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EPIDEMIOLOGICAL STUDY OF CONTAGIOUS DISEASES IN THONDURU MANDAL, ANDHRA PRADESH, INDIA

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ABSTRACT

Objective: To evaluate epidemiological data and correlate it with various factors like Temperature, Rainfall, Sanitation with contagious diseases such as Acute diarrhea and Respiratory Infections in Thonduru Mandal of Andhra Pradesh, India.

Method: Epidemiological data of the year 2013 has been obtained from the records of the Primary Health Centre, Thonduru Mandal, Andhra Pradesh. The population of the villages that fall under Lingala Mandal has been obtained from the 2011 population census, organized by Government of India. Sanitation data has been obtained from the Panchayat office of the mandal. The data was then statistically analyzed.

Results: The Epidemiological data was then correlated with the data of biotic and abiotic elements like Temperature, Rainfall, and sanitation. A link has been established between the diseases and the seasonal conditions. This helps the local health authorities to deal with any future outbreak of the said diseases.

Conclusions: The diseases selected for the analysis are found to be closely related with sanitation and change in the weather patterns like temperature in the locality. The relation between the revalence of these diseases and other parameters has been established by data collected from the Primary Health Centre.

Keywords: Epidemiological data, contagious diseases, acute diarrhea, Respiratory Infections and Primary health centre

INTRODUCTION

Epidemiology plays a particularly important role in monitoring, investigating and evaluating the cause and risk factors related to a particular disease. Disease surveillance systems and health data sources provide the raw information necessary to monitor trends in health and disease. Descriptive epidemiology provides a way of organizing and analyzing these data in order to understand variations in disease frequency geographically and over time and makes it possible to identify trends in health and disease and also provides a means of planning resources for populations (Suciu et al., 2008).

In the recent years the value of information about diseases, distribution for planning the delivery of healthcare services has become more apparent. In several studies, disease occurrence has been related to Temperature, Rainfall and Hygiene among other factors. There is a close link between epidemiology and preventive medicine. The common basis for different applications of epidemiology is disease occurrence and its relation to various characteristics of individuals and their environment (Elliot et al., 2000).

The purpose of the study is to establish the link between diseases like Respiratory Infections with changes in temperature, whereas diseases like Acute Diarrheal Disease, which spread through fecal matter, are related to sanitation, as open defecation is rampant in the area.

Area of Study

Thonduru is a village and a Mandal in the Kadapa district in the state of Andhra Pradesh, India. Total population of Lingala as per 2011 population census is 34,103 of which males and females are 17,669 and 16,434 respectively. Sex Ratio in Lingala is 964 females per 1000 males.

Two types of diseases were observed during the surveillance such as Acute Diarrhea and Respiratory infection, which were the predominant contagious diseases found in Lingala.

METHODS

Sample collection and Data analysis

Epidemiological data has been collected from the Primary Health Centre, Lingala, Andhra Pradesh, India. The prevalence of contagious diseases for each month with respect to both the sexes was recorded along with the household data including the socio-economic status and sanitation (Table 1). About 43% of the houses did not have toilets in the area of study (Dipika et al., 2007). Exposure of the

individual to contaminated food or water correlates closely with the risk for Acute Diarrhea.

Prevalence calculation

Prevalence refers to the proportion of individuals in a population having a disease or characteristics. The prevalence was calculated using equation the following equation:

$$P = N_d / N_t \ldots.(3.1)$$

N_d is the number of individuals having the disease at a specific time.

N_t is the number of individuals in the population at that point in time.

The prevalence data values of Acute Diarrhea and Respiratory infection diseases recorded in the year shown in Table 2. The mean and sex based mean values of Acute Diarrhea and Respiratory infection diseases shown in Table 3.

Sampling

Simple random sampling is used for sampling as it is free of classification errors, and it requires minimum advance knowledge of the population. Its simplicity also makes it relatively easy to interpret data collected in this manner (Ahlom and Norell., 2000). For these reasons, simple random sampling best suits situations where there is no sufficient information, available about the population. The data collection can be efficiently conducted on randomly distributed items, or where the cost of sampling is small enough to make efficiency less important than simplicity.

Diversification of data

Standard deviation is used for expressing the variability in the sample population. It is calculated using the following formula.

$$s_N = \sqrt{\frac{1}{N}\sum_{1=1}^{N}(x_i - \overline{x})^2} \cdots\cdots (3.2)$$

The standard deviation data values of Acute Diarrhea and Respiratory infection diseases shown in Table 4.

Table 1: Data of the no. of cases of ADD and RI recorded in the year 2014

Month	ADD		RI	
	M	F	M	F
Jan	15	7	211	223
Feb	19	22	211	176
Mar	23	13	223	197
Apr	36	26	194	202
May	21	15	174	181
June	17	19	176	191
July	34	39	198	206
Aug	33	21	174	195
Sept	24	11	263	214
Oct	14	8	243	212
Nov	5	4	240	210
Dec	4	2	270	186

Note: ADD – Acute Diarrheal Disease RI – Respiratory Infection

Table 2: Prevalence values of ADD and RI recorded in the year

Month	ADD		RI	
	M	F	M	F
Jan	0.08	0.04	1.19	1.35
Feb	0.10	0.13	1.19	1.07
Mar	0.13	0.08	1.26	1.12
Apr	0.20	0.16	1.09	1.23
May	0.12	0.09	0.98	1.10
June	0.09	0.12	0.99	1.16
July	0.19	0.24	1.12	1.25
Aug	0.18	0.13	0.98	1.18
Sept	0.13	0.07	1.48	1.30
Oct	0.08	0.05	1.37	1.29
Nov	0.03	0.02	1.35	1.27
Dec	0.02	0.01	1.52	1.13

Table 3: Mean and sex based mean values of ADD and RI

Sl. no.	Diseases	Mean	Sex based mean	
			M	F
1	Acute Diarrheal Disease	36	20.4167	15.5834
2	Respiratory infection	414.167	214.75	200.25

Table 4: Standard Deviation (SD) values of ADD and RI

S.No	Diseases	SD
1	Acute Diarrheal Disease	20.036
2	Respiratory infection	40.46735

Test of significance

The sample under study is large, therefore chi square test is used for test of significance. Karl Pearson developed a test for testing the significance of discrepancy between experimental values and the theoretical values obtained under some hypothesis.

A chi-squared test, also referred to as test, is any statistical hypothesis test in which the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true.

$$\chi^2 = \sum \frac{(O-E)^2}{E} \quad \text{.....(3.3)}$$

O = the frequencies observed

E = the frequencies expected

∑ = the 'sum of' Chi-square test for independence of attributes is used in testing the significance of sanitation data. In this test two attributes WOT and WT are tested whether they are independent or not.

Hypothesis testing

Hypothesis testing, involves stating the hypotheses, formulating a null and alternative hypothesis. The hypotheses are stated in such a way that they are mutually exclusive. In this work, hypothesis testing was used to establish or reject a hypothesis (Cox DR., 1977; Cox DR., 1982).

RESULTS AND DISCUSSION

Correlation of Acute Diarrheal Disease (ADD)

Acute Diarrheal Disease is one of the major diseases recorded in the area of study. The primary cause of the disease is the lack

of hygiene and sanitation in the area of the study. Poor sanitation in the area is attributed to the number of toilets per household (Bhan et al., 1989). The data of the number of toilets per house hold is mentioned in the Table 5. Households without toilets are more prone to this disease as they practice open defecation. The data unequivocally proves the fact that less number of toilets and the practice of open defecation are the real culprits in causing the disease.

The graph Prevalence Vs Sanitation establishes the fact that the prevalence of the disease is more in households with no toilets across different months (Fig. 1).

Test of hypothesis- Acute Diarrheal disease

H0: There is no significant difference between the people affected by diarrheal without toilets and people affected by diarrheal with toilets.

HA: There is significant difference between the people affected by diarrheal without toilets and people affected by diarrheal with toilets.

χ^2cal=22.76 by using SAS

χ^2tab=19.675 at d.o.f = (r-1) (s-1)=(2-1)(12-1)=11

χ^2cal > χ^2tab

Therefore the null hypothesis is rejected and the alternate hypothesis is accepted. There is significant difference between the people affected by diarrheal without toilets and people affected by diarrheal with toilets.

Correlation of Respiratory Infection (RI)

Respiratory infection is caused by a plethora of viruses like adeno viruses, which survive at lower temperatures. All the viruses that cause Respiratory Infection spread rapidly in winter months as these months record relatively less temperature than other months (Graham NMH., 1990). The data explains the fact that the prevalence of the disease increases sharply in the months with lesser average temperatures (Table 6).

The graph Prevalence Vs Temperature establishes the fact that the prevalence of the no. of cases suffering with Respiratory Infection is more in January for females and more in December for males, this graph explains that prevalence of the no of cases suffering with Respiratory Infection occur more in winter season (Fig. 2).

Test of Hypothesis- Respiratory Infection

H0: The no. of cases suffering with Respiratory Infection was same during the twelve month period.

HA: The no. of cases suffering with Respiratory Infection is not same during the twelve month period.

χ^2cal= 43.48 by using SAS (Statiscal analysis software)

χ^2tab=19.675 at LOS=5% from the chi square table

χ^2cal > χ^2tab

Therefore the null hypothesis is rejected and the alternate hypothesis is accepted.

The no. of cases suffering with Respiratory Infection is not same during the twelve month period.

Table 5: Correlation data of ADD in Thonduru

Month	WOT	WT	Prevalence	
			Not having toilets	Having toilets
Jan	20	2	0.058647587	0.005864759
Feb	37	4	0.108498035	0.011729517
Mar	33	3	0.096768518	0.008797138
Apr	48	14	0.140754208	0.041053311
May	24	12	0.070377104	0.035188552
June	25	11	0.073309483	0.032256173
July	56	17	0.164213243	0.049850449
Aug	44	10	0.129024691	0.029323793
Sept	30	5	0.08797138	0.014661897
Oct	19	1	0.055715207	0.002932379
Nov	9	0	0.026391414	0
Dec	6	0	0.017594276	0

WOT = Households without Toilets, WT = Households with Toilets

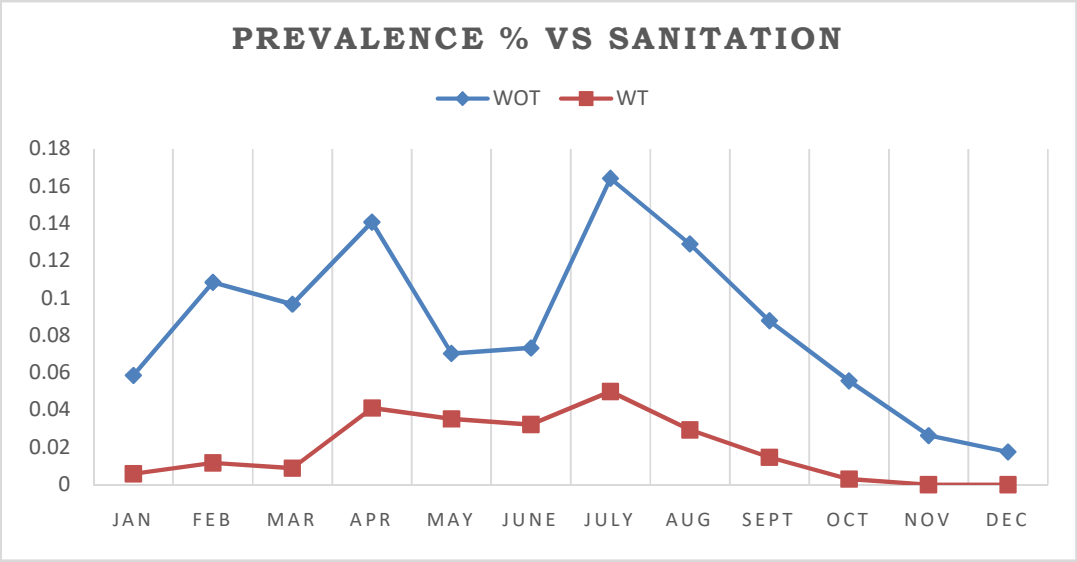

Fig.1: Graphical correlation of ADD in Thonduru

Table 6: Correlation data of RI

Month	Temp(°C)	Prevalence	
		Male	Female
Jan	25	1.1941819	1.35694292
Feb	27	1.1941819	1.07095047
Mar	30	1.2620975	1.19873433
Apr	33	1.0979682	1.22915906
May	33	0.9847756	1.1013752
June	32	0.9960949	1.16222466
July	29	1.1206067	1.25349884
Aug	29	0.9847756	1.18656444
Sept	28	1.4884827	1.30217841
Oct	29	1.3752901	1.29000852
Nov	26	1.3583112	1.27783863
Dec	25	1.5281001	1.13179993

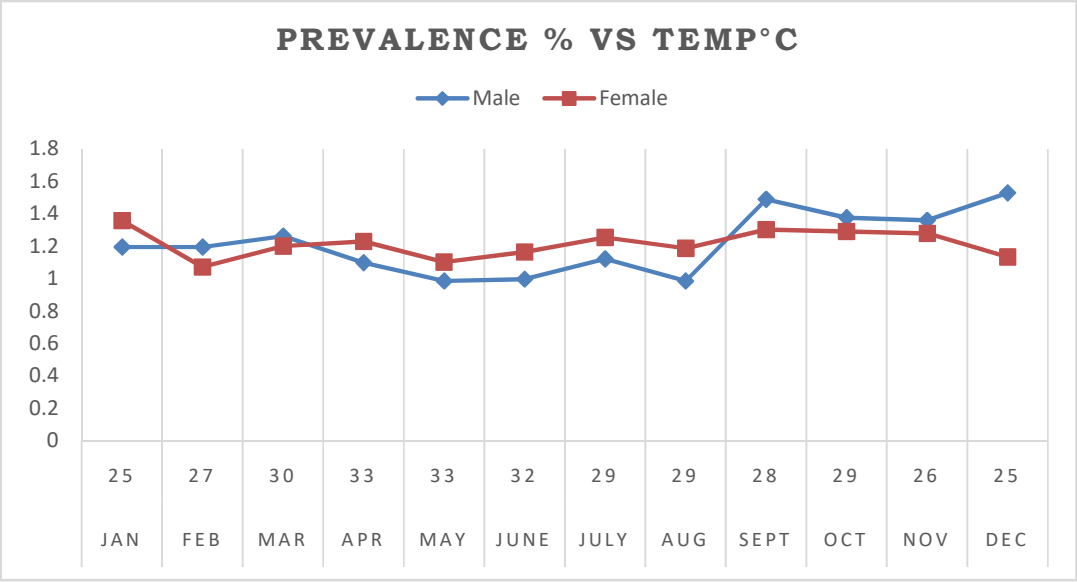

Fig. 2: Graphical correlation of RI in Thonduru

CONCLUSION

This study underlines the need for good sanitation practices in the locality. Lack of proper sanitation is the major culprit behind the recurrence of diseases like Acute Diarrheal Disease. The number of toilets in the locality reflects the high prevalence of the disease in the locality. The local administration has to take measures to build toilets and discourage people from defecating in the open. The key to preventing this disease lies in the dissemination of information on cleanliness and hygiene to the people in the study area. High prevalence of Respiratory Infections in the population especially during months with lower average temperatures establishes that the pathogens causing Respiratory Infections thrive and spread at a rapid phase during the months with lower temperatures. It is imperative to

take steps towards controlling the spread of pathogens causing Respiratory diseases.

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Conflict of interest

The authors declare no conflict of interest.

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