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INDICATORS CORRELATED WITH THE PERFORMANCE OF REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME IN RAJASTHAN, INDIA 2011-2014

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ABSTRACT

Introduction: TB remained one of the top 10 causes of death worldwide in 2015. India continues as one among top 20 high burden countries. A retrospective analytical epidemiological study was carried out on indicators of Revised National Tuberculosis Control Programme (RNTCP) of Rajasthan, India during 2011 to 2014. The objectives were (1) to identify the indicators correlated with the indicators having vital significance in ongoing transmission of tuberculosis, incidence, drug resistance pattern and therapeutic effectiveness and (3) to develop regression equation for making future prediction. **Methodology:** Vital or dependent indicators were identified based on the vital information they convey. Correlation and regression analysis were performed on Epi-info. **Results:** Four dependent or vital indicators were selected. These are (1) *Percentage of paediatric cases out of all new cases*; (2) *Annual new smear positive case notification rate*; (3) *3 month conversion rate of new smear positive patients in percentage*; and (4) *treatment success rate of new smear positive patients*. 19 independent indicators were found correlated. 'Suspects examined per smear positive case diagnosed' showed strong negative correlation with *Annual new smear positive case notification rate.* With every unit rise in No of suspects examined there was decline of 6.796 cases in annual new smear positive case notification rate ($p<0.05$). **Discussion:** Study identified 19 independent indicators correlated with 4 dependent or vital indicators of RNTCP. *Annual new smear positive case notification rate* declines with the rise in suspects examined per smear positive case diagnosed. Similar analytical studies are required to validate these initial findings.

KEYWORDS: Correlation; Indicator; Tuberculosis; Programme; India**.**

INTRODUCTION

Global alliances against tuberculosis have witnessed a programmatic transition in year 2015. Year 2015 had been the end line for achieving the targets of Millenium Development Goals (MDGs) and 'Stop TB Strategy'. Now UN adopted the Sustainable Development Goals (SDGs) for period 2016-2030 and End TB strategy for period 2016-2035 for post 2015 era. One of the targets set under SDGs is to end the global TB epidemic by 2030. WHO end TB strategy calls for 90% reduction in TB deaths and 80% reduction in TB incidence rate by 2030. Global TB report estimated 10.4 million new (incident) TB cases and 1.4 million TB deaths in 2015 worldwide. TB remained to be one of the top 10 causes of death worldwide. India is one among top 20 countries with high TB burden. WHO End TB strategy calls all member states to progress in tune with the guideline and achieve proposed targets.[1]

Government of India had formally launched Revised National Tuberculosis Control Programme (RNTCP) in 1997. Since then RNTCP has expanded its coverage many fold in phased manner. The programme has achieved total coverage of the country in March 2006. India, being a signatory of End TB Strategy, needs to achieve milestones & targets set out in strategy.[2]

It was found pertinent to analyze the performance of RNTCP indicators in Rajasthan as study site. A retrospective secondary data base analytical epidemiological study was carried out on data of RNTCP indicators for Rajasthan state during 2011 to 2014. The objectives of this study were (1) to identify the indicators correlated if any with the indicators having vital significance direct or indirect with ongoing transmission of tuberculosis, incidence, drug resistance pattern and therapeutic effectiveness and (3) to develop regression equation for making future prediction for vital indicators using correlated other RNTCP indicators.

METHODOLOGY

Study site

Rajasthan is largest state of India located on western side. Its geographical area is 342,239 Km^2. It shares

10.4% in total land area of country. Rajasthan is surrounded by Pakistan on west & Northwest, Punjab state on North, Haryana & Uttar Pradesh states on north-east, Madhya Pradesh state on south-east, and Gujarat state on south-west. Rajasthan is divided in to 33 districts for administrative purposes.[3]

Secondary data

Central TB division, government of India publishes annual status reports of RNTCP every year. These reports have data of various indicators of RNTCP for districts, states and country. Annual reports of the years 2011, 2012, 2013, and 2014 were accessed from the website.[4] All accessed annual reports had yearly RNTCP data for Rajasthan's all 33 districts. Available district wise data of RNTCP indicators from 2011 to 2014 was entered in Microsoft Excel computer programme. Entered data was cleaned and quality checked before analysis.

Vital indicators

All available indicators were observed and the details on numerator, denominator, and vital information of the programme they convey were considered for identifying the few vital or dependent indicators. All remaining indicators were termed as independent indicators.

Analysis

Each of the identified vital or dependent indicators was analysed with other indicators separately for each year. Pearson's product-moment correlation coefficient of linear correlation (r)[5] was computed in Microsoft Excel computer software for assessing the strength of the correlation. Dependent and other indicators showing correlation coefficient value of at least 0.50 in any of the studied years were considered suitable for further analysis. Correlation coefficient between dependent and independent indicators was then computed for pooled data of years 2011-2014 for showing strength of correlation for overall period. Extent of variability brought out in dependent indicators by correlated indicator was then computed by estimating the coefficient of determination (r^2) for separate years and for pooled year's data[5]. For showing the direction of correlation, relative distribution of values of dependent and independent indicators along with best fit line for pooled years data; scatter graphs were created in Epi-info Epidemiological software version 3.3.2.

Regression analysis between dependent and independent indicators was performed in Epi-info software. Constant and coefficient were estimated for predicting the values of dependent indicators for given values of independent indicators. Values of dependent indicators were predicted using the values of constant and coefficient for randomly selected values of independent indicators. Observed and estimated values of dependent indicators were then analysed for assessing the proximity in between. Agreement score (r) was estimated for reflecting proximity between observed and predicted values of dependent indicators with a given set of correlated independent indicators.

RESULTS

Rajasthan state is having yearly data on 35 RNTCP indicators for all its 33 districts. Five dependent or vital indicators were selected after its assessment in respect to their relative significance in ongoing TB transmission, its incidence rate, drug resistance and treatment. These are (1) *Percentage of paediatric cases out of all new cases* – for suggesting the recent transmission of TB in community; (2) *Annual new smear positive case notification rate* – for suggesting the incidence rate of TB in community; (3) *3 month conversion rate of new smear positive patients in percentage* – for suggesting the drug resistance pattern among patients on treatment; and (4) *treatment success rate of new smear positive patients* – for suggesting therapeutic effectiveness.

Table 1 displays the list of pairs of dependent & independent indicators having correlation coefficient (r) value at least 0.50 in any of the studied years. Overall correlation value for pooled years data from 2011-2014 is also provided in Table 1. First dependent indicator '*percentage of paediatric cases out of all new cases*' showed correlation coefficient (r) value of 0.50 with 4 independent indicators in at least one studied years. Out of these 4, 'Annual new extra pulmonary case notification rate' showed overall correlation strength of only 0.13. Other 3 indicators showed the positive correlation of value from 0.28 to 0.62 ($p<0.05$).

Second dependent indicator '*Annual new smear positive case notification rate*' showed correlation coefficient value of 0.50 in any of the years with 10 independent indicators. Out of these 10, independent indicator 'Suspects examined per smear positive case diagnosed' showed negative correlation coefficient value of more than 0.50 in all the years separately as well as for overall period ($p<0.05$). The independent indicators out of remaining 9 with the values of r more than 0.50 for pooled years were 5 namely; (1) 'Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop]' with overall r value of 0.96, (2) 'Annual total case notification rate' with overall r value of 0.89, (3)'Annual smear positive case detection rate' with overall r value of 0.73; (4)'Annual previously treated case notification rate' with overall r value of 0.65; and (5) 'Annual new smear negative case notification rate' with overall r value of 0.61. Remaining 4 independent indicators out of 10, showed strength of less than 0.50 with dependent indicator '*Annual new smear positive case notification rate*'.

Third dependent indicator '*3 month conversion rate of new smear positive patients in %*' showed correlation strength of 0.50 with 5 independent indicators in any of the years. All of these 5 indicators showed positive correlation for pooled years. Though the strength of all

these correlated indicators was less than 0.50, these were statistically significant ($p<0.05$).

Fourth dependent indicator '*Treatment success rate of new smear positive patients*' showed correlation with 2 independent indicators. Out of these 2 independent indicators, indicator 'treatment success rate among smear positive previously treated cases in %' showed strength of 0.72 for overall period.

Table 2 describes the degree of variation in percentage in dependent indicators brought out by variation in independent indicators. Indicator 'No. of paediatric cases out of all new cases' and 'No of suspects examined' were found responsible for 39% & 11% variation in indicator *'% of paediatric cases out of all new cases*' respectively. Out of 10 independent indicators which found correlated with '*Annual new smear positive case notification rate*' in any of the studied years, 6 indicators were found affecting at least 37% variation in it. Out of these 6, indicator 'Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop] was responsible for 92% variation. Other indicators in decreasing order of degree of variation were Annual total case notification rate (79%); Annual smear positive case detection rate (53%); Suspects examined per smear positive case diagnosed (46%); Annual new smear negative case notification rate (37%) etc.

Dependent indicator '*3 month conversion rate of new smear positive patients in %*' did show 20% variation with variation in '3 month conversion rate of retreatment patients in %'. Other 2 independent indicators 'No of all smear positive cases registered within one month of starting DOTS treatment' and 'No of all cured smear positive cases having end of treatment follow up sputum done within 7 days of last dose' were found responsible for 13% variation each in it.

Fourth dependent indicator '*treatment success rate of new smear positive patients*' did show 52% variation with variation in 'Treatment success rate among smear positive previously treated cases in %'.

In table 2 independent indicator 'Annual new extra pulmonary case notification rate' was found responsible for bringing only 1% variation in its dependent indicator, so this independent indicator did not subject to further analysis. Indicators 'Treatment success rate of new smear positive patients' and '3 month conversion rate of new smear positive patients in %' showed mutual correlation at two places in table 2 due to their different place of consideration (dependent Vs independent) in correlation analysis. So the indicator 'treatment success rate of new smear positive patients' did not considered as independent indicator for further analysis with dependent indicator '3 month conversion rate of new smear positive patients in %'.

Graph 1 contains three scatter plots, demonstrating the best fit line and its steepness in case of '*percentage of paediatric cases out of all new cases*' with three independent indicators. It is evident from the scatter plots that the correlation is in positive direction[5] with all the three independent indicators. The best fit line is steepest in case of 'No of paediatric cases out of all new cases'.

Graph 2 is cluster of 10 scatter plots from No. 4 to 13 demonstrating pictorial correlation of dependent indicator '*Annual new smear positive case notification rate*' with its correlated 10 independent indicators. Scatter plot 4 demonstrated negative correlation of dependent indicator with 'Suspects examined per smear positive case diagnosed'. If values of independent indicator 'Suspects examined per smear positive case diagnosed' rises then the values of dependent indicator '*Annual new smear positive case notification rate*' decreases. Remaining scatter plots from No 5 to 13 shows positive correlation with varied steepness of best fit line.

Graph 3 is cluster of 4 scatter plots from No. 14 to 17 demonstrating pictorial correlation of dependent indicator '*3 month conversion rate of new smear positive patients in %*' with its correlated 4 independent indicators. All 4 independent indicators depicted positive correlation albeit with different steepness of best fit line.

Graph 4 is cluster of 2 scatter plots from No 18 & 19 demonstrating pictorial correlation of dependent indicator '*Treatment success rate of new smear positive patients*' with its correlated 2 independent indicators. Both independent indicators expressed positive correlation with more steepness of fitting line in case of independent indicator 'Treatment success rate among smear positive previously treated cases in %'.

Table 3 describes the regression equation model of correlated dependent and independent indicators. Table 5 shows the values of constant, coefficient and probability found out on regression analysis. Table 5 also shows the agreement score (r) between observed and estimated values of dependent indicator by regression equation for randomly selected values of independent indicator. Regression equation of 13 indicators showed agreement score from 0.49 to 0.95 between observed and estimated values of dependent indicators with given independent indicators. Remaining 6 indicators showed agreement score below 0.49 and up to 0.04.

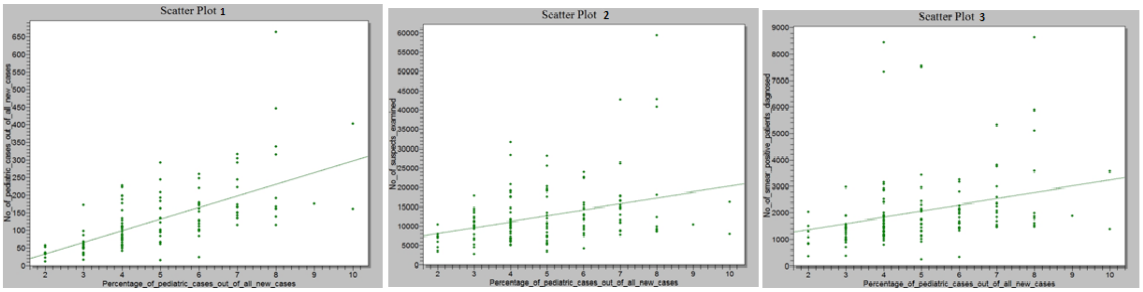
Table 1: Year wise Pearson's Product-moment coefficient of linear correlation (r) of correlated indicators.

Dependent Indicators	Independent Indicators	Pearson's Product-moment coefficient of linear correlation (r) in years				
		Year 2011	Year 2012	Year 2013	Year 2014	Years 2011-2014
% of paediatric cases out of all new cases	Annual New Extra pulmonary case notification rate	0.56	0.40	0.19	0.38	0.13
	No. Of paediatric cases out of all new cases	0.62	0.66	0.54	0.63	0.62**
	No of suspects examined	0.29	0.35	0.28	0.53	0.33**
	No of smear positive patients diagnosed	0.32	0.25	0.21	0.52	0.28*
Annual new smear positive case notification rate	Suspects examined per smear positive case diagnosed	- 0.60	- 0.67	- 0.68	- 0.67	-0.68**
	Annual smear positive case detection rate	0.75	0.73	0.68	0.72	0.73**
	Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop]	0.97	0.97	0.94	0.97	0.96**
	Annual total case notification rate	0.91	0.87	0.86	0.89	0.89**
	Annual new smear negative case notification rate	0.52	0.58	0.59	0.67	0.61**
	Annual previously treated case notification rate	0.76	0.74	0.52	0.50	0.65**
	Annual previously treated smear positive case notification rate	0.79	0.79	0.60	0.50	0.25*
	% of cases (all forms of TB) registered receiving DOT through community volunteer	0.50	0.46	0.29	0.45	0.33**
	No of all smear positive cases started DOTS within 7 days of diagnosis	0.26	0.42	0.42	0.51	0.42**
	No of all smear positive cases registered within 1 month of starting DOTS treatment	0.26	0.45	0.43	0.53	0.43**
3 month conversion rate of new smear positive patients in %	Treatment success rate of new smear positive patients	0.51	0.01	0.50	0.44	0.30**
	No of all smear positive cases registered within one month of starting DOTS treatment	0.17	0.30	0.50	0.45	0.36**
	No of all cured smear positive cases having end of treatment follow up sputum done within 7 days of last dose	0.21	0.32	0.54	0.38	0.36**
	3 month conversion rate of retreatment patients in %	0.45	0.45	0.30	0.62	0.45**
	% of all smear positive cases registered within 1 month of starting DOTS treatment	0.18	-0.02	0.25	0.75	0.25*
Treatment success rate of new smear positive patients	3 month conversion rate of new smear positive patients in %	0.51	0.01	0.50	0.44	0.30**
	Treatment success rate among smear positive previously treated cases in %	0.59	0.90	0.53	0.59	0.72**

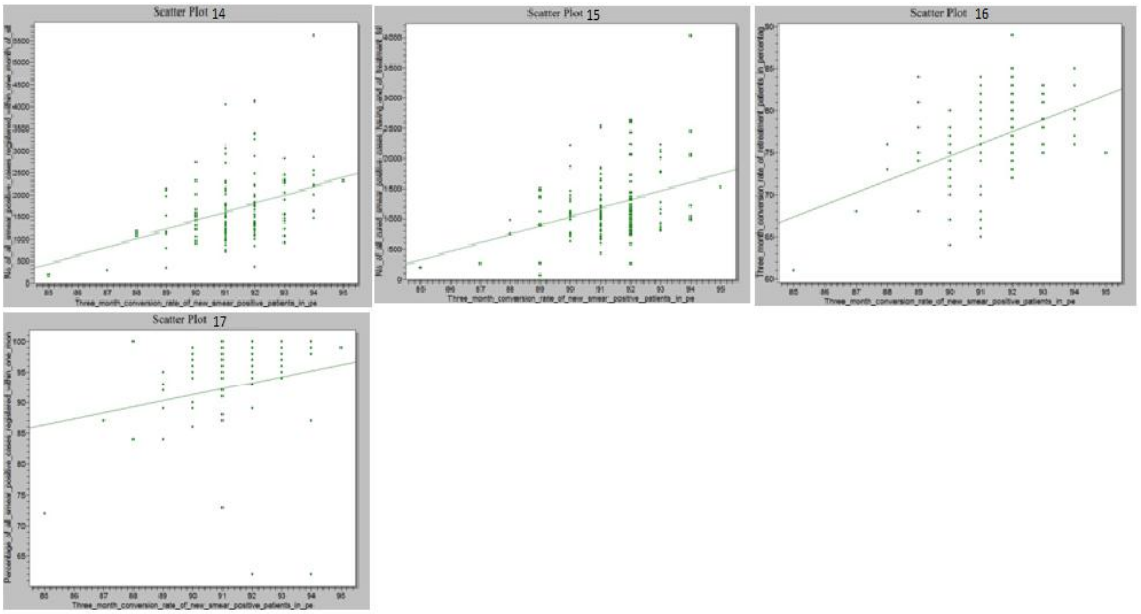
*p value <0.01; **p value <0.001

Table 2: Year wise Co-efficient of determination (r^2) of correlated indicators.

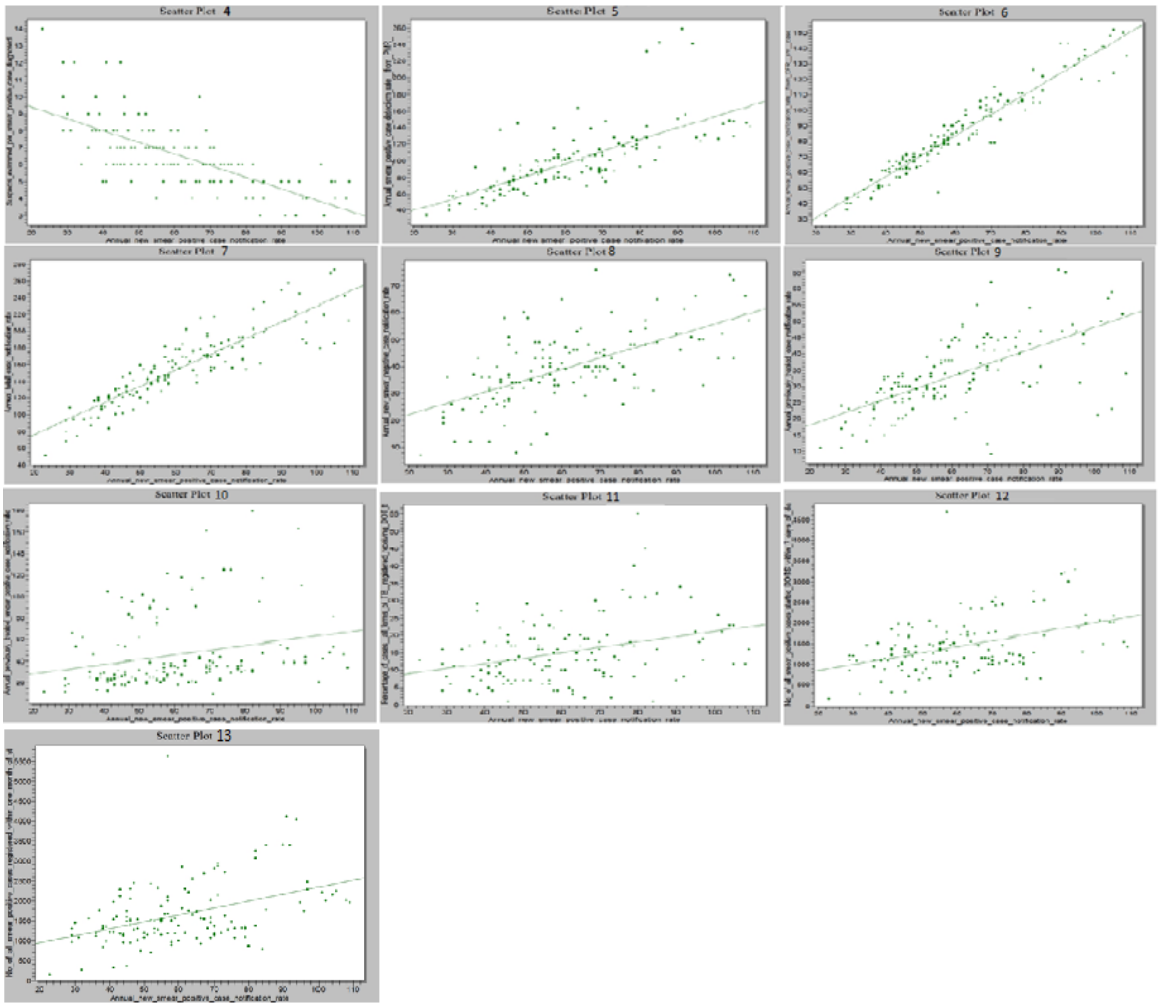
Dependent Indicators	Independent Indicators	Co-efficient of determination (r^2) in years				
		Year 2011	Year 2012	Year 2013	Year 2014	Years 2011-2014
% of paediatric cases out of all new cases	Annual New Extra pulmonary case notification rate	0.32	0.16	0.03	0.14	0.01
	No. Of paediatric cases out of all new cases	0.39	0.43	0.29	0.39	0.39
	No of suspects examined	0.08	0.12	0.08	0.28	0.11
	No of smear positive patients diagnosed	0.10	0.06	0.04	0.27	0.08
Annual new smear positive case notification rate	Suspects examined per smear positive case diagnosed	0.36	0.45	0.47	0.45	0.46
	Annual smear positive case detection rate	0.57	0.53	0.46	0.52	0.53
	Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop]	0.94	0.94	0.88	0.94	0.92
	Annual total case notification rate	0.82	0.77	0.75	0.80	0.79
	Annual new smear negative case notification rate	0.27	0.33	0.35	0.45	0.37
	Annual previously treated case notification rate	0.59	0.55	0.27	0.25	0.42
	Annual previously treated smear positive case notification rate	0.63	0.62	0.36	0.25	0.06
	% of cases (all forms of TB) registered receiving DOT through community volunteer	0.25	0.21	0.08	0.20	0.11
	No of all smear positive cases started DOTS within 7 days of diagnosis	0.07	0.18	0.18	0.26	0.18
	No of all smear positive cases registered within 1 month of starting DOTS treatment	0.06	0.20	0.18	0.28	0.18
3 month conversion rate of new smear positive patients in %	Treatment success rate of new smear positive patients	0.26	0.00	0.25	0.19	0.09
	No of all smear positive cases registered within one month of starting DOTS treatment	0.03	0.09	0.25	0.20	0.13
	No of all cured smear positive cases having end of treatment follow up sputum done within 7 days of last dose	0.04	0.10	0.29	0.14	0.13
	3 month conversion rate of retreatment patients in %	0.21	0.20	0.09	0.39	0.20
	% of all smear positive cases registered within 1 month of starting DOTS treatment	0.03	0.00	0.06	0.56	0.06
Treatment success rate of new smear positive patients	3 month conversion rate of new smear positive patients in %	0.26	0.00	0.25	0.19	0.09
	Treatment success rate among smear positive previously treated cases in %	0.35	0.82	0.28	0.35	0.52



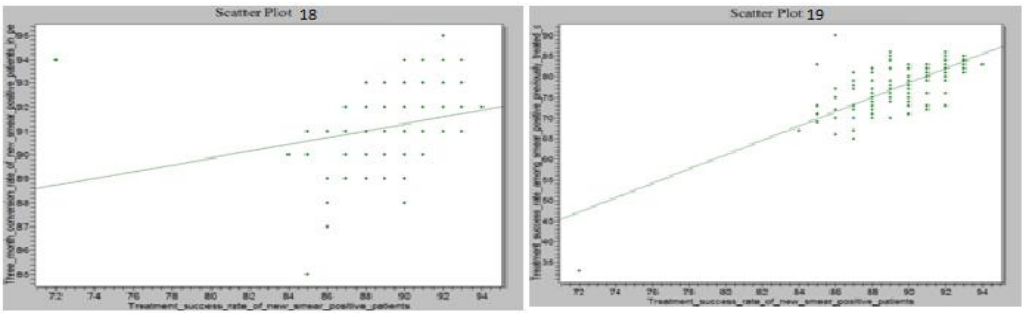
Graph 1: Scatter diagrams of dependent variable *'% of paediatric cases out of all new cases'* with its predictors.



Graph 2: Scatter plots of dependent variable '*Annual New smear positive case notification rate*' with its correlated independent indicators.



Graph 3: Scatter plots of dependent indicator '*3 month conversion rate of new smear positive patients in %*' with its correlated independent indicators.



Graph 4: Scatter plots of dependent indicator 'Treatment success rate of new smear positive patients' with its correlated independent indicators.

Table 3: Regression equation modelling of dependent indicators with respect to their correlated independent indicators for pooled years 2011-2014.

Dependent Indicators	Independent Indicators	Regression model			
		Constant	Coefficient	p value	Agreement score (r)
% of paediatric cases out of all new cases	No. Of paediatric cases out of all new cases	3.434	0.012	0.000	0.82
	No of suspects examined	4.072	0.000	0.000	0.62
	No of smear positive patients diagnosed	4.276	0.000	0.000	0.55
Annual new smear positive case notification rate	Suspects examined per smear positive case diagnosed	105.390	-6.796	0.000	0.75
	Annual smear positive case detection rate	24.145	0.375	0.000	0.67
	Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop]	1.632	0.696	0.000	0.95
	Annual total case notification rate	-2.999	0.415	0.000	0.85
	Annual new smear negative case notification rate	24.738	0.916	0.000	0.53
	Annual previously treated case notification rate	23.096	1.130	0.000	0.53
	Annual previously treated smear positive case notification rate	54.069	0.150	0.002	0.55
	% of cases (all forms of TB) registered receiving DOT through community volunteer	50.013	0.726	0.000	0.27
	No of all smear positive cases started DOTS within 7 days of diagnosis	42.538	0.013	0.000	0.62
	No of all smear positive cases registered within 1 month of starting DOTS treatment	42.927	0.011	0.000	0.64
3 month conversion rate of new smear positive patients in %	No of all smear positive cases registered within one month of starting DOTS treatment	90.164	0.001	0.000	0.31
	No of all cured smear positive cases having end of treatment follow up sputum done within 7 days of last dose	90.158	0.001	0.000	0.40
	3 month conversion rate of retreatment patients in %	80.880	0.136	0.000	0.32
	% of all smear positive cases registered within 1 month of starting DOTS treatment	85.376	0.062	0.002	0.49
Treatment success rate of new smear positive patients	3 month conversion rate of new smear positive patients in %	40.391	0.534	0.000	0.04
	Treatment success rate among smear positive previously treated cases in %	65.914	0.302	0.000	0.41

DISCUSSION

The word correlation is used in everyday life to denote some form of association. The degree of linear correlation is measured by a correlation coefficient (Pearson's correlation coefficient) denoted by r. When one variable increases as the other increases the correlation is positive; when one decreases as the other increases or vice-versa it is negative. The strength of the association in absolute values of r, 0-0.19 has been suggested as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderate, 0.6-0.79 as strong and 0.8-1 as very strong correlation. Part of the variation in dependent variable due to the dependence on the independent variable is measured by squared value of correlation coefficient (r).[5]

This study reports that few of the RNTCP indicators which were considered as vital or dependent indicators are well correlated with some of the other RNTCP indicators. Considered all 4 dependent indicators showed correlation of different grades with 19 independent indicators for all pooled years data. Out of these 19 independent indicators, 1 independent indicator i.e. 'suspects examined per smear positive case diagnosed' showed negative correlation with considered dependent indicator i.e. '*Annual new smear positive case notification rate*' in pooled and separate years data. Remaining 18 independent indicators expressed positive correlations with their dependent indicators. '*Annual new smear positive case notification rate*' showed declining trend with the rise in 'Suspects examined per smear positive case diagnosed'. This correlation was found responsible for bringing 46% variation in dependent indicator. Developed regression equation showed 75% score of agreement between observed and estimated values of dependent indicator against the randomly selected values of independent indicator. Correlation only shows an association between two measures A & B. When it is said that A is correlated with B vice versa is also true. Therefore the degree to which *Annual new smear positive case notification rate* is correlated with Suspects examined per smear positive case diagnosed vice versa is equally correlated. It is plausible to say that lower *Annual new smear positive case notification rate* may render the system examining more suspected cases per sputum smear positive case detected. From action point of view one can think examining more suspected cases of tuberculosis per sputum smear positive case diagnosed will increase the *Annual new smear positive case notification rate*, at least initially followed by plateau and decline phase. As in well-known example of association between age and grip strength, initially grip strength increases with rise in age, after certain age there is hardly any change takes place in grip strength. After some years of age grip strength decreases but age kept on rising. Here also to bring down the magnitude of tuberculosis in community in the form of reduced annual new smear positive case notification rate, efforts may be enhanced to examine all suspected cases of tuberculosis.

Dependent indicator *'% of paediatric cases out of all new cases*' showed strong positive correlation with apparently explaining independent indicator 'No. of paediatric cases out of all new cases'. Independent indicator 'No of suspects examined' showed weak correlation. 'No. of paediatric cases out of all new cases' was found responsible for 39% variation in proportion of paediatric cases. The agreement score was 82% between observed and estimated values of percentage of paediatric cases out of all new cases with observed values of No. of paediatric cases. Convincingly if every paediatric case suspected with tuberculosis is examined likely it will result in new paediatric TB case detection. Assumably early detection of paediatric cases will initially increase the proportion of paediatric cases out of all new TB cases followed by declining trend.

Annual new smear positive case notification rate showed strong and very positive correlation with 'Annual smear positive case detection rate; Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop]; Annual total case notification rate; Annual new smear negative case notification rate; and Annual previously treated case notification rate. Out of these, Annual smear positive case notification rate [from CFR: sm+ cases (NSP+Rel+TAD)/pop] was found responsible for 92% variation in *Annual new smear positive case notification rate* for pooled years data. It is reasonable to detect & notify every smear positive TB case; weather it is new, relapse or treatment after default. These correlations are biologically plausible. It is convincing to assume when magnitude of TB is more, every type of cases will be detected.

Third dependent indicator '*3 month conversion rate of new smear positive patients in %*' showed mild to moderate correlation with '% of all smear positive cases registered within 1 month of starting DOTS treatment'; No of all smear positive cases registered within 1 month of starting DOTS treatment; No of all cured smear positive cases having end of treatment follow up sputum done within 7 days of last dose; and 3 month conversion rate of retreatment patients in %. Out of these, 3 month conversion rate of retreatment patients in % indicator expressed maximum 20% variation in '3 month conversion rate of new smear positive patients in %'. Remaining independent indicator showed less than 20% variation in dependent indicator.

Fourth dependent indicator '*Treatment success rate of new smear positive patients*' showed good positive correlation with 'Treatment success rate among smear positive previously treated cases in %' with 52% resulting variation.

CONCLUSION AND RECOMMENDATIONS

This study identified 19 independent indicators correlated with 4 indicators of RNTCP which were considered as dependent or vital indicators from the strategic point of view of programme. *Annual new smear*

positive case notification rate declines with the rise in suspects examined per smear positive case diagnosed. Programme should not leave any efforts unmade for trying to examine all suspected TB cases. Similar analytical studies on the secondary data of RNTCP are required to validate these initial findings from Rajasthan state. Cluster Randomized trial studying effects of enhanced efforts for examining suspected TB cases on annual new smear positive case notification rate will further generate evidence on preventive value of efforts.

LIMITATION OF STUDY

Correlation studies do not prove causation; it only shows some form of association. When two factors A and B are found to be correlated in analysis, it is not sure whether A causes B or B causes A.

CONFLICT OF INTEREST

None declared.

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