APPLICATION OF MULTIVARIATE ANALYSIS IN THE IDENTIFICATION OF MAJOR DIMENSIONS OF MULTIBACILLARY LEPROSY IN TAMILNADU

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ABSTRACT : Leprosy is a major health problem in India. The study observed that the actual use of health care services for leprosy was observed from the level of utilization and spatial preference of the consumers to these services. Multibacillary leprosy led to a dangerous epidemiological situation in Tamilnadu. In this context an attempt to identify and seek an explanation between the disease causing factors and health care man power variables. The disease data related to leprosy for all districts of Tamilnadu as on 1985 to 1995 were collected from district leprosy offices. The data is related to disease parameters such as prevalence rate, bacteriological status of the patients, treatment, deformity cases etc. The disease ecological structure in relation to the selected variables was determined with the application of Factor Analytic techniques. This study has laid its major emphasis on identifying the major dimensions of multibacillary leprosy. With the above findings the study has made an attempt to probe into the requirement of adequate health and medical manpower needed for the implementation of MDT treatment programme in a large scale for prevention and control.

The geographers' early contribution to Medical Geography was the mapping of disease distribution and mapping has today become the primary tool of analysis for geographers. Identification and interpretation of spatial variations resulting from such distributions offer valuable clues to add necessary inputs for formulating suitable policy decisions for an efficient health care planning. (Phillips and Verhasselt, 1989).

Leprosy is caused by mycobacterium leprea. It is one of the major social health probles in India. Multibacillary leprosy includes both lepromatous and borderling leprosy. This has led to a dangerous epidemiological situation, i.e. increasing number of patients relapsing with dapsone resistant leprosy and the spread of resistant strains among their contacts.

Multibacillary leprosy usually occurs in patches, nodules or ulcers in the skin. It affects various parts of the body like skin, nose, eyes, throat and upper respiratory tract. Treatment should be continued for a maximum period of 2 years or until smear tests answer negatively, whichever is later. Smear negativity means 2 consecutive skin smears taken at monthly intervals. (Thangaraj & Yawalkar 1989).

The present study is envisaged to analyse the ecological structure of multibacillary leprosy and to identify the major dimensions responsible for the variation in the spatial pattern of multibacillary leprosy in Tamilnadu. This study also highlighted he significance of MDT and its impact on the prevalence rate of multibacillary cases.

OBJECTIVES

- To study the ecological structure of leprosy.

- To analysis the Ecological dimensions of multibacillary leprosy.

- To analysis the major dimensions of ecological structure of leprosy in relation to health care delivery system involving treatment types such as monotherapy and multidrug therapy.

- To study the inter correlationships between the ecological structure and spatial pattern of multibacillary leprosy.

METHODOLOGY

To achieve the major objectives of the present study data were collected from various published sources. The disease data related to leprosy for all districts of Tamilnadu as on 1985 to 1995 were collected from district leprosy offices. The data related to disease parameters such as prevalence rate, bacteriological status of the patients, treatment nature, deformity cases etc (24 variables) were collected and computed form the above leprosy offices of the district concerned. The disease

ecological structure in relation to the selected variables was determined with the application of Factor Analytic Technique. This study has laid its major emphasis to identify the major dimensions of multibacillary leprosy and their correlation to the selected factors.

INTERPRETATION

The factor analysis employed in the study identified eight major dimensions explaining a total variance of more than 93 percent (Table 1). Nearly one fourth of the total variance is accounted by the first dimension dealing with the 'Nature of Multibacillary'. The first five dimensions explained a total variance of more than 78 percent. The contribution of the last three dimensions (VI, VII, VIII) altogether accounted for only 15.34 percent of the total variance. Thus it is clear that the analysis of factor solution with reference to the dimensions emerged indicate that the first five dimensions with an eigen value of more than 1.98, explained a total variance of more than 78 percent and thus played a significant role in the ecological structure of Multibacillary leprosy.

Factor Solution :

The Eigen Values and the total percentage variance explained by each of the Eight Factors.

Factor	Name of the Dimension	Eigen Value	% of Variance	Cumula tive%
I	Nature of multibacillary leprosy	7.21	31.12	31.12
II	Use of medical man power	5.18	21.12	52.24
III	Essential for laboratory Technician	3.60	10.24	62.48
IV	Importance of Non-medical personnel	3.42	8.11	70.59
V	Need for regular treatment	1.98	7.94	78.53
VI	Significance of multibacillary leprosy	1.58	6.12	84.65
VII	Patients released from treatment	1.36	5.12	89.77
VIII	Prevalent rate of leprosy	0.94	4.10	93.87

Complied by the author

RESULTS AND DISCUSSION

Dimension I : Nature of Multibacillary leprosy

The first dimension on 'Nature of Multibacillary leprosy' explained a total variance of 31.12 percent with an eigen value of 7.21. The analysis of correlation matrix revealed that the in-patients with the positive bacteriological status responded more to MDT treatment (0.26) with reference to regularity of treatment -0.09 and also number of patients released from treatment (-0.33) and number of patients cured (-0.05). (Methews, 1989 and Palande et al 1995). The positive correlation observed among variables on medical and health manpower explained that a decrease in the patients registration new cases detection and relapsed cases are mainly due to a decrease in the health and medical manpower. Health & medical manpower are essential to treat multibacillary leprosy cases.

Dimension II :Use of Medical Manpower

It is observed in the correlation matrix that the new case detection rate is associated with the registration of total number of cases, the registration rate of in patients (0.43) and the detection of new cases with deformity (0.44). A decrease in the medical health manpower also affecrted the new case detection rate and also patients in the dapsone monotherapy treatment (0.43), (Pandian 1991) patients with surveillance after completion of treatment (0.24) patients relapsed during the year (0.30) and also patients released from treatment (0.50) which subsequently determined the prevalence rate.

Dimension III : Essential for Laboratoy Technicians

The third dimension designated as essential for laboratory technician experienced a total variance of 10.24 percent with an eigen value of 3.60. The correlaltion matrix explained that the patients registraticn is subjected to total number of patients registered, new cases detected with deformity (0.44) and patients with negative bacteriological status (0.77). The patients received monotherapy treatment (0.86) and MDT treatment with bacteriologically negative status (0.77) have experienced the curative rate on the basis of the regularity of treatment when there is a high degree of regularity of treatment (-.20) there is a higher number of patients released from treatment (0.35). thus indicating the essential of regularity of treatment irrespective of the type of treatment. (Nagarajan, 1994).

Dimension IV : Importance of Non-medical Man power

The fourth demensions on 'importance of non-medical man power' explained a total variance of 8.11 percent with an eigen value of 3.42. The correlation matrix explains that a decrease in the non-medical and health manpower were responsible for an increase in the number of in-patients and number of relapsed cases. (Jacobson, 1994).

Dimension V : Need for regular treatment

The need for regular treatment explained a total variance of 7.94 percent with an eigen value of 1.98. The correlation matrix for this dimension on importance of regular treatment explained the bacteriological statusx (0.28), txtent of deformity and also the type of treatment. This dimension includes that the monotherapy treatment is characterised by the number of patients relapsed (0.43) and patients recovered from treatment. (Pandian, 1991). The above said variable altogether played a vital role in determining the prevalence rate.

Dimension VI : Significance of MDT treatment on multibacillary leprosy

This dimension with an eigen value of 1.58 explained a total variance of 6.12 percent. It is understood from the correlation matrix that negative bacteriological status (0.53) is correlated with the general treatment and monotherapy treatment explained the number of patients released form treatment and patients under surveillance after completion of treatment (0.46) and also number of patients relapsed (0.30) subjected to regularity of treatment (0.18) irrespective of health and medical manpower. (Vijayakumaran 1995).

Dimension VII : Patients released from treatment

Disease persistence emerged as the seventh dimension with an eigen value of 1.36 and total variance of 5.12. It can also be observed that the positive correlation noticed among the variables such as positive with unknown bacteriological status (0.44) in general treatment or monotherapy treatment (0.50) characterised the number of patients under surveillance after completion of treatment (0.49) and patients released from treatment (0.46). The prevalence rate at the time of introduction of MDT and also the prevalence rate at a later stage can give an idea about the significance of MDT treatment. (Geogiev, and McDougall, 1990).

Dimension VIII : Prevalent rate of leprosy

The last and eighth dimension on disease prevalence has an eigen value of 0.94 with a variance of 4.10 percent. The correlation revealed that monotherapy with regular treatment to some extent provides relief for release of small number of patients from treatment provided that they follow regular treatment. It is also found that the patients who received MDT have a higher chance of quick recovery with the help of adequate technical, health and medical manpower. (Noordeen, 1991). Indeed the MDT is to a greater extent responsible for the decline in the prevalence rate.

CONCLUSION

With the above findings the study has made an attempt to probe into the requirement of adequate health and medical manpower needed for the implementation of MDT treatment programme on a large scale for prevention and control. The identification of economic areas of multibacillary cases further help the planner to derive a suitable health care programme and also to plan for an efficient coverage of the programme. Understanding the spatial variation in the major determinants of various dimensions for multibacillary leprosy also helps the planner to identify the problematic region on priority basis and concentrate on the selected dimensions that may be responsible for the endmicity.

The study has thus established the hypothesis that the curative efficacy of multidrug therapy on multibacillary leprosy is dependent upon the efficiency of medical/ health / manpower and efficacy of medical personnel. This confirms the causal relationships between the epidemiological and ecological structure of leprosy and also for efficient organisation of the health care system.

LIST OF VARIABLES

Multibacillary Leprosy

1. Examined population in percentage.
2. New cases detected in percentage.
3. Patients registered in examined population in percentage.
4. Total in-patients registered.
5. New cases detected with deformity in percentage.
6. Patients with positive bacteriological status.

7. Patients with negative bacteriological status.

8. Patients with unknown bacteriological status.

9. Cases under treatment in percentage.

10. Patients received monotherapy treatment.

11. Patients received multidrug therapy treatment.

12. Surveillance status after completion of treatment.

13. Percentage of cases relapsed.

14. Percentage of patients with regular treatment.

15. Percentage of patients released from treatment.

16. Prevalence at the start of MDT.

17. Prevalence as on 1995.

18. Total cases cured in percentage.

19. Medical Officer/Population ratio.

20. Leprosy inspector/population ratio.

21. Laboratory Technician/Population ratio.

22. Laboratory Technician/known cases ratio.

23. Physiotherapy Technician/population ratio.

24. Physiotherapy Technician/known cases ratio.

Correlation Matrix
Multibacillary Leprosy

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23
1	1.00																							
2	0.83	1.00																						
3	0.89	0.58	1.00																					
4	-0.28	0.43	0.18	1.00																				
5	0.04	0.44	0.39	0.36	1.00																			
6	-0.04	-0.44	-0.39	-0.36	-0.99	1.00																		
7	0.08	0.52	0.77	0.21	0.53	-0.53	1.00																	
8	0.10	0.08	-0.02	-0.04	0.28	0.28	0.44	1.00																
9	0.04	0.08	0.82	0.14	0.43	0.43	0.50	-0.15	1.00															
10	0.02	0.43	0.86	0.07	0.43	0.43	0.50	-0.89	0.82	1.00														
11	-0.26	-0.21	0.02	0.14	0.06	-0.09	-0.17	0.28	0.28	0.17	1.00													
12	-0.38	0.24	0.38	0.34	0.46	-0.46	0.49	0.32	0.35	0.46	0.42	1.00												
13	0.23	0.30	0.63	0.15	0.30	-0.30	0.37	0.03	0.57	0.50	0.12	0.07	1.00											
14	-0.09	-0.24	-0.20	-0.28	-0.18	0.18	-0.36	0.17	-0.02	-0.11	0.32	0.08	0.02	1.00										
15	0.33	0.50	0.35	0.37	0.56	-0.56	0.46	0.05	0.30	0.36	0.06	0.69	-0.12	-0.20	1.00									
16	0.13	0.20	0.35	-0.26	0.07	-0.06	0.39	0.30	0.20	0.39	-0.13	0.20	0.02	-0.82	0.18	1.00								
17	0.28	0.14	-0.02	-0.01	0.40	-0.40	0.39	0.70	-0.22	-0.13	-0.21	0.23	-0.17	0.01	0.21	0.16	1.00							
18	-0.15	0.12	-0.38	-0.27	-0.21	0.021	-0.44	-0.04	-0.22	-0.30	-0.33	-0.19	-0.21	0.07	0.11	-0.04	-0.84	1.00						
19	0.24	-0.14	-0.08	-0.50	-0.10	0.10	0.07	-0.04	-0.27	-0.15	-0.60	-0.60	-0.16	-0.19	-0.24	0.03	0.06	-0.07	1.00					
20	-0.06	-0.25	-0.19	-0.03	-0.33	0.33	-0.29	-0.43	0.13	-0.15	0.32	-0.20	-0.18	-0.24	-0.25	-0.46	-0.48	-0.26	0.08	1.00				
21	0.22	-0.24	-0.36	-0.69	-0.32	0.32	-0.07	0.29	-0.44	-0.33	-0.18	-0.16	-0.34	0.35	-0.26	0.19	0.27	-0.09	0.30	0.10	1.00			
22	0.33	-0.24	-0.27	-0.58	-0.35	0.35	0.07	0.43	-0.36	-0.27	-0.21	-0.12	-0.39	0.20	-0.25	0.43	0.31	-0.14	0.27	-0.21	0.85	1.00		
23	0.15	-0.24	-0.16	-0.41	0.04	-0.04	0.03	0.42	-0.11	-0.16	-0.39	-0.27	0.05	-0.03	-0.38	0.06	0.27	-0.09	0.62	-0.11	0.28	0.22	1.00	
24	0.49	-0.20	-0.06	-0.16	0.27	-0.28	0.14	0.51	-0.12	-0.01	0.15	0.05	0.03	-0.09	-0.09	0.22	0.58	-0.27	-0.07	0.13	0.04	0.20	0.07	1.00

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