Advances in Applied Mathematical Biosciences.
ISSN 2248-9983 Volume 5, Number 1 (2014), pp. 1-8

http://www.irphouse.com

Association of Camel Milk with Tuberculosis

***Manju Saxena and Kavita**

Department of Mathematics & Statistics, J.N.V.U, Jodhpur, Rajasthan, India.
**Corresponding author, Email: dr_manjusaxena@yahoo.com*

Abstract

The camel is among the animals mentioned in the Quran as a miracle of god. It is common practice to let camels to eat certain plants in order to use the milk for medicinal purpose. In this paper, we have applied stratified sampling using proportional allocation and found sample of 350 camel milk consumers (CMC) from four districts of North West Rajasthan (India) Jodhpur, Jaisalmer, Bikaner, and Badmer. All the people in the sample are consuming camel milk since birth; similarly a stratified sample of 350 people who are non camel milk consumers (NCMC) or dairy milk consumers is also selected from the same region. After selecting the sample with the help of questionnaire a demographic data is collected from both the samples and it is found that there are only 1.14% tuberculosis patient in CMC sample and 14% tuberculosis patient in NCMC sample. Binary logistic regression analysis is also applied for the association between tuberculosis and consumption of camel milk.

Keywords tuberculosis; camel milk; binary logistic regression analysis; Rajasthan

1. INTRODUCTION

Besides the nutritive value of camel milk, which is extremely well adapted for human requirements, there appears to be an additional factor: the medicinal, or Natural healing properties of camel milk.

In India camel milk is used therapeutically against dropsy, Jaundice, problems of the spleen, tuberculosis, asthma, anemia, and piles (Rao et al., 1970). The "chal" and other lung ailments (Gast et al., 1963) have proven beneficial in the treatment of tuberculosis (Akundov et al., 1972). The milk also apparently has slimming properties (Yasin and Wahid, 1957).

Research by Indian scientist supports the therapeutic value of camel milk in the treatment of several diseases including tuberculosis (IIse, 2004).

The demographic data and medical history were recorded using some standard questionnaire. The questionnaires were filled by the sample units containing different type of questions as name of sample unit, age of the sample unit, weight (in kg),

height (in meters), BMI of sample unit, social and cultural habits, working conditions, occupation, food habits, whether he is vegetarian or non vegetarian(VONV), smoker or non smoker(SONS), consumption of camel milk or dairy milk, is the sample unit has T.B (on the basis of T.B symptoms), what is the age of sample unit when last baby was born, Working hour of sample unit etc.

2. MATERIAL AND METHODS

2.1 STUDY DESIGN: A cross sectional survey was carried out among the camel breeders of the four district of Rajasthan Jodhpur, Jaisalmer, Bikaner, and Badmer who are consuming camel milk since birth.

2.2 SAMPLE SIZE: Applying stratified sampling using proportional allocation we found a sample of 350 people who are consuming camel milk while a same size sample is also selected i.e. of size 350 of the people who are dairy milk consumers. A preliminary survey was conducted on 350 camel milk consumers and 350 dairy milk consumers. These all camel breeders are of the different community as Dewasi (Raica), Rajput, Jat, Charan, Muslims, Bisnoi and same as of dairy milk consumers. These all 350 camel milk consumers (CMC) were the head of the family, these people were interviewed and they filled a questionnaire which contains about 42 questions.

3. ESTIMATION PROCESS

3.1 BINARY LOGISTIC REGRESSION ANALYSIS

Binary logistic regression is a type of regression analysis where the dependent variable is a dummy variable (coded 0, 1)

Logistic regression (sometimes called the **logistic model** or **logit model**) is used for prediction of the probability of occurrence of an event by fitting data to a logit function logistic curve. Like many forms of regression analysis, it makes use of several predictor variables that may be either numerical or categorical.

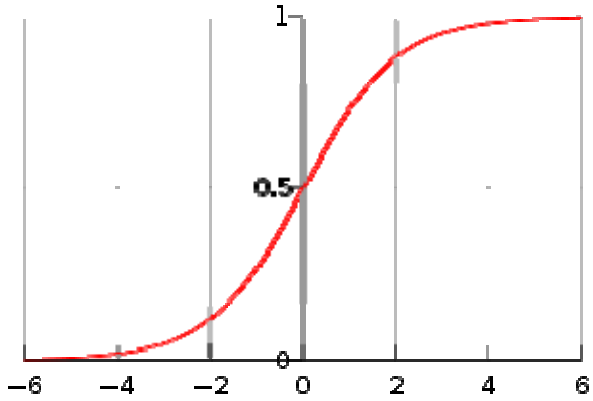

Figure 1. The logistic function, with z on the horizontal axis and $f(z)$ on the vertical axis

An explanation of logistic regression begins with an explanation of the logistic function:

$$f(z) = \frac{e^z}{e^z+1} = \frac{1}{1+e^{-z}}$$

A graph of the function is shown in figure The input is z and the output is $f(z)$. The logistic function is useful because it can take as an input any value from negative infinity to positive infinity, whereas the output is confined to values between 0 and 1. The variable z represents the exposure to some set of independent variables, while $f(z)$ represents the probability of a particular outcome, given that set of explanatory

The variable z is a measure of the total contribution of all the independent variables used in the model and is known as the logit.

The variable z is usually defined as

$$z = \beta_0 + \beta_1 x_1 + \beta_3 x_3 + \cdots + \beta_k x_k$$

Where β_0 is called the "intercept" and β_1, β_2, β_3, and so on, are called the "regression coefficients" of x_1, x_2, x_3 respectively. The intercept is the value of z when the values of all independent variables are zeros (e.g. the value of z in someone with no risk factors). Each of the regression coefficients describes the size of the contribution of that risk factor. A positive regression coefficient means that the explanatory variable increases the probability of the outcome, while a negative regression coefficient means that the variable decreases the probability of that outcome; a large regression coefficient means that the risk factor strongly influences the probability of that outcome, while a near-zero regression coefficient means that that risk factor has little influence on the probability of that outcome.

In our problem we are interested to find out the likelihood of having or we can say suffering from tuberculosis in the sample of 700 people out of which 350 are camel milk consumer (CMC) 350 are non camel milk consumers (NCMC). In the other words we can say that we are interested to find out that whether having T.B or not, associated with camel milk.

We assume hypotheses

Hypotheses

1. Dairy milk consumers are more likely to have T.B
2. The older persons are, the more likely to have T.B
3. The persons with low BMI are more likely to have T.B.
4. The persons with more working hour (W.H) less likely to have T.B.
5. Non vegetarian more likely to have T.B.
6. Smokers are more likely to have T.B.

Here the outcome variable or dependent variable is dichotomous. The outcome variable i.e. Y is T.B.

"P" is the probability that Y for cases equals 1, P (T.B=1)

"1-P" is the probability that Y for cases equals 0,

1 – P (T.B=0)

The predictor variable or independent variables are milk, age, BMI, W.H, VONV, SONS, denoted as

$$X_1, X_2, X_3, X_4, X_5, X_6$$

The variables are measured such as:

Dependent

T.B; No T.B = 0, having T.B = 1

Independent

1. Milk NCMC = 0 CMC = 1
2. Age as no of years.
3. BMI as the BMI of individuals is.
4. W.H as no. of working hour
5. VONV Non vegetarian = 0 Vegetarian = 1
6. SONS Non smokers = 0 Smokers = 1

The logistic equation will be of the form

$$\text{Log}\left[\frac{P}{1-P}\right] = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$$

$$\text{Log}\left[\frac{P}{1-P}\right] = a + b_1(\text{Milk}) + b_2(\text{BMI}) + b_3(\text{AGE}) + b_4(\text{W.H}) + b_5(\text{VONV}) + b_6(\text{SONS})$$

$$\text{Log}\left[\frac{P}{1-P}\right] = 57.263 - 3.016 \times \text{Milk} - 2.525 \times \text{BMI} - .016 \times \text{AGE} - .307 \times \text{W.H} - .553 \times \text{VONV} - .165 \times \text{SONS}$$

From table-5

To estimate odds the equation is exponentiates

$$\frac{P}{1-P} = e^{57.263-3.016\times\text{Milk}-2.525\times\text{BMI}-.016\times\text{AGE}-.307\times\text{W.H}-.553\times\text{VONV}-.165\times\text{SONS}}$$

$$P = \frac{e^{57.263-3.016\times\text{Milk}-2.525\times\text{BMI}-.016\times\text{AGE}-.307\times\text{W.H}-.553\times\text{VONV}-.165\times\text{SONS}}}{1+e^{57.263-3.016\times\text{Milk}-2.525\times\text{BMI}-.016\times\text{AGE}-.307\times\text{W.H}-.553\times\text{VONV}-.165\times\text{SONS}}}$$

4. RESULT AND DISCUSSION

From the data collected it is found that in the sample of camel milk consumers there are 40% people are vegetarian, 60% are non-vegetarian. 95.71% are Smokers, 4.29% are non smokers. There is 1.14% T.B patient. All the persons in this sample are camel breeders. They are living in dry climate and they are consuming camel milk since birth.

Table-1 Demographic and physical characteristics of camel milk consumers

S.No.			No. of individuals	%
1	Food habits	Vegetarian	140	40%
		Non- Vegetarian	210	60%
2	Smoking habits	Smokers	335	95.71%
		Non smokers	15	4.29%
3	Disease	T.B Patient	4	1.14%
4	Occupation	All are camel breeders		

On the other hand in the sample of non camel milk consumers there are 37.71% people are vegetarian, 62.29% are non-vegetarian. 90.2% are smokers, 9.27% are non smokers. There are 14% T.B patient. All people are living in dry climate and there food habits are same as of camel milk consumers. There are 40.86% individuals whose occupation is Farming. 12.29% are in Service (SE), 12.29% are Shopkeeper (SK), 9.14% are Teacher (TE), 7.14% are Driver (DRI), 8% are government servant (G.S), and 10.29% are labor (LA).

Table-2 Demographic and physical characteristics of Non camel milk consumers

S.No.			No. of individuals	%
1	Food habits	Vegetarian	132	37.71%
		Non- Vegetarian	218	62.29%
2	Smoking habits	Smokers	316	90.2%
		Non smokers	34	9.27%
3	Disease	T.B Patient	49	14%
4	Occupation	Farmer	143	40.86%
		Service	43	12.29%
		Shopkeeper	43	12.29%
		Teacher	32	9.14%
		Driver	25	7.14%
		Government Servant	28	8%
		Labor	36	10.29%

Out of 350 individuals it is clear from (Table-3) that most of the T.B patients are of lower BMI. All four T.B patient in CMC sample are of BMI group (19-21), (21-23),(23-25). While in NCMC sample out of 49 T.B patient 15(100%) out of 15 individuals are of BMI (17-19), 29(96.67%) out of 30 individuals are of (19-21) and 5(8.48%) out of 59 individuals are of (21-23), no T.B patient in high BMI (Table-3).

Table-3 Distribution of the CMC and NCMC according to BMI (body mass index) regarding T.B

		CMC		NCMC	
S.No	BMI	frequency	T.B	Frequency	T.B
1	17-19	0	0	15	15
2	19-21	11	2	30	29
3	21-23	260	1	59	5
4	23-25	79	1	174	0
5	25-27	0	0	21	0
6	27-29	0	0	23	0
7	29-31	0	0	26	0
8	31-33	0	0	1	0
9	33-35	0	0	1	0
Total		350	4	350	49

Out of 350 individuals in the CMC sample there is nobody who has BMI greater than 25 it means nobody of this sample suffering from obesity. While in the 350 persons of NCMC (table 4) there are 72(20.58%) persons who are suffering from the problem of obesity.

Table-4 Frequency distribution of BMI of camel milk consumer and non camel milk consumers

		CMC		NCMC	
S.No	BMI	Frequency(CMC)	%	Frequency(NCMC)	%
1	17-19	0	0	15	4.29%
2	19-21	11	3.14%	30	8.57%
3	21-23	260	74.29%	59	16.86%
4	23-25	79	22.57%	174	49.71%
5	25-27	0	0	21	6%
6	27-29	0	0	23	6.57%
7	29-31	0	0	26	7.43%
8	31-33	0	0	1	0.29%
9	33-35	0	0	1	0.29%
Total		350	100%	350	100%

The Wald chi-square statistics from Table-5 are not significant for AGE, W.H, VONV and SONS (p values of.667,.173,.507,.900 respectively) whereas χ^2 value for MILK, and BMI is significant at the.05 level (i.e. p value.000,.000 respectively) thus we conclude that being non camel milk consumer (NCMC), having low BMI, have positive effect on likelihood of having T.B. On other hand AGE, W.H being vegetarian or non- vegetarian, being smoker or non smoker does not effect on likelihood of having T.B.

From table-5 for milk: =.049 if we subtract 1 from this value, we get proportion increase (or decrease) in odds caused by non camel milk consumer, -0.951, odds of having T.B decrease 95.1% for Camel milk consumer. (As No T.B=0, having T.B=1, and NCMC=0, CMC=1).

The estimated logistic coefficient for BMI i.e. is -2.525 and the exponential of this value is =.080, this indicate that for one unit increase in BMI the odd in favor of having T.B are estimated to be decreased by multiplicative factor of 0.080 (Table-5).

Table-5

S.No.		B	S.E	Wald	Degree of freedom	Sig	Exp(B)
1	MILK	-3.016	.778	15.039	1	.000	.049
2	BMI	-2.525	.387	42.478	1	.000	.080
3	AGE	-.016	.038	.185	1	.667	.984
4	W.H	-.307	.225	1.853	1	.173	.736
5	VONV	-.553	.833	.440	1	.507	.575
6	SONS	-.165	1.313	.016	1	.900	.848
7	Constant	57.263	9.044	40.091	1	.000	7.39E+24

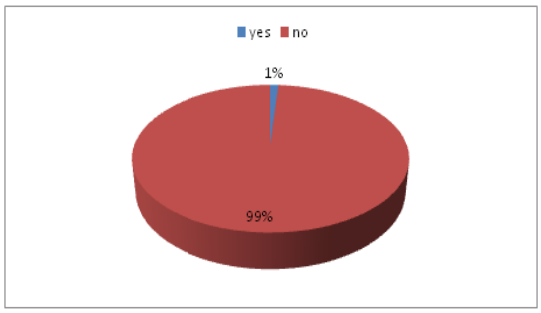

Figure-1 T.B patient in CMC sample

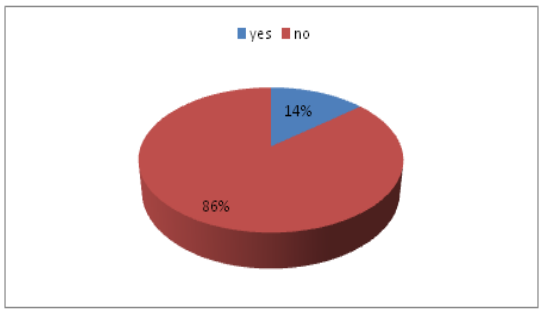

Figure-2 T.B patient in NCMC sample

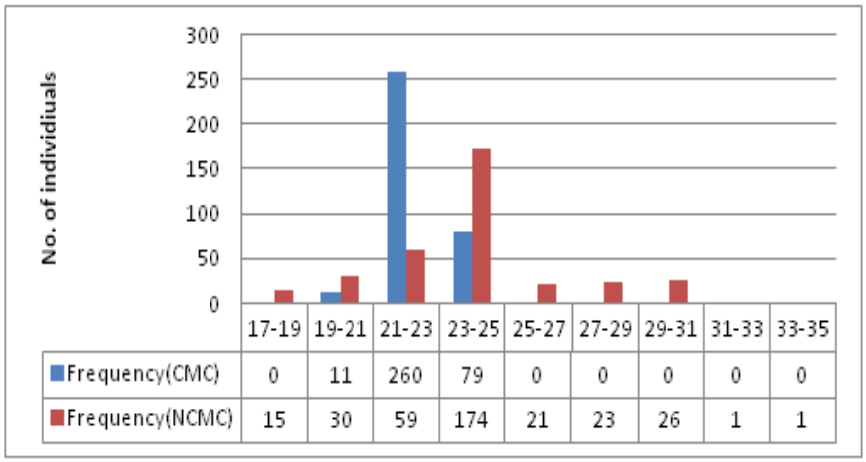

Figure-3 Frequency distribution of BMI of CMC & NCMC

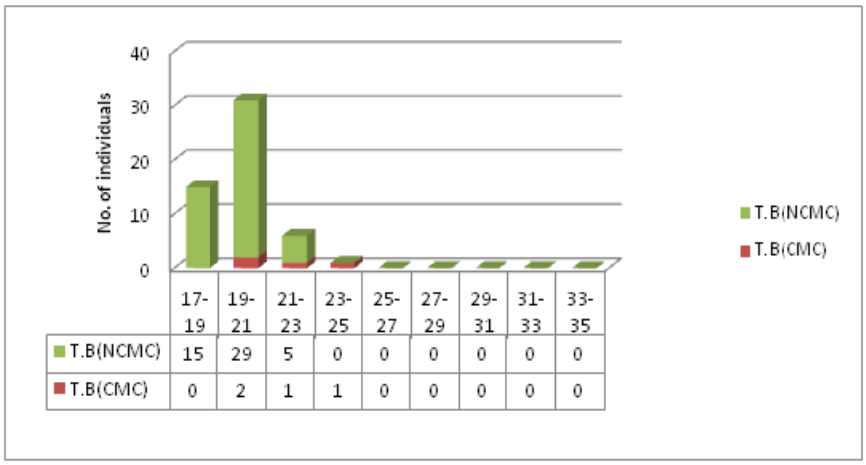

Figure -4 Frequency distribution of T.B patient of CMC & NCMC w.r.t BMI

5. CONCLUSION

From this study we conclude that camel milk is better than other milk. The people who consume camel milk have low prevalence of T.B in comparison to those who consume dairy milk. Although there are other factors which effect on probability of having T.B which are BMI and lifestyle. For the person with low BMI the chance of having T.B increases. At last we conclude that camel milk also plays a major role in decreasing the chances of T.B in the people.

REFERENCES

[1] Akhundov, A.A., Dyrdyev, B. and Serebryakov, E.R. Effect of combined treatment on water electrolyte exchange in pulmonary TBC patients. Zdravookhr. Turkm. 16: 40–44, 1972.

[2] Gast, M., Mauboisj, L. and Adda, J. Le lait et les produits laitiers en Ahaggar. Centr. Rech. Anthr. Prehist. Ethn. 1969.

[3] Ilse Kohler-Rollefson, 2004. Why does the camel need to be saved. Saving the Camel and Peoples' Livelihoods Building a Multi Stockholder Platform for the Conservation of the Camel in Rajasthan, International Conference, 23-25 November, 2004, Sadri, Rajasthan, India. pp.19-24.

[4] Rao, M.B., Gupta, R.C. and Dastur, N.N. Camels' milk and milk products. Ind. J. Dairy Sci. 23: 71–78, 1970.

[5] Yasin, S.A. and Wahid, A. Pakistan camels. A preliminary survey. Agriculture, Pakistan. 8: 289–297, 1957.