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Comparative epidemiological studies on *Echinococcosis* of local and imported livestock in Al-madina Al-munawwarah in Saudi Arabia

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Abstract

Aim of the work- This research aims to study the epidemiology of the parasite in livestock by using statistical methods for analyzing the numbers of infections and prevalence of the disease among one year (1431HD) in the camels, cattle, sheep and goats..The genus Echinococcus is of great importance because it can cause the cystic echinococcosis(CE), or hydatid cyst, this disease is one of the serious parasitic diseases that may lead to death, and only can be treated surgically This disease can bring a lot of material loss to livestock and can cause serious ill health in man. The genus *Echinococcus* contains a number of zoonotic species.There are at least 4 species in the genus.

Material and methods : The data where collected regularly each week for among one year from the official slaughter house records for the infected camels, cattle, sheep and goats with the cystic echinococcosis, all the collected data were inserted in tables and divided to four quarters(Q1,Q2,Q3 and Q4) three months in each quarter, then statistical analysis (Chi test for goodness of fit and for independence) where used to analysis the numbers and prevalence of infected animals.

Results: The present study have been demonstrated that the prevalence of the CE in the year 1423HD was higher in camels with percentage of 7.21% followed by cattle (6.35%) then sheep (2.60%) and the least in goats (1.84%) for both local and imported livestock ,there were very high significant relation between the local and imported livestock and there were very high significant relation between types of animals and between the fourth quarter Q4 and the other quarters (Q1, 2,&3).

Conclusion: The results obtained in this study showed abundant rate of CE in slaughtered animals, and it proved the presence of echinococcosis the deadly disease in the region of the study, which leads to think strongly to find intensive controlling programs to eliminate or eradicate this disease to avoid losing livestock and reducing man mortalities or infections. More epidemiological studies are needed to watch the changes in the prevalence of the cystic echinococcosis because it is a major public health problem throughout the world and causes serious socio-economic effects

Keywords: *Echinococcusis,* cystic echinococcosis , hydatidosis , epidemiology.

Introduction:

The genus *Echinococcus* is of great importance because it contains a number of zoonotic species that can cause the disease called cystic echinococcosis ,or hydatidosis (CE). The larval stage of the *Echinococcus grnulosus*- is called hadatid cyst which is highly pathogenic and can make serious ill health in man , *Echinococcus multilocularis* causes the alveolar cyst which is deadly and fatal [1,2].

The rate of infection in human reaches 1 million infected human worldwide [3] ,there are at least 4 species in the genus, some of these species are forming deadly disease which can be fatal in 90% of untreated patients within 10 years [4,5,6],carnivores such as dogs and foxes serve as final host, they become infected with the adult worm when they consume offal of the intermediate host that contained a hydatid cyst. Adult parasites are found in the intestine of dogs. Eggs passed in feces, infect a large number of herbivore mammalians which serve as intermediate hosts including camels, sheep, pigs and cattle. The larval stages (hydatid cysts) develop in the liver and lungs and occasionally other organs of the intermediate host. Humans are infected with hydatid cyst when they

accidentally ingest echinococcus eggs. [7,8,9]

This disease can cause a lot of loss in livestock and economic disadvantage to the livestock traders and national wealth, there are reports of a decrease in feed conversion ratios, lowering of milk production in lactating animals, decrease in reproduction rates and a decrease in the value of wool [10,11,12]. In some societies the economic effects of infection in domestic stock may be the most important economic effect costing the livestock industries millions of dollars in the endemic areas [13] It also costing the patients and health ministries a lot of money for diagnosing, hospitalization and surgery, it is estimated to reach 800$ for diagnosing and 3000$ for surgery per patient in some countries [14,15,16].

CE has a global distribution, it is endemic or hyperendemic in sheep raising areas or countries including Mediterranean sea surrounding countries [17,18]. Among the Middle East countries, the disease has been repeatedly reported from Iran, Iraq, Kuwait, Saudi Arabia and the Levant countries that include Lebanon, Syria, Palestinian and Jordan [12,16,19,20,21,22,23,24,25]. In Saudi Arabia, CE is a significant endemic disease in the various provinces, particularly in the western region [1,26,27,28], *Echinococcus* found throughout the world although a number of species have a limited geographical distribution [13,29]

. There are many reasons which increase the epidemiology or spreading of this disease, Local traditions may contribute to massive infections.Some primitive tribes of Kenya, for instance, are said to relish dog intestine roasted on a stick over a campfire. Because cleaning of the intestine may involve nothing more than squeezing out its contents and cooking may entail nothing more than external scorching, these people probably have the highest rate of infection with hydatids in the world

Sheepherders in the United States suffer from increased risk infection by living closely with their dogs [17], slaughtered animals in rural abattoirs, where minimal hygiene and slaughtering requirements do not exist. The quantity of meat prepared outside of slaughterhouses for family and religious occasions (wedding or other parties, Aid El adha which is a day where all the Muslim families slaughter a sheep at home, etc.) contribute the infection [12,30], In the United States, *E. granulosus* appears to be most prevalent in sheep-raising areas, In california, the spread of echinococcosis appears to be related to a quaint transhumant form of husbandry in which bands of sheep migrate from place to place under the control of contract Basque shepherds from Spain and France. These shepherds, for the most art, are ignorant of the epidemiology of hydatid disease and feed their dogs mostly on dead sheep [7].

The highest incidence of infection rates in man are usually noticed in areas where there is a close association between man and domestic livestock, especially when using the dogs as working dogs where they became infected by consuming offal from infected sheep, the potential for domestic transmission of *E. granulosus* is highest in poor countries where the level of education may be low, veterinary services inadequate and there is a widespread practice of home slaughtering. In such circumstances, the rates of infection in dogs can reach between 20% and 50% with perhaps an excess of 50% of the sheep population being infected [13].

The transmission of CE is also enhanced by many factors such as the high dog population, the role of dogs in guarding livestock and farms and the close contacts with humans [30,31].

The high number of stray dogs in the villages, poor knowledge of people about the disease and the route of its transmission increases the risk of human contamination with CE.Scrupulous hygiene is the first line of defense [30].

Periodic anthelmintic medication of dogs or cats, carries the threat one step further away,destruction of all stray dogs,regimented anthelmintic medication of the rest, and prohibition against feeding uncooked offal to dogs and cats will help to eliminate spreading of CE [7,31].

In some wealthy countries, CE has been successfully controlled or indeed eradicated. However, in most parts of the world it remains a serious threat to human health [13]. *E. granulosus* has been eliminated in some countries such as Iceland,New Zealand, through intensive long-lasting intervention, by periodically treating the dog populations with

anthelmintics and/or aggressive culling policies of stray dogs [8]. This work aims to study the epidemiology of the parasite in livestock by using statistical methods for analyzing the numbers of infections and prevalence of the disease among one year (1431HD) in the camels, cattle, sheep and goats.

Material and Methods:

The research procedures plan were divided to three parts

1st part is the field study by collecting the data. The 2nd part is the practical applied study by using statistical calculations. The 3rd part is to use the obtained results form previous two parts to resolve the problem and getting the expected reveals and proves.

a-1-Data numbers of the infected livestock where collected regularly each week from the slaughterhouses in Al-Madina Al-Munawwara among the year of the study (1431HD) for the infected camels, cattle, sheep and goats with the parasite, or hydatid cyst.

a-2 -All the collected data were inserted in tables and divided to four quarters(Q1,Q2,Q3 and Q4) three months in each quarter, then the collected data where analyzed statistically using (chi test for goodness-of fit and for independence) using some statistical programs such as spss , DMC SOFTWARE, INC .and Microsoft excel to demonstrate significant sings of the followings:

- Significant sing of the epidemiology between local and imported livestock.
- Significant sing of the 4th quarter and other three quarters of the same year.
- Prevalence of echinococcosis among the year of study

Results

1st Part: The statistical results for the epidemiology

Table (A-1) shows the number and infection rates of the infected local and imported animals with hydatid cyst through the quarters of year 1431HD.

The following are detailed statistical tests that performed on the obtained

Results:

The first study shows rates of in fictions**.**

The present study have been demonstrated that the prevalence of the hydatid cyst in year 1431HD was highest in camels with percentage of 34.64% followed by cattle (28.70) then goats (15.11%) and the least percentage was observed in sheep (10.06%) in both local and imported livestock as shown in figure (1-1).

Also the present study have been demonstrated that the prevalence of the hydatid cyst in year 1431HD was highest in camels with percentage of 35.14% followed by goats (15.37%) then sheep (12.93%) and the least percentage was realized in cattle (0.00) (there were no infected cattle) in local livestock as shown in figure (2-1).

The present study have been detected that the prevalence of the hydatid cyst in year 1431HD was highest in cattle with percentage of 30.27% followed by goats (13.86%) then sheep (8.96%) and the least percentage was realized in camels (0.00) (there were no infected camels) in local livestock as shown in figure (2-1).

Using the Chi square test for independence to compare the rate infection between local and imported livestock.:

- In the first quarter of year 1431.HD and by using the Chi square test for independence table (4-1) showed that the chi square value was 62.76 and the p-value was 1.5113E-13 12 ($p<0.0001$), which means very high significant statistic relation between the type of animal and the local or imported infection with hydatid cysts in the first quarter of year 1431.HD.

-In the second quarter of year 1431.HD. by using the Chi square test for independence table (5-1) showed that the chi square value was 56.6588and the p-value was 56.6588E-12 ($p<0.0001$), which means very high significant statistic relation between the type's of animal and being local or imported in infection with hydatid cysts in the second quarter of year 1431.HD.

-In the third quarter of year 1431.HD. by using the Chi square test for independence on table (6-1) it was noticed that the chi square value was 73.7863 and the p-value was 6.5947E-16 ($p<0.0001$), which means very high significant statistic relation between the type's of animal and being

local or imported in infection with hydatid cysts in the third quarter of year 1431.HD.
-In the fourth quarter of year 1431.HD.
by using the Chi square test for independence in table (7-1) it was found that the chi square value was 130.394 and the p-value was 4.4489E-28 ($p<0.0001$), which means very high significant statistic relation between the type's of animal and being local or imported in infection with hydatid cysts in the fourth quarter of year 1431.HD
-Among the year 1431.HD and by using the Chi square test for independence in table (8-1) it was noticed that the chi square value was 65.8079 and the p-value was 3.3692E-14 ($p<0.0001$), which means very high significant statistic relation between the type's of animal and being local or imported in infection with hydatid cysts among the year 1431.HD**.**

Using the Chi square test for independence to find the statistical relation between the imported and local livestock according to animal type among the year's quarters:

- In camels among four quarters of year 1431.HD and by using the Chi square test for independence in table (9-1) it was found that the chi square value was 4.0 and the p-value was 26.14, which means no significant statistic relation between local or imported camels for the infection with hydatid cysts in all quarters of year 1431.HD**.**

- In cattle among the four quarters of year 1431.HD and by using the Chi square test for independence in table (10-1) it was noticed that the chi square value was 4.0 and the p-value was 0.2614, which means no significant change between local or imported cattle for the infection with hydatid cysts in all quarters of year 1431.HD**.**

- In sheep among four quarters Of the year 1431.HD.

By using the Chi square test for independence in table (11-1)it was found that the chi square value was 5.4023 and the p-value was 0.1445, which means no significant statistic relation between local or imported sheep for the infection with hydatid cysts in all quarters of year 1431HD**.**

- In goat among four quarters Of the year 1431.HD.

Using Chi square test for independence in table (12-1) showed that the Chi square value was 14.7075 and the p-value was 2.0844E-3($p<0.0002$), which means a significant statistic relation between local or imported goat for the infection with hydatid cysts in all quarters of year 1431.HD**.**

- In Sheep among four quarters Of the year 1431.HD.

Using the Chi square goodness of fit test for independence to compare the rate of infection between types of livestock.

- In the first quarter of year 1431.HD (Local livestock) and by using the Chi square goodness of fit test in table (13-1) it was found that the Chi square value was 33.2507 and the p-value was 2.8514E-7 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different local animals in the first quarter of year 1431.HD**.**

- In the second quarter of year 1431.HD (Local livestock) and by using the Chi square goodness of fit test in table (14-1) it was realized that the Chi square value was 38.091 and the p-value was 2.7038E-8 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different local animals in the second quarter of year 1431.HD**.**

- In the third quarter of year 1431.HD. (Local livestock) and by using the Chi square goodness of fit test hn table (15-1) it was found that the Chi square value was 70.0139 and the p-value was 4.2392E-15 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different local animals in the third quarter of 1431.HD**.**

- In the fourth quarter of year 1431.HD. (Local livestock) and by using the Chi square goodness of fit test in table (16-1) found that the Chi square value was 57.201 and the p-value was 2.3280E-12 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different local animals in the fourth quarter of year 1431.HD**.**

- Among year 1431.HD (Local livestock)and by using the Chi square goodness of fit test in table (17-1) it was observed that the Chi square value was 39.8539 and the p-value was 1.1442E-8 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different local animals among year 1431.HD.

- In the first quarter of year 1431.HD (Imported livestock)
And by using the Chi square goodness of fit test in table (18-1) it was found that the Chi square value was 55.2219 and the p-value was 6.1570E-12 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different imported animals in the first quarter of year 1431.HD**.**

- In the second quarter of year 1431.HD (Imported livestock) and by using the Chi square goodness of fit test in table (19-1) it was found that the Chi square value was 41.3664 and the p-value was 5.4678E-9 ($p<0.0001$), which means very high significant statistic relation of the infection rates n with hydatid cysts between types of the different imported animals in the second quarter of year 1431.HD**.**

- In the third quarter of year 1431.HD (Imported livestock) and by using the Chi square goodness of fit test in table (20-1) it was observed that the Chi square value was 26.7436 and the p-value was 6.6628E-6 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different imported animals in the third quarter Of the year 1431.HD.

- In the fourth quarter of year 1431.HD (Imported livestock) and by using the Chi square goodness of fit test in table (21-1) found that the Chi square value was 68..3335 and the p-value was 9.7061E-15 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different imported animals in the fourth quarter of year 1431.HD.

- Among year 1431.HD (Local livestock) and by using the Chi square goodness of fit test in table (22-1) it was found that the Chi square value was 36.4745 and the p-value was 5.9434E-8 ($p<0.0001$), which means very high significant statistic relation of the infection rates with hydatid cysts between types of the different imported animals among year 1431.HD.

Table (A-1)- Comparison between the numbers and infection rates of infected local and imported animals with hydatid cyst through the quarters of year 1431HD.

Quarter	Animal type	Slaughtered animals						Rate of infection with hydatid cyst %		
		Infected			Non Infected			%	%	%
		Local	Imported	Total	All Slaughtered		Total	Local	Imported	Total
					Local	Imported				
1st quarter	Camel	637	0.00	637	2372	0.00	2372	26.85	0.00	26.85
	Cattle	0.00	414	414	0.00	1472	1472	0.00	28.13	28.13
	Sheep	1852	4110	5962	19338	44570	63908	9.58	9.22	9.33
	Goat	1885	20	1905	20935	5427	26362	9.00	0.37	7.23
	Sum	**4374**	**4544**	**8918**	**42645**	**51469**	**94114**	**10.26**	**8.83**	**9.48**
2nd quarter	Camel	2660	0.000	2660	9711	200	9911	27.39	0.00	26.84
	Cattle	0.000	1370	1370	282	5081	5363	0.00	26.96	25.55
	Sheep	6723	8126	14849	78946	211305	290251	8.52	3.85	5.12
	Goat	6671	1936	8607	93016	18794	111810	7.17	10.30	7.70
	Sum	**16054**	**11432**	**27486**	**181955**	**235380**	**417335**	**8.82**	**4.86**	**6.59**
3rd quarter	Camel	1677	0.00	1677	3706	2	3708	45.25	0.00	45.23
	Cattle	0.00	497	497	0.00	1995	1995	0.00	24.91	24.91
	Sheep	2306	11366	13672	31125	88721	119846	7.41	12.81	11.41
	Goat	5266	1972	7238	35241	8074	43315	14.94	24.42	16.71
	Sum	**9249**	**13835**	**23084**	**70072**	**98792**	**168864**	**13.20**	**14.00**	**13.67**
4 th quarter	Camel	1322	0.00	1322	2130	53	2183	62.07	0.00	60.56
	Cattle	0.00	607	607	239	994	1233	0.00	61.07	49.23
	Sheep	8770	12087	20857	22550	53571	76121	38.89	22.56	27.40
	Goat	13270	1084	14354	27060	3868	30928	49.04	28.02	46.41
	Sum	**23362**	**13778**	**37140**	**51979**	**58486**	**110465**	**44.95**	**23.56**	**33.62**
Among the year	Camel	6296	0.00	6296	17919	255	18174	35.14	0.00	34.64
	Cattle	0.00	2888	2888	521	9542	10063	0.00	30.27	28.70
	Sheep	19651	35689	55340	151959	398167	550126	12.93	8.96	10.06
	Goat	27092	5012	32104	176252	36163	212415	15.37	13.86	15.11
	Sum	**53039**	**43589**	**96628**	**346651**	**444127**	**790778**	**15.30**	**9.81**	**12.22**

Discussion:

The present study have been demonstrated that the prevalence of the hydatid cyst in year 1431HD was highest in camels with percentage of 34.64% followed by cattle (28.70) then goats (15.11%) and the sheep were the least (10.06%) in both local and imported livestock , these results give a strong indication that the camels are the most infected group with hydatid cyst(CE), followed by cattle , goats then sheep. Many studies have been demonstrated the same sequence of infections in animal types.**Fadladdin** [1] demonstrated the infection prevalence with CE in an epidemiological study on livestock at Madina region with 6.75% in camels followed by cattle (3.42) then goats (2.25%) and the sheep were the least (1.53%),comparing these results with the present study a considerable evidence proved that the prevalence of infection with CE have a very dangerous increasing levels. **Baeshen**[28]revealved the same arrangement of infections prevalence in study preformed at Jeddah region, also **Ghandour** [32] found the same sequence, this results can be attributed to the need of meat amount, because camels take up to 3 years to be viable in the amount for the purpose of benefiting from slaughter, while the cattle are feasible at the age of two years , sheep at age of one year and goats at six months, this suggestion coincided with Fadladdin [1] and supported by a hypothesis mentioned by **Roberts *et al.*** [33]**and Ibrahim** [34] that a high abundance or prevalence of infection in young livestock would be considered of much greater significance than a similar level in older stock, but **Azlaf and Dakkak** [30] recorded different arrangement ,the highest rate of infection was in cattle followed by sheep ,goats, then camels .The difference in infection rates form a region than other is possible.**Torgerson *et al.*** [35] revealed in a study in Kazakhstan that there is a variation in infection between different countries , also this study revealed that the infection rates increased in remarkable significant level than a previous study performed on year 1424HD in the same region by **Fadladdin** [1]**. Baeshen** [28] found a similar result in a study conducted for the infection rates with CE over the years 1415HD and 1416HD,where infection rates have raised in the following years , the explanation of that attributed to **Torgerson *et al.* ; Al yaman *et al.*** [36,35] who mentioned that the incidence differ in the world countries in different regions, and that the infection with CE reinfect places previously having a low prevalence rates with CE infections , this constitutes a challenge which must be taken in consideration in the epidemiological studies and in controlling this disease. Also, the increasing of the prevalence rates associated to many factors and reasons, one is the increase in final host population of carnivores such as stray dogs and cats [37] due to the absence of rabies which is another additional factor ,or because the weakness in control of CE with combination of routine anthelmintic treatment of dogs, weakness in the controlling and reduction of stray dog populations, and weakness in supervision of the slaughter of livestock and subsequent disposal of offal and education of the public also have been came weak [1,12,13]**.**

This study revealed that local camels recorded a very high rate of infection with CE with percentage of 35.14% compared with goats (15.37%) , sheep (12.93%) and cattle (0.00%) this referred to many reasons ,one is the strain that infects camels may be adapted to be non-infectious in cattle , sheep or goats, or the other types of livestock has immunity to camel infecting strain .This finding has a significant importance to the level of parasite strains or livestock strains ,or the strains of local livestock (sheep, goat and cattle) exposed to low number of echinococcus eggs These results are in accordance with those of **Fadladdin ; Azlaf and Dakkak** [1,30],another reason, the camels herding areas has large amount of stray dogs or carnivores, which represents the final host that is responsible for infection to camels which are intermediate host [31,37]. The behavior and habits of camel's herders and the way they raising them and feeding their dog is another reason.This indicates that echinococcosis is endemic in Al-madina Al-amunawwarh's camels.

This study revealed that the fourth quarter of the year 1431HD recorded a very high rate of infection with CE with a percentage

of **33.62**% compared with 9.48%, 6.59%, 13.67% for the first, second and third quarters respectively, the increasing of the prevalence rate in the fourth quarter may be due to some reasons, mainly is the fourth quarter includes the period of pilgrimage season (Hajj),so Muslims slaughter large numbers of livestock [1,30].

Using the Chi square test for independence in the present study showed a very high significant statistic relation between the type of animal and being a local or imported for the infection with hydatid cysts whether in each quarter of the year 1431.HD separately or in the all quarters together, the p-value was 1.5113E-13 ($p<0.0001$).Another high significant relation was obtained by performing the same test to find the statistical relation between imported and local livestock according to the animal type (camel , cattle ,sheep, and goats) in each quarter separately ($p<0.0001$) or among the year's quarters ($p<0.0001$) , also very high significant (increase or decrease was realized by using the Chi square goodness of fit test for independence to compare the rate of infections between types of livestock, and being a local or imported ,whether in each quarter of the year 1431.HD separately or in all quarters together, or among the year, the p-value was<0.0001,many studies are in accordance with these results [1,13,28,34,38],whilst some obtained different rates [35].

Conclusion

The results obtained in this study showed abundance rates of CE in slaughtered animals, and it proved the presence of echinococcosis the deadly disease in the region of the study, witch leads to think strongly to find intensive controlling programs to eliminate or eradicate this disease, to avoid losing livestock and reducing man mortalities or infections. More epidemiological studies are needed to watch the changes in the prevalence of the cystic echinococcosis because it is a major public health problem throughout the world and it causes serious socio-economic effects, and the presence of disease infection and its prevalence proves that the echinococcosis remains an international public health challenge.

Table and histogram. (1-1) showing Infection rates of hydatid cyst among year 1431HD in both local and imported livestock.

Animal type	infection with hydatid cyst %
	Local and imported
Camel	34.64
Cattle	28.70
Sheep	10.06
Goat	15.11
Total	**44.95**

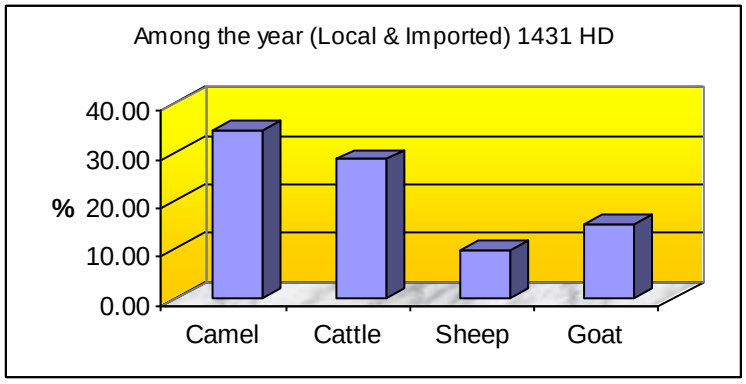


Table and histogram (2-1) showing infection rates of hydatid cyst among year 1431HD in local livestock..

Animal type	infection with hydatid cyst %
	Local livestock
Camel	35.14
Cattle	0.00
Sheep	12.93
Goat	15.37
Total	**15.30**

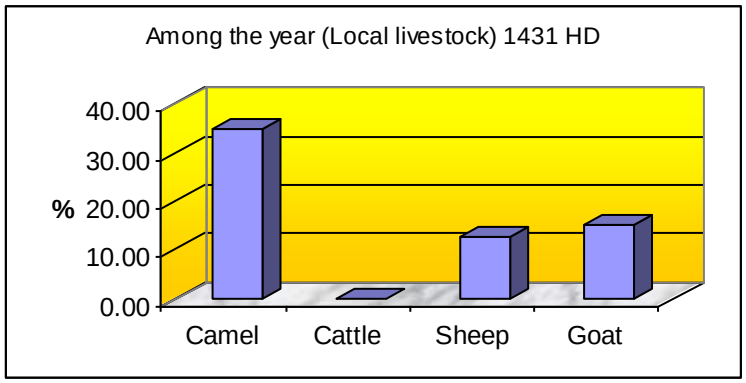


Table and histogram (3-1) showing nfection rates of hydatid cyst among year 1431HD in imported livestock ..

Animal type	infection with hydatid cyst %
	Imported livestock
Camel	0.00
Cattle	30.27
Sheep	8.96
Goat	13.86
Total	**9.81**

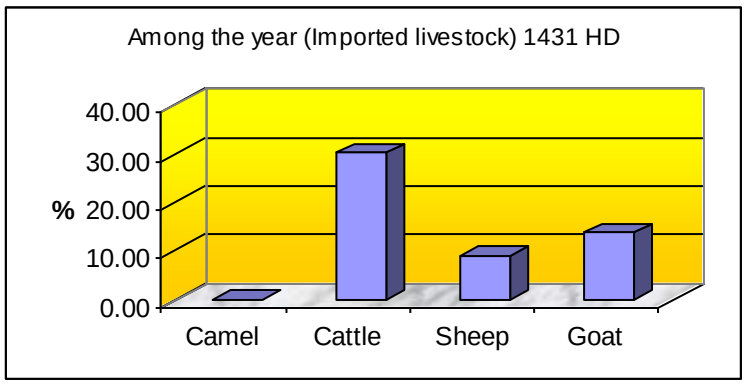
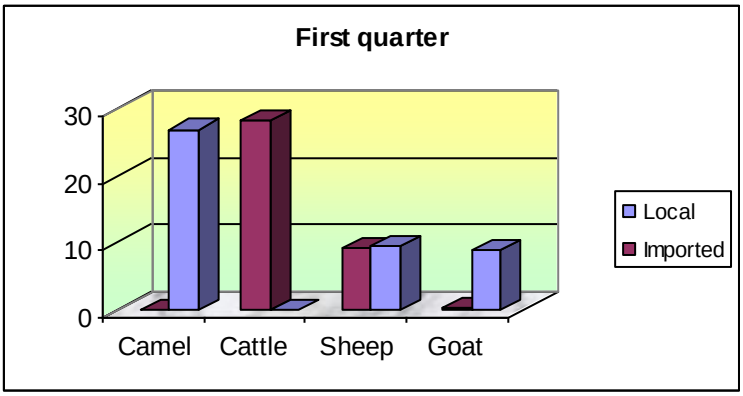


Table and histogram (4-1) showing infection rates of hydatid cyst in the fourth quarter of year 1431HD with Chi test for independence.

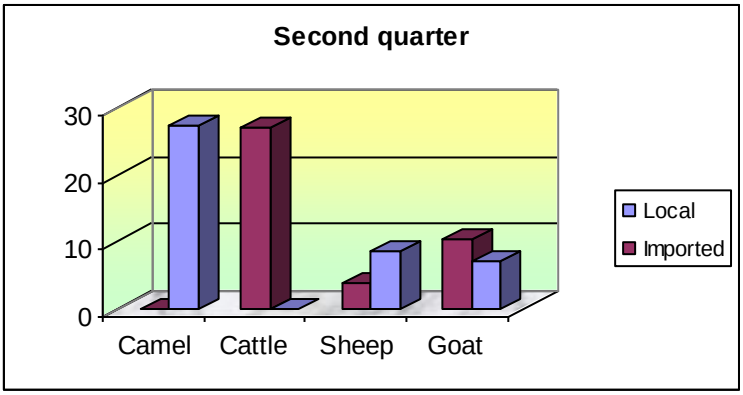
Animal type	infection with hydatid cyst %	
	local	imported
Camel	26.85	0.00
Cattle	0.00	28.13
Sheep	9.58	9.22
Goat	9.00	0.37
Total	**10.26**	**8.83**



Chi test for independence			
Significance	x^2	P-value	1st qurter
High significant	62.76	1.5113E-13	1431 H D

Table and histogram (5-1) showing infection rates of hydatid cyst in the fourth quarter of year 1431HD with Chi test for independence.

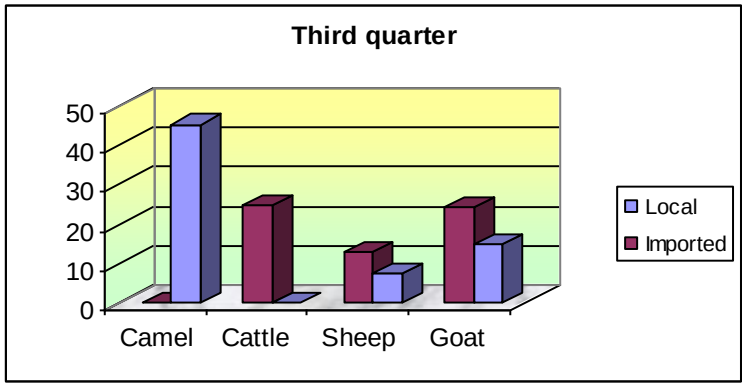
Animal type	infection with hydatid cyst %	
	local	imported
Camel	27.39	0.00
Cattle	0.00	26.96
Sheep	8.52	3.85
Goat	7.17	10.30
Total	**8.82**	**4.86**



Chi test for independence			
Significance	x^2	P-value	2nd quarter
High significant	56.6588	3.03E-12	1431 H D

Table & Histogram (6-1)Infection rates of hydatid cyst in the fourth quarter of year 1431HD with Chi test for independence.

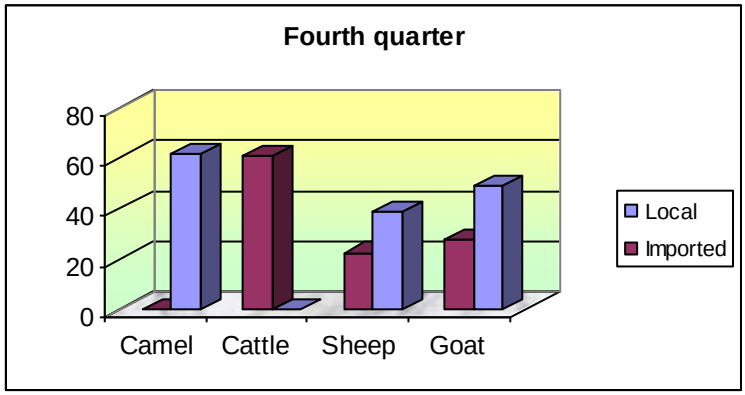
Animal type	infection with hydatid cyst %	
	local	imported
Camel	45.25	0.00
Cattle	0.00	24.91
Sheep	7.41	12.81
Goat	14.94	24.42
Total	**13.20**	**14.00**



Chi test for independence			
Significance	x^2	P-value	3rd quarter
High significant	73.7863	6.5947E-16	1431 H D

Table and histogram (7-1) showing infection rates of hydatid cyst in the fourth quarter of year 1431HD with Chi test for independence.

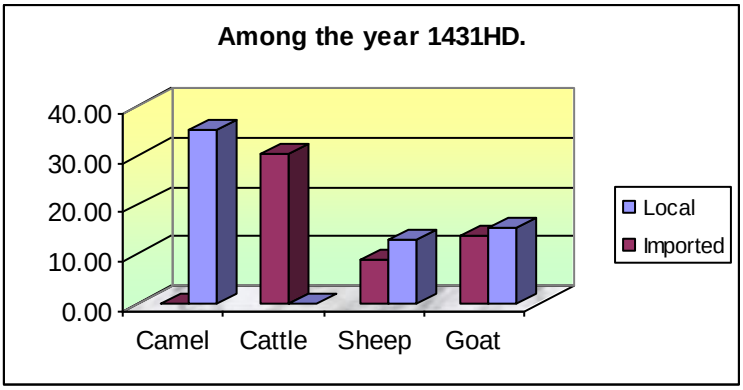
Animal type	infection with hydatid cyst %	
	local	imported
Camel	62.07	0.00
Cattle	0.00	61.07
Sheep	38.89	22.56
Goat	49.04	28.02
Total	**44.95**	**23.56**



Chi test for independence			
Significance	x^2	P-value	4th qurter
High significant	130.394	4.4489E-28	1431 H D

Table and histogram (8-1) showing infection rates of hydatid cyst among year 1431HD with Chi test for independence.

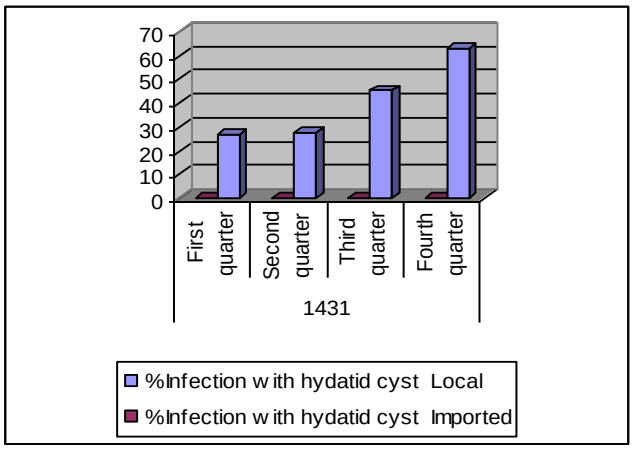
Animal type	infection with hydatid cyst %	
	local	imported
Camel	35.14	0.00
Cattle	0.00	30.27
Sheep	12.93	8.96
Goat	15.37	13.86
Total	**15.30**	**9.81**



Chi test for independence			
Significance	x^2	P-value	Among year
High significant	65.8079	3.3692E-14	1431 H D

Table and histogram (9-1) showing infection rates hydatid cyst of camels r in the four quarters of year 1431HD with Chi test for independence.

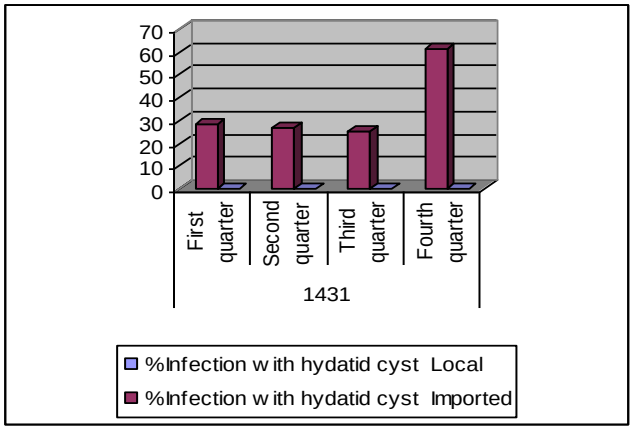
Year	Camel	infection with hydatid cyst%		
		Local	Imported	Sum
1431	1st quarter	26.8	0	26.8
	2nd quarter	27.39	0	27.39
	3rd quarter	45.25	0	45.25
	4th quarter	62.7	0	62.7
	total	162.14	0	162.14



Chi test for independence			
Significance	x^2	P-value	four quarters
Non significant	4.0	0.2614	1431 H D

Table and histogram (10-1) showing infection rates of cattle with hydatid cyst in the four quarters of year 1431HD with Chi test for independence.

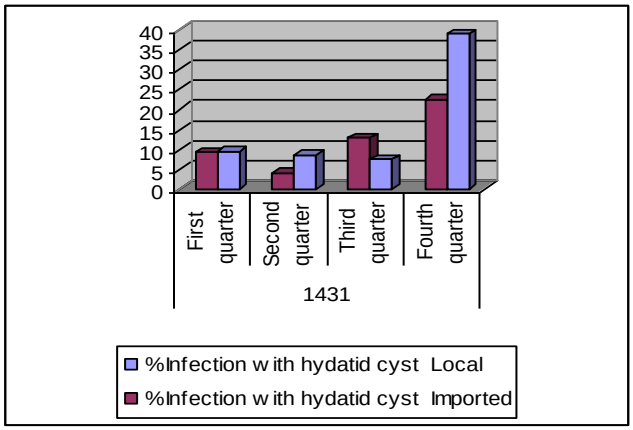
Year	Cattlel	infection with hydatid cyst%		
		Local	Imported	Sum
1431	1st quarter	0	28.13	28.13
	2nd quarter	0	26.96	26.96
	3rd quarter	0	24.91	24.91
	4th quarter	0	61.07	61.07
	total	0	141.07	141.07



Chi test for independence			
Significance	x^2	P-value	four quarters
Non significant	4.0	0.2614	1431 H D

Table and histogram (11-1) showing infection rates of hydatid cyst in sheep in the four quarters of year 1431HD with Chi test for independence.

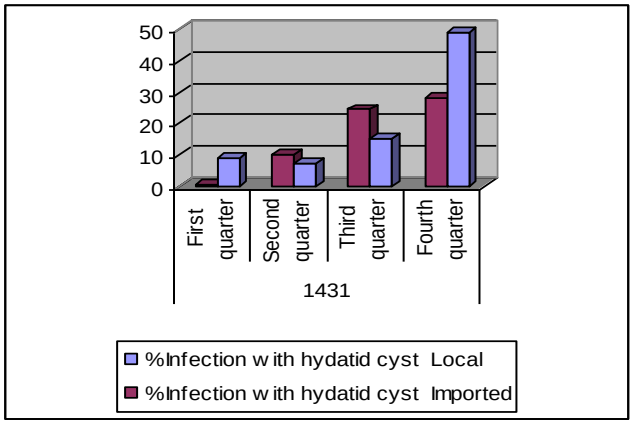
Year	Sheep	infection with hydatid cyst%		
		Local	Imported	Sum
1431	1st quarter	9.58	9.22	9.58
	2nd quarter	8.52	3.85	8.52
	3rd quarter	7.41	12.81	7.41
	4th quarter	38.89	22.56	38.89
	total	64.4	48.44	64.4



Chi test for independence			
Significance	x^2	P-value	four quarters
Non significant	5.4023	0.1445	1431 H D

Table and histogram (12-1) showing infection rates of hydatid cyst in goats in the four quarters of year 1431HD with Chi test for independence .

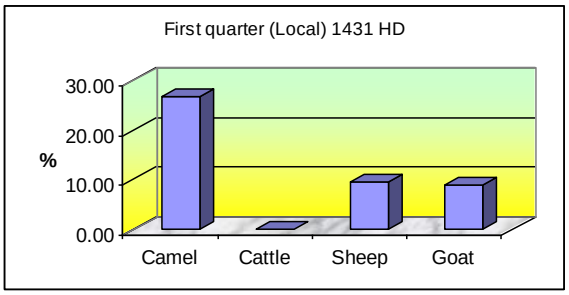
Year	Goat	infection with hydatid cyst%		
		Local	Imported	Sum
1431	1st quarter	9	0.37	9.37
	2nd quarter	7.17	10.3	17.47
	3rd quarter	14.94	24.42	39.36
	4th quarter	49.04	28.02	77.06
	total	80.15	63.11	143.26



Chi test for independence			
Significance	x^2	P-value	four quarters
significant	12	0.2133E-3	1431 H D

Table and histogram (13-1) showing infection rates of hydatid cyst of local livestock in the 1st quarter of year 1431HD with Chi goodness of fit test .

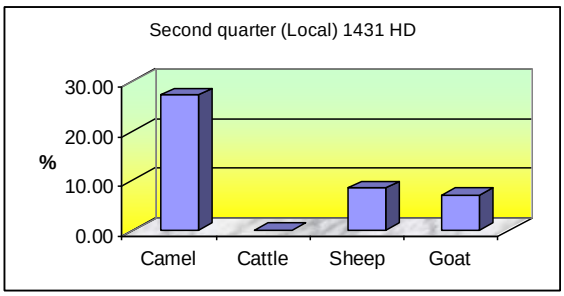
Animal type	infection with hydatid cyst %
Camel	26.85
Cattle	0.00
Sheep	9.58
Goat	9.00
Total	10.26



Chi square goodness of fit test			
Significance	x^2	P-value	1st quarter
High significant	33.2507	2.8514E-7	1431 H D

Table and histogram (14-1) showing infection rates for hydatid cyst of local livestock in the 2nd quarter of year 1431HD with Chi goodness of fit test .

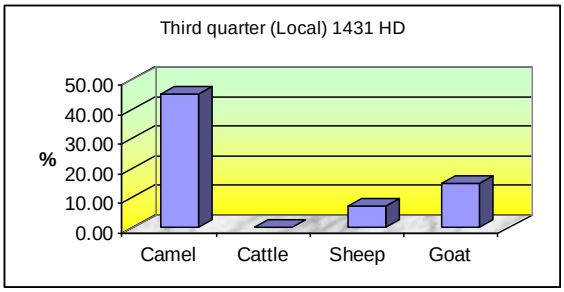
Animal type	infection with hydatid cyst %
Camel	27.39
Cattle	0.00
Sheep	8.52
Goat	7.17
Total	8.82



Chi square goodness of fit test			
Significance	x^2	P-value	2nd quarter
High significant	38.091	2.7038E-8	1431 H D

Table and histogram (15-1) showing infection rates for hydatid cyst of local livestock in the third quarter of year 1431HD with a Chi goodness of fit test.

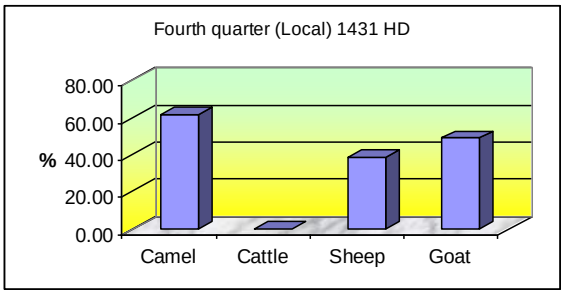
Animal type	infection with hydatid cyst %
Camel	45.25
Cattle	0.00
Sheep	7.41
Goat	14.94
Total	13.20



Chi square goodness of fit test			
Significance	x^2	P-value	3rd quarter
High significant	70.0139	4.2392E-15	1431 H D

Table and histogram (16-1) showing infection rates for hydatid cyst of local livestock in the fourth quarter of year 1431HD with Chi goodness of fit test.

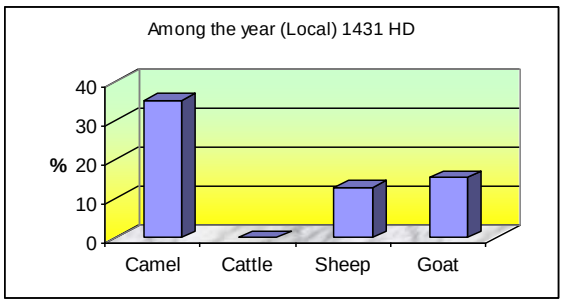
Animal type	infection with hydatid cyst %
Camel	62.07
Cattle	0.00
Sheep	38.89
Goat	49.04
Total	**44.95**



Chi square goodness of fit test			
Significance	x^2	P-value	4th quarter
High significant	57.201	2.3280E-12	1431 H D

Table and histogram (17-1) revealing infection rates for hydatid cyst of local livestock among the year 1431HD with a graphic illustration and Chi goodness of fit test.

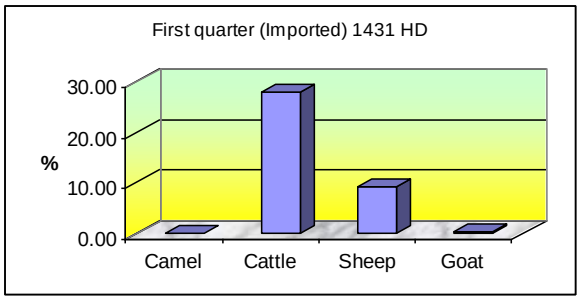
Animal type	infection with hydatid cyst %
Camel	35.14
Cattle	0.00
Sheep	12.93
Goat	15.37
Total	**15.30**



chi square goodness of fit test			
Significance	x^2	P-value	Among year
High significant	39.8539	1.1442E-8	1431 H D

Table and histogram (18-1) revealing nfection rates for hydatid cyst in the fourth quarter of year 1431HD with a graphic illustration and Chi goodness of fit test .

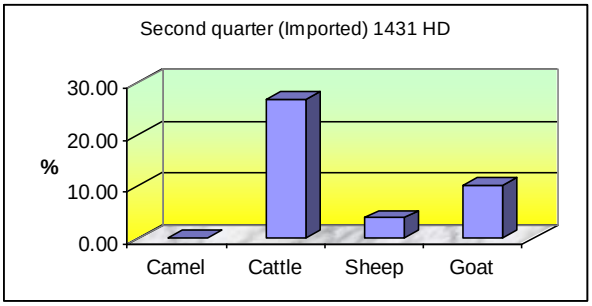
Animal type	infection with hydatid cyst %
Camel	0.00
Cattle	28.13
Sheep	9.22
Goat	0.37
Total	**8.83**



Chi square goodness of fit test			
Significance	x^2	P-value	1st quarter
High significant	55.2219	6.1570E-12	1431 H D

Table and histogram (19-1) revealing infection rates for hydatid cyst of imported livestock in the fourth quarter of year 1431 HD with a graphic illustration and Chi goodness of fit test.

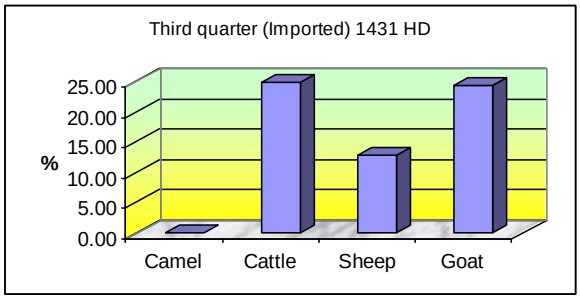
Animal type	infection with hydatid cyst %
Camel	0.00
Cattle	26.96
Sheep	3.85
Goat	10.30
Total	**4.86**



Chi square goodness of fit test			
Significance	x^2	P-value	2nd quarter
High significant	41.3664	5.4678E-9	1431 H D

Table and histogram (20-1) showing infection rates for hydatid cyst imported livestock in the fourth quarter of year 1431HD with a graphic illustration and chi goodness of fit test table.

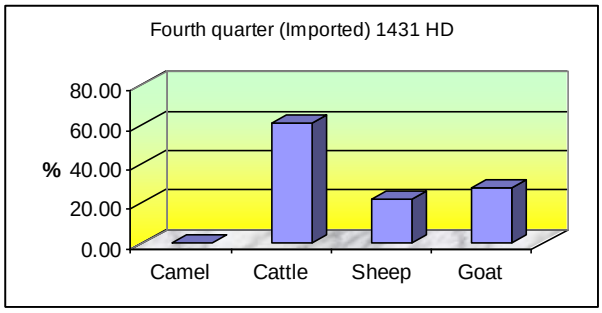
Animal type	infection with hydatid cyst %
Camel	0.00
Cattle	24.91
Sheep	12.81
Goat	24.42
Total	**14.00**



Chi square goodness of fit test			
Significance	x^2	P-value	3rd quarter
High significant	26.7436	6.6628E-6	1431 H D

Table and histogram (21-1) revealing infection rates for hydatid cyst imported livestock in the fourth quarter of year 1431HD with a graphic illustration and Chi goodness of fit test.

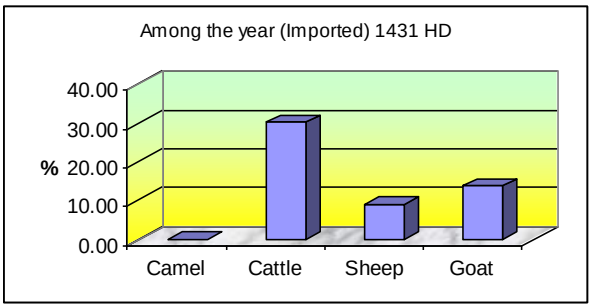
Animal type	infection with hydatid cyst %
Camel	0.00
Cattle	61.07
Sheep	22.56
Goat	28.02
Total	**23.56**



Chi square goodness of fit test			
Significance	x^2	P-value	4th quarter
High significant	68..3335	9.7061E-15	1431 H D

Table and histogram (22-1) showing infection rates for hydatid cyst imported livestock among year 1431HD with a graphic illustration and Chi goodness of fit test .

Animal type	infection with hydatid cyst %
Camel	0.00
Cattle	30.27
Sheep	8.96
Goat	13.86
Total	**9.81**



Chi square goodness of fit test			
Significance	x^2	P-value	Among year
High significant	36.4745	5.9434E-8	1431 H D

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