conclusion: The best of our knowledge this is the first study recorded the presence of caprine arthritis encephalitis in Egypt and further study to characterize the virus and wider seroprevalence study is required. The Milk whey ELISA test proved to be accurate simple non-invasive technique for surveillance of the disease on herd bases.

## 1. INTRODUCTION

Caprine Arthritis-Encephalitis Virus (CAEV) is an economically important viral disease occurs in goats worldwide and causes a progressive disease. Although most infections are subclinical, a minority of animals develop progressive, untreatable disease syndromes including four common clinical syndromes are often recognized. In adults the clinically recognized presentations are synovitis/arthritis, most commonly noted are the carpi, indurative and progressive mastitis and progressive interstitial pneumonia. All conditions in adults lead to poor production and wasting. Kids may develop

encephalitis (Cork *et al.*, 1974 a, b, Blacklaws *et al.*, 2004).

Caprine arthritis encephalitis virus (CAEV) is classified as small ruminant lentivirus (SRLVs), Caprine arthritis encephalitis (CAE) virus is one of the only two lentiviruses belonging to the Retroviridae family that is currently known to infect sheep and goats (Knowles, 1997; Rowe and East, 1997). CAEV is genetically and antigenically related to maedi-visna virus (MVV) of sheep (Zanoni, 1998; Ravazzolo *et al.*, 2001), and the two viruses are therefore together as small ruminant lentivirus (SRLV) (Peterhans *et al.*, 2004) there is evidence that SRLV can be transmitted from sheep to goats (Leroux *et al.*, 1997).

In the Middle East, CAEV has been detected in Saudi Arabia, Syria, Jordan, and Lebanon and also in Turkey, with prevalence's of between 0.8% and 12.5% (Alluwaimi *et al.*, 1990; Giangaspero *et al.*, 1992; Al-qudah *et al.*, 2006; Tabet *et al.*, 2015; Burgu *et al.*, 1994). To the best of our knowledge and according to OIE, no available data about the disease condition in Egypt.

Specific prophylaxis for CAEV is not available. The priority in the control of CAE is to get a rapid and certain diagnostic tool, to shorten the timetable of the eradication of infection, to discover the infected goats as soon as the antibodies could be detected after exposure (Turin *et al.*, 2005).

Based on clinical signs that frequently appear late and are not specific to infection, laboratory-based diagnosis for early detection, comprising antibody Agar gel immunodiffusion (AGID) and, more recently, enzyme-linked immunosorbent assay (ELISA) are internationally prescribed tests (OIE2008, Reina *et al.* 2009). In SRLV infections, seroconversion may take several months to develop (Houwens and Nauta, 1989).

One of the confirmatory diagnosis methods of CAEV, the enzyme-linked immunosorbent assays (ELISA), is highly suitable in terms of cost and is proved to be more sensitive than AGID test for the detection of CAEV antibodies (Oem *et al.*, 2012). The objective of this study was to determine the seroprevalence of CAEV antibodies and to investigate potential risk factors associated with the prevalence of CAEV infection in the population of goats raised in Behera and Alexandria Governorates.

## **2. Material and Methods**

### **2.1. Animals**

Three hundred and forty three goats from ten flocks were clinically examined for signs of caprine arthritis encephalitis. The number of goats in each flock and the location are shown in table (1).

### **2.2. Samples**

One hundred and seventy six caprine sera were collected from the jugular vein of goats using vacutainer tubes without anticoagulant. Samples were allowed to clot and transferred onto ice as quickly as possible to the laboratory. The sera were separated by centrifugation at 2000rpm for 10 min and aspirated in Eppendorf tubes and stored at  $-20^{\circ}\text{C}$  until testing.

Thirty four milk samples were collected from goats for ELISA using sterilized screw capped glass tubes by centrifugation and separation of milk whey (milk serum). The number and distribution of samples

showed in table (1).

### **2.3. Field Diagnosis**

The goat flocks were examined clinically for the criteria of caprine arthritis encephalitis, signs of arthritis (Goats with uni- or bilateral front lameness and swelling of one or both carpal joints were considered as possibly affected by the arthritic form of CAE). Mastitis abnormal neurological signs or pneumonia that could suggest the presence of CAEV.

Epidemiological data were obtained as (age, breeding, and kidding and herd health details) from the herd owners. Management practices were noted at the first visit, and any history of clinical signs compatible with CAEV infection in the herd. It also included the number of goats kept, and nutritional, reproductive and health management.

### **2.4. Lab Diagnosis**

#### **2.4.1 Enzyme linked immune-sorbent assay (ELISA)**

Serum and milk samples were tested for the CAEV antibodies by IDEXX MVV/CAEV p28 Ab verification kit (IDEXX Laboratories, Inc., Maine, USA) following the instruction of manufacturer. The CAEV infection was based on the antibody detection of an immunogenic peptide (p28 protein) of a transmembrane protein (TM, ENV gene) and of the recombinant p28 protein, which enters into the composition of the viral capsid (Gag gene).

### **2.5. Statistical analysis**

All frequencies were subjected to analysis by chi-square analysis test with the aid of SAS (2004) software.

## **3. RESULTS**

### **3.1. Prevalence of clinically suspected caprine arthritis encephalitis**

All goats in the ten flocks (343 goats) were clinically examined for the criteria of caprine arthritis encephalitis. A total of 56 goats were caprine arthritis encephalitis clinically suspected (16.33%). Caprine arthritis encephalitis clinical signs were recorded in each flock. Signs of Arthritis were recorded in 9 goats (2.62%) all were females and pregnant at the second and last trimester and at age of about 6 years, signs were in the form of variable degrees of lameness, painful polyarthritis of the carpal joint, accompanied by synovitis and bursitis. 6.12% of animals suffered from mastitis in the form of asymmetry of the halves, together with diffuse hardening.

**Table (1):** Number of examined samples per each flock of goats.

Flock No	Flock location	Number of goats in the flock	Number of Serum samples	Number of Milk samples	Date
1	Abu el Matameir , (Behera)	13	10	0	10/1/2018
2	Abu el Matameir , ( Behera)	31	17	0	10/1 /2018
3	Kafr Eldawar, (Behera)	8	8	0	14/1 /2018
4	Kafr Eldawar, (Behera)	56	46	5	21/1 /2018
5	Borg El Arab (Alexandria)	77	37	16	1/ 2/2018
6	Borg El Arab (Alexandria)	90	35	10	1/ 2/2018
7	45 street, (Alexandria)	7	3	0	17/2 /2018
8	Al Dalangat (Behera)	12	4	0	20/2 /2018
9	Kafr Eldawar (Behera)	30	7	0	20/2 /2018
10	Kafr Eldawar (Behera)	19	9	3	20/2 /2018
<b>Total</b>		343	176	34	

6.41% of goats were suffered from pneumonia in the form of chronic pneumonia and progressive dyspnea. Signs of encephalitis were recorded in 4 animals (1.16%) in the form hesitant shuffling gait when driven, ataxia, alert and hyper reflexes, also corneal opacity is recorded in 3 cases of the 4 animals. Other signs included in the complain of owners include Emaciation, lower birth weights in offspring, slower growth and increased reproductive failure.

### 3.2. Sero prevalence of caprine arthritis encephalitis:

#### 3.2.1. On flocks level

Ten flocks from different localities at Alexandria and Behera were examined serologically for evidence of caprine arthritis encephalitis infection by ELISA. The Ten flocks of goats were tested serologically for the presence of caprine arthritis encephalitis antibodies.

Only three herds (herd numbers 5, 6 and 9) had serologically strong positive goats at a percentage of

30% of the herds tested were positive. Weak positive cases were recorded in four flocks (flock number 4, 5, 6 and 9) which needed to be retested to be confirmed but we could not reach to the goats again. The total positive flocks (strong positive and weak positive) were 4 at a percentage of 40%. Flocks number 1, 2, 3, 7, 8 and 10 were totally negative.

#### 3.2.2. On individual level

As shown in table (3). One hundred and seventy six caprine sera were examined serologically by ELISA. Fifteen Samples were strong positive at a percentage of (8.52%) and this result is significant statistically. And nine goats were weak positive. Totally twenty- four animals were positive at a percentage of (13.64%). The highest number of positive animals was recorded in the flock number (5), where twelve from examined goats from this flock (37) were positive, at a percentage of 32.43%.

**Table (2):** Sero prevalence of caprine arthritis encephalitis on flocks' level.

Flocks with strong positive cases		Flocks with weak positive cases		Total	
No	%	No	%	No	%
3	30	4	40	4	40
(Flocks 5,6,9)		(Flocks 4,5,6,9)			
Chi-square value = 0.22 NS (P>0.05)					

### 3.3. Relationship between clinical signs suspected in relation to ELISA results:

As shown in table (4), fourteen goats were clinically normal but positive serologically for caprine arthritis encephalitis by ELISA (10 strong positive and 4 weak positive cases) at a percentage of 11.67%. Ten animals showed clinical signs were positive by ELISA (5 strong positive and 5 weak positive cases) at a percentage of 17.86% of the fifty six clinical cases recorded, from them 6 goats were suffering from pneumonia (3 strong positive and 3 weak positive) and 2 goats were suffering from indurative mastitis (strong positive). And two cases were weak positive suffering from arthritis.

Forty-six goats showed clinical signs were negative by ELISA. One hundred six goats were clinically normal, and also negative serologically for caprine arthritis encephalitis by ELISA test.

### 3.4. Sero prevalence of caprine arthritis encephalitis in relation to age:

As shown in table (5). Excluding weak positive cases, the highest sero prevalence of Caprine Arthritis Encephalitis was in goats at the age between 4-5 years

**Table (3):** Sero prevalence of caprine arthritis encephalitis.

Flock No.	Location	No. of animals in the flock	NO. of animals tested	NO. of positive					
				Strong positive		Weak positive		Total	
				No	%	No	%	No	%
1	Abu el Matameir , Behera	13	10	0	0	0	0	0	0
2	Abu el Matameir , Behera	31	17	0	0	0	0	0	0
3	Kafr Eldawar Behera	8	8	0	0	0	0	0	0
4	Kafr Eldawar Behera	56	46	0	0	2	4.35	2	4.35
5	Borg El Arab Alexandria	77	37	8	21.62	4	10.81	12	32.43
6	Borg El Arab Alexandria	90	35	5	14.28	2	5.71	7	20
7	45 street, Alexandria	7	3	0	0	0	0	0	0
8	Al Dalangat Behera	12	4	0	0	0	0	0	0
9	Kafr Eldawar Behera	30	7	2	28.57	1	14.29	3	42.86
10	Kafr Eldawar Behera	19	9	0	0	0	0	0	0
<b>Total</b>		343	176	15	8.52	9	5.11	24	13.64
Chi-square value				22.28*		6.52NS		28.80*	
Significance				P<0.01		P>0.05		P<0.001	

at a percentage of 21.1% which is statistically significant, followed by 13.64% at the age of 3-4 years.

### 3.5. Sero prevalence of caprine arthritis encephalitis in relation to sex:

As shown in table (6), four of tested goats recorded to be positive serologically by ELISA, were males at a percentage of 5.26%. (Two strong positive and two weak positive). Concerning female, twenty goats were positive (thirteen strong positive and seven weak positive) at a percentage of 14.49% and this is not significant statistically.

### 3.6. Sero prevalence of caprine arthritis encephalitis in relation to breed:

As shown in table (7), all positive goats (fifteen strong positive and this result have a higher significance statistically and nine weak positive) were from the Barki breed of goat, at a percentage of 22.64%. All tested animals from breeds Egyptian Baladi, Egyptian Nubian goat (Zaraibi), and Damascus (Shami), were negative serologically by ELISA.

**Table (4):** Relationship between clinical signs suspected and ELISA test results

Clinical condition	No of Tested animals	Strong positive		Weak positive		Total positive		
		No	%	No	%	No	%	
Arthritis	9	0	0	2	22.22	2	22.22	2.25NS(P>0.05)
Pneumonia	21	3	14.29	3	14.29	6	28.57	0.00NS (P>0.05)
Mastitis	22	2	9.1	-	0	2	9.1	2.10NS (P>0.05)
Encephalitis	4	0	0	-	0	0	0	0.00NS (P>0.05)
Total clinical cases	56	5	8.93	5	8.93	10	17.86	0.00NS (P>0.05)
clinically normal animals	120	10	8.33	4	3.33	14	11.67	2.73NS (P>0.05)
Total	176	15	8.52	9	5.11	24	13.64	1.6NS (P>0.05)
Chi-square value		22.28*		6.52NS		28.80*		
Significance		P<0.01		P>0.05		P<0.001		

**Table (5):** Sero prevalence of caprine arthritis encephalitis in relation to age.

Age	Tested	Positive samples						Significance
		Strong positive		Weak Positive	Total positive			
		No.	%		No	%		
2-6 m	6	-	0	-	0	-	0	NS
6-12 m	28	1	3.57	-	0	1	3.75	1.02NS
1-2 y	56	5	8.93	6	10.71	11	19.64	0.10NS
2-3 y	29	2	6.89	-	0	2	6.89	2.07NS
3-4 y	22	3	13.64	1	4.55	4	18.18	1.10NS
4-5 y	19	4	21.1	-	0	4	21.1	4.47* (P<0.05)
5-7 y	16	-	0	2	12.5	2	12.5	
Total	176	15	8.52	9	5.11	24	13.64	2.30NS
Chi-square value		7.60NS		9.85NS		7.48NS		
Significance		(P>0.05)		(P>0.05)		(P>0.05)		

**Table (6):** Sero prevalence of caprine arthritis in relation to sex.

Sex	Tested	Positive samples						Significance
		strong positive		Weak positive		Total positive		
		N	%	No	%	No	%	
Male	38	2	5.26	2	5.26	4	10.53	NS
Female	138	13	9.42	7	5.1	20	14.49	1.94NS
Total	176	15	8.52	9	5.11	24	13.64	1.61NS
Chi-square value		0.66NS		0.002NS		0.27NS		

**Table (7):** Sero prevalence of caprine arthritis encephalitis in relation to breed.

Breed	Tested	Positive samples						Significance
		strong positive		Weak positive		Total positive		
		No.	%	No	%	No	%	
Egyptian Baladi (native breed)	43	-	0	-	0	-	0	NS
Barki	106	15	14.15	9	8.49	24	22.64	1.69NS
Egyptian Nubian goat (Zaraibi)	19	-	0	-	0	-	0	NS
Damascus (Shami)	8	-	0	-	0	-	0	NS
Total	176	15	8.52	9	5.11	24	13.64	
Chi-square value		9.63*		5.56NS		16.38		
Significance		P<0.01		P>0.05		P<0.001		

### 3.7. Sero prevalence of caprine arthritis encephalitis in relation to location:

As shown in table (8). Four of tested goats were recorded to be positive serologically by ELISA at Behera governorate, at a percentage of 3.96%. Twenty tested goats were recorded to be positive serologically by ELISA test at Alexandria governorate, at a percentage of 26.69 % and these results are significant statistically.

### 3.8. Sero prevalence of caprine arthritis encephalitis in relation to breeding purpose.

As shown in table (9). Twenty-one of tested animals were recorded to be positive serologically by ELISA in dairy goat, at a percentage of 13.29 % (thirteen strong positive and eight weak positive). Three of tested goats were recorded to be positive serologically by ELISA in meat producing goat, at a percentage of 16.67%.

**Table (8):** Sero prevalence of caprine arthritis encephalitis in relation to location.

Location	Tested	Positive samples						Significance
		strong positive		Weak positive		Total positive		
		No.	%	No	%	No	%	
Behera	101	2	1.98	2	1.98	4	3.96	NS
Alexandria	75	13	17.33	7	9.33	20	26.67	0.53NS
Total	176	15	8.52	9	5.11	24	13.64	
Chi-square value		13.01*		4.80*		18.84*		
Significance		P<0.001		P<0.05		P<0.0001		

**Table (9):** Sero prevalence of caprine arthritis encephalitis in relation to breeding purpose.

Type of goat	Tested	Positive samples						Significance
		Strong positive		Weak positive		Total positive		
		No.	%	No	%	No	%	
Dairy	158	13	8.23	8	5.1	21	13.29	1.28NS
Meat	18	2	11.11	1	5.56	3	16.67	0.36NS
Total	176	15	8.52	9	5.11	24	13.64	1.61NS
Chi-square value		0.17NS		0.008NS		0.15NS		
Significance		P>0.05		P>0.05		P>0.05		

### 3.9. Sero prevalence of caprine arthritis encephalitis in relation to breeding system.

As shown in table (10). All serologically positive cases were in goats raised by open system, at a percentage of 18.18% and this result is of a significant value statistically. No one of tested goats was recorded to be positive serologically by ELISA test in animals raised by closed system.

### 3.10. Detection of anti- p28 antibodies in milk samples using ELISA:

Ten milk samples were tested for CAE virus antibodies. Seven Milk whey samples whey from goats recorded to be positive by serum ELISA, and three negatives by serum ELISA were examined by ELISA test for the detection of anti -p28 antibodies

directed against CAEV. As shown in table (11). All milk whey samples (7) that were recorded to be positive by serum ELISA, were also positive by milk ELISA at a percentage of 100%, also the three samples that were negative by serum ELISA were also negative by milk ELISA.

**Table (11):** Detection of anti- p28 antibodies in milk samples using ELISA test.

Sample	1	2	3	4	5	6	7	8	9	10
Serum ELISA	+	+	+	+	+	+	+	-	-	-
Milk ELISA	+	+	+	+	+	+	+	-	-	-

## 4. DISCUSSION

Lentiviruses are exogenously transmitted non-oncogenic retroviruses, which cause important and widespread human and animal diseases. The prototypic lentiviruses are maedi-visna virus (MVV) of sheep and caprine arthritis encephalitis virus (CAEV) of goats (Fenner, 1976). The aims of this study were to estimate the prevalence of caprine arthritis encephalitis disease in goats and to investigate potential risk factors associated with the prevalence of CAEV infection in the population of goats raised in Behera and Alexandria Governorates.

Ten goats' flocks were included in this study located at Behera and Alexandria Governorates. All goats in all flocks were clinically examined for clinical signs suspected of CAE virus infection.

Goats were examined clinically for clinical signs suspected of CAE virus infection. Herd seroprevalence in this study was higher than that reported in Jordan (23.2%), Turkey (1.9%), southern Mexico (3.6%), and Great Britain (10.3%), and Belgium (17%) (Al-Qudah *et al.*, 2006, Dawson and

Sera samples collected from each flock included in this study were screened for antibodies to CAE virus infection by ELISA. From the results presented in table (2), 10 flocks from different localities at Alexandria and Behera were examined serologically for any evidence of caprine arthritis encephalitis infection by ELISA. 40% (4/10) of the flocks tested were positive. (Three flocks had strong positive and one flock had weak positive cases). The percentage of seropositive, seronegative and weak positive ELISA results was 30% of flocks, 10% of flocks and 60% of flocks respectively. Excluding weak positive results, the sero prevalence of the disease on herd level was 30%. Similar results were reported by NyiLin *et al.*, (2011) a study in the western part of Thailand where CAEV antibody status was determined with the ELISA test. Herd seroprevalence was 31% (56/343) animals.

Her seroprevalence in this study was higher than that reported in Jordan (23.2%), Turkey (1.9%), southern Mexico (3.6%), and Great Britain (10.3%), and Belgium (17%) (Al-Qudah *et al.*, 2006, Dawson and

Wilesmith, 1985; Burgu *et al.*, 1994; Torres-Acosta *et al.*, 2003; Michiels *et al.*, 2018 ), On the other hand, the herd prevalence reported in this study was lower than that reported in Central Mexico (28.6%) Wales (56.8%), Australia (82%), Italy (38%) and USA (73 %)(Adams *et al.*, 1984; Grewal *et al.*, 1986; Cutlip *et al.*, 1992; Gufler *et al.*, 2007, Greenwood *et al.*, 1995). and lower than that reported in in Quebec, Canada, with 82.5% (Belanger and Leboeu, 1993, (in Jamaica with 46.3% (Grant *et al.*, 1988) .

These data show that there are high prevalence of CAE in goats in industries countries than agriculture and non-developed countries, in goat dairy industry countries, the goats have been raised for a long time with high density of goats and poor biosecurity of farm management. Most infected goats do not show clinical sign, infection is lifelong, infected bucks and does are shedders within farm. These are the reasons for higher prevalence in such countries

Individual base prevalence is shown in table (3) where One hundred and seventy six sera samples were examined serologically by ELISA. Fifteen Samples were positive at a percentage of (8.52%) and this result is significant statistically. And nine samples were weak positive (5.11%) excluding weak positive, we had a seroprevalence of 8.52% Similar seroprevalence was recorded by (Al-Qudah *et al.*, 2006) who reported a seroprevalence of 8.21% in Jordan. and 8.2% reported in Brazil (Bandeira *et al.*, 2009) And nearly similar to results reported in Belgium which was 9% seroprevalence. Individual prevalence was 8.52% reported. Was lower than that reported in Syria (12.1%), Switzerland (42%), and USA (31%) and Italy (23.6) (Grewal *et al.*, 1986; Krieg and Peterhans, 1990; Giangaspero *et al.*, 1992 Gufler *et al.*, 2007). On the contrary, this individual goat seroprevalence was significantly higher than that reported in Saudi Arabia (1.9%) and Sultanate of Oman 1.4% (Alluwaimi *et al.*, 1990, Tageldin *et al.*, 2012).

From the results presented in table (4), 10/120 goats were clinically normal but positive serologically for caprine arthritis encephalitis by ELISA, at a percentage of 8.33%, and this matches with (Narayan and Cork, 1990) reported that Positive serological or virus isolation results are self-explanatory for infection in the animal. However, since not all infected animals show clinical disease, identification of infection in clinically normal animals does not prognosticate eventual disease. These animals shed virus and would have to be culled from herds in any

attempt to control the disease, and also (Rowe *et al.*, 1992) who mentioned that a majority of CAEV infected goats are lifelong carriers without clinical signs but are potentially capable of transmitting CAEV, primarily through colostrum and milk. It was reported that most infected goats remain asymptomatic, and only about 20 % of animals with CAE show clinical signs of the disease. (Clements and Zink 1996; Smith and Sherman 2009). Same was recorded by (Crawford and Adams, 1981) that roughly one fourth of infected animals eventually progress to clinical form of the disease.

From the results presented in table (5), excluding weak positive cases, the highest sero prevalence of Caprine Arthritis Encephalitis were in goats at the age between 4-5 years (4/19), at a percentage of 21.1%, followed by 3-4 years (3/22) at a percentage of 13.64% and these results agrees with (Al-Qudah *et al.*, 2006) who reported that The highest CAEV seroprevalence was observed in goats older than 3-years and younger than 6-years of age, Prevalence of CAEV was highest in goats between 3 and 6 years was 15%. The lower prevalence in young goats less than one year is mainly due to the long period the animal needs to seroconvert. Through delays of up to 8 months and possibly longer for seroconversion have been reported (Smith, and Sherman, 2009). Many goats seroconvert after a period of stress or at parturition (Matthews, 2009). Exposing 15 negative does under dairy conditions yielded 9 of 15 seroconverting after 10 months contact. Exposure of five negative wethers in pasture conditions resulted in seroconversion of two animals after 22 months of contact. All five were negative at 9 months. (Adams *et al.*, 1983).

Older goats have a greater tendency to be seroconversion than young goat (Nord *et al.*, 1998; Ghanem, *et al.*, 2009). 2, 3, 4, and 5 years or more of age have higher probability to seropositive than 1 year old by 1.7, 2.6, 4.5, and 5.7 times (Rowe, *et al.*, 1991). More than 1 year old goats tend to seroconvert. Goats that are 3 and 4 years old have higher probability to seroconvert than goats which 2 years old by 1.7 and 3.2 times, respectively (Rowe *et al.*, 1992). While Cutlip *et al.*, (1992) showed increasing prevalence in goats 3 years old.

From the results presented in table (6), thirteen animals recorded to be positive were females at a percentage of 9.42 % (13/138) and only two seropositive animals were males at a percentage of 5.26 % ( 2/38) and this result is statistically not



important, this agrees with Ratanapob *et al.*, (2009) indicated that sample from female goats had more tendencies to give seropositive results than sample from male goats. On the other hand, a report from Bandeira, *et al.* (2009) mentioned that male goats were more likely to be infected with CAEV than female and they explained this is due to importation of males from countries with high prevalence of the diseases. Many studies have not found relation between the sex of goats and seroprevalence of CAEV infection (East, *et al.*, 1987; Rowe *et al.*, 1991; Cutlip *et al.*, 1992; Gufler *et al.*, 2007).

From the results presented in table (7), all sero positive animals were from the breed barki (15/106) at a percentage of 14.15%, and all tested animals from breeds Egyptian Nubian goat (Zaraibi), Egyptian Baladi and Damascus (Shami) were seronegative, this finding agrees with some studies found different prevalence among breeds of goats. For example, Angora and Pygmy goats had lower prevalence than dairy, native and mixed breed (Cutlip, *et al.*, 1992). However, some did not found relation between disease status (Rowe, *et al.*, 1991).

From the results presented in table (9), 13/158 tested animals were recorded to be positive serologically by ELISA in dairy goat at a percentage of 8.23%, while 2/18 tested animals were recorded to be positive serologically by ELISA in meat producing goats at a percentage of 11.11%, this disagrees with (Ratanapob *et al.*, 2009) who reported that Seroprevalence in dairy goats was higher than in meat goats (20.63 percent vs 9.46 percent), but the small number of meat goats tested (18) may be attributed in this disagreement.

From the results presented in table (10), All serologically positive cases (15) were in animals raised by open system (132), at a percentage of 11.36%, and this disagrees with some studies found that in some countries where goats were kept indoor during harsh seasons, seroprevalence in kids born indoor was higher than kids born outdoor. It may be a result of kids born indoor being in closer contact with their mothers (Gufler *et al.*, 2007), higher in goats born indoors (24.2%) than in goats born outdoors (20.0%). This finding demonstrates that horizontal transmission (long-term close contact) can play an important role in CAEV infection and is confirmed by findings in literature (East *et al.*, 1993; Gufler 2004; Phelps and Smith, 1993; Rowe *et al.*, 1992). Under practical conditions, twin/triplet kids were suckled additionally by other dams or kids were fed by a milk

pool. The authors observed suckling and licking between newborn kids more frequently in kids born indoors (close contact) than in kids born outdoors. This observation could also explain the higher seroprevalence in goats born indoors.

This disagrees with our results of higher seroprevalence in animals outdoor. Which may be explained by It is that uncontrolled movement of goat herds from area to other and to uncontrolled contact with other herds that may transmit infection could explain presence of seropositive goats within examined outdoor herds.

From the results presented in table (11), All milk whey samples (7) that were recorded to be positive by serum ELISA, were also positive by milk ELISA at a percentage of 100%, also the three samples that were negative by serum ELISA were also negative by milk ELISA, No sample produced a dubious, or suspicious, serological analysis by ELISA and this finding agrees with Plaza *et al.*, (2009) who mentioned that we can use samples other than serum, such as milk or milk whey samples and concluded that Our results indicate that the use of whey as a sample for the ELISA method of detecting anti-CAEV antibodies in goats provides improved results over the use of whole milk. Given these results were in good agreement with those obtained using blood sera and that no false diagnoses were produced, the use of these non-invasive samples will help simplify the routine diagnosis of this disease and will be especially useful in herds under official dairy control and could be used as a herd test to examine the milk tank before examination of individual animals.

## 5. Conclusions

In this study we recorded the first detection of caprine arthritis infection in goats in Egypt by detection of antibodies by ELISA test. The information obtained in this study is considered a first step in further studies and widespread surveillance of the disease in Egypt.

Higher prevalence of the diseases was recorded in Alexandria Governorates than in Behera. And Barki breed goats are more susceptible to infection

The highest CAEV seroprevalence was observed in goats older than 3-years and younger than 6-years of age. Sero prevalence of CAEV is higher in females rather than male goats.

In contrast to other studies higher prevalence was recorded in open system of breeding, this may be attributed to the fact that mobile flocks may have

higher chance of contact with other animals and sheep which may play role in infection of goats.

The use of whey as a sample for the ELISA method of detecting anti-CAEV antibodies in goats provides high agreement with those obtained using blood sera and, the use of these non-invasive samples will help simplify the routine diagnosis of this disease and can be used as a herd test on bulk milk sample

## 6. REFERENCES

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