

Incidence of Tuberculosis in Jamnagar district of Gujarat & Role of Indigenous drugs to combat the disease

PURVI VYAS * ASHISH K. JAISWAL ** F.D. GHANCHI *** H.M. CHANDOLA ****

Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar.

ABSTRACT : Tuberculosis is mainly affected by poor living condition, malnutrition; shanty housing and overcrowding. These are the main reasons for the spread of the disease which is not only affecting the health of our country, but the economy as well. Estimates of TB prevalence, incidence and mortality in the country are based on an analytical and consultative process that takes into account all information available on case notification, prevalence of infection and disease, proportion of smear positive cases, number of cases treated and untreated, mortality and demography. Women bear the brunt of the disease more than men. They ignore the disease initially fearing its interference in their daily chores. The social stigma of the disease adds to the burden for both men and women. Here the attempt has been made to study the prevalence of Tuberculosis in Jamnagar district from last four years. DOTS which underpins the Stop TB Strategy, was being applied in Jamnagar district in 2005; 19,13685 of the total population of Jamnagar district lived in areas where DOTS had been implemented by public health services. Here data were collected from TB unit which comes under DOTS. Data collection was coordinated with the help of Data entry operator, Statistical analyzer from District Tuberculosis Centre, Jamnagar. Data has been summarized to see the rate of notification, treatment outcome, age group wise distribution of patients and difference between male and female case notification. This study on Gender in Tuberculosis Research constitutes one of the remarkable information about condition of gender difference in Jamnagar district and that is more than twice between male and female notification rate. These findings also incorporated with The WHO Gender and Health Research Series have been developed by the Department of Gender, Women and Health (GWH). Data also reveals more than 90% cure rate of New Smear Positive Pulmonary Tuberculosis after implication of DOTS under RNTCP programme.

Key words : DOTS, RNTCP, notification, chemotherapy, Rasayana Drugs.

INTRODUCTION

"I have no business to live this life if I cannot eradicate this scourge from the mankind." (Robert Koch, delivering a lecture at Berlin University on his discovery of tuberculosis bacilli, 1882).

It has been 125 years since Robert Koch first discovered the tuberculosis bacilli and the world is still fighting hard to control this deadly but easily curable disease. Before the advent of chemotherapy it was considered as "Captain of ship of death" throughout the whole world including both developed as well as underdeveloped countries. THE SCALE of the global tuberculosis epidemic is enormous. About a third of the world's population is infected with Mycobacterium Tuberculosis^{1,2}. It is estimated that two of every five Indians are infected with the TB bacillus. There is a strong chance that of them, at least 10% will develop TB disease during their lifetime. Of the 1.8 million new TB cases

occurring annually, around 0.8 million have sputum positive pulmonary TB. One sputum positive patient can infect 10-15 persons in a year if left untreated. Poorly treated patients can develop drug-resistant and potentially incurable forms of TB. The South-East Asia Region, with 4.97 million TB cases, carries over one-third of the global burden of TB³.

India is an extremely large country with a population of almost 1.2 billion, divided into 30 states and 5 union territories. Health is administered in a decentralized manner at the level of the states and union territories and therefore has divergent public sector health service provision, combined with an equally large and diverse private sector service provision. Socio-demographic and health indices vary from state to state. Policies for TB control activities are formulated at the central level in consultation with other stake holders, with a central TB unit in the Ministry of Health and Family Welfare having overall responsibility for the Revised National TB Control Programme (RNTCP). The social and economic impact of Tuberculosis (TB) which claims lives of more than 4,00,000 people every year is devastating, especially as it affects the economically most productive age group⁴. Approximately 1/4th to 1/3rd of total deaths were resulting from this dreaded disease.

* M.D.(Ayu.), Ph.D. Scholar, Speciality: Kayachikitsa.

** 3rd Year M.D. Scholar, Dept. of TB & Chest Diseases, G.G.Hospital, M.P. Shah Medical College, Jamnagar.

*** Professor & Head of Dept. of TB & Chest Diseases, G.G. Hospital, M.P. Shah Medical College, Jamnagar.

**** Professor of Kayachikitsa & Dean, I.P.G.T & R.A.

This mortality from TB creates orphans and thus subjecting families to severe hardships. The economic drain on societies and families is staggering, often leading to disarray and family disintegration.

The Revised National TB Control Programme is based on passive case finding which aims to diagnose and treat persons with TB symptoms reporting at various health facilities. The perceptions of TB prevailing in the community would influence the health seeking behavior of people in accessing health care facilities for their symptoms. While there is information on the care seeking behavior of chest symptomatic there is dearth of information on community perceptions on TB^{5,6}.

So, here an attempt has been made to study the actual scenario of Tuberculosis in Jamnagar district from 2004 to 2008 (last four years) with following aims & objectives:

- Case notification by type of patients, 2005-2008.
- Treatment outcome of New Smear Positive cases, 2004-2007.
- Age & sex distribution among TB cases.
- Gender issues in tuberculosis control in New smear positive Pulmonary Tuberculosis at Jamnagar.

MATERIAL & METHOD

Data source : Programmatic data on case notifications and treatment outcomes from all four years national TB control programmes has been compiled for analysis of trends and reporting within the annual report on TB control in the Jamnagar district. All quarter wise data were collected from 4 DMC of Jamnagar district. Then year wise percentage of notification was calculated from total of all quarterly figures. Also male:female ratio in number of registered cases was collected and studied to see the gender difference in notification of new smear positive Pulmonary Tuberculosis. Age group wise notification of new Smear pulmonary Tuberculosis were also studied to see which age group is more affected in particular region.

OBSERVATIONS & RESULTS

FIG 1 : CASE NOTIFICATION BY TYPE OF PATIENTS :

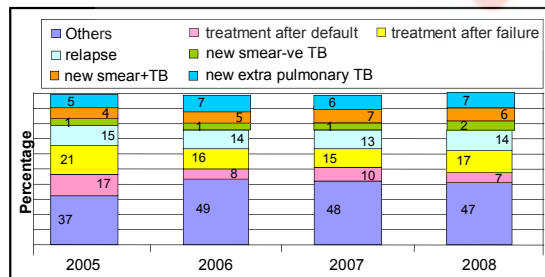
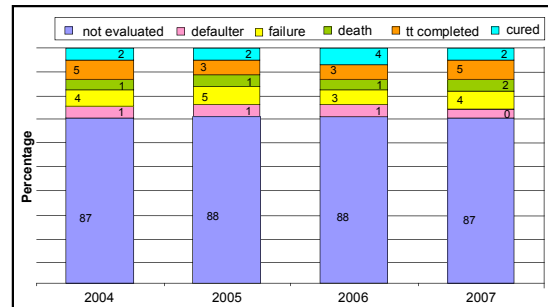


FIG 2 : TREATMENT OUTCOME OF NEW SMEAR POSITIVE PATIENTS :



Age Group wise distribution among TB cases :

FIG 3 : AGE GROUP WISE COMPARISON OF MALE PATIENTS :

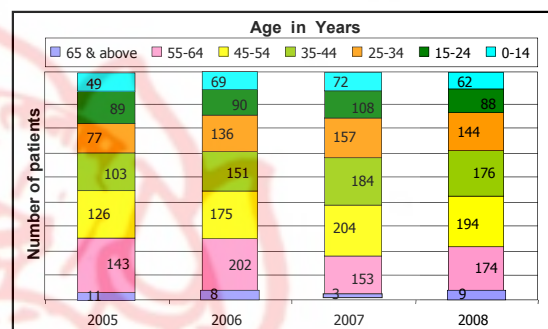


FIG 4 : AGE GROUP WISE COMPARISON OF FEMALE PATIENTS :

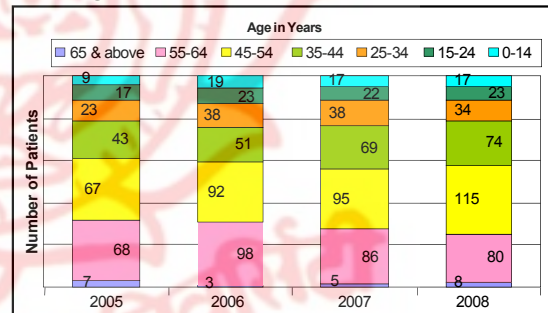


FIG 5-(1) : GENDER DIFFERENCE IN NEW SMEAR POSITIVE PULMONARY TUBERCULOSIS AT JAMNAGAR :

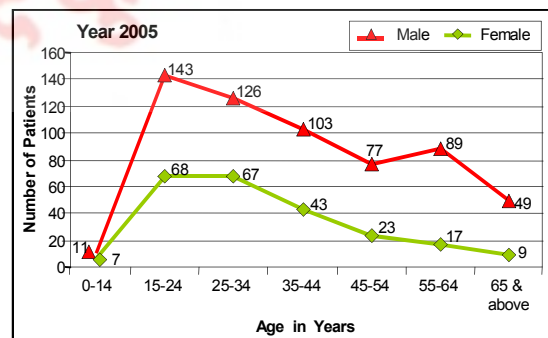


FIG. 5-(2) : YEAR 2006 :

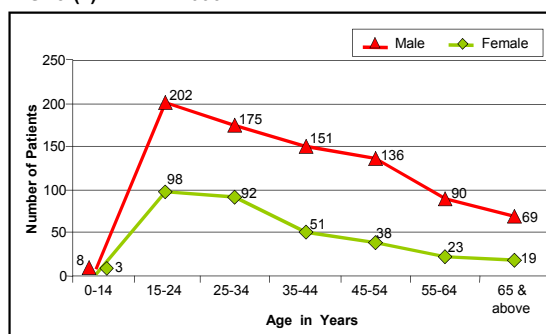


FIG. 5-(3) : YEAR 2007 :

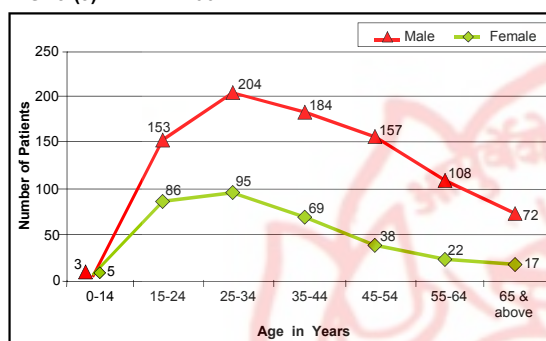
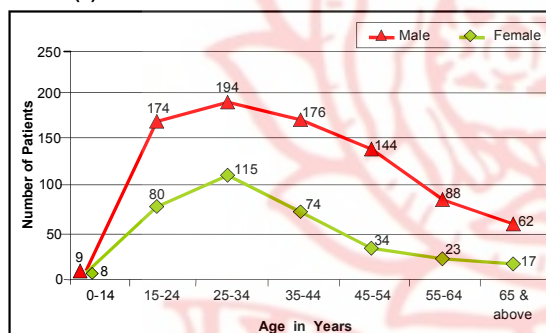


FIG. 5-(4) : YEAR 2008 :



The term “case notification”, as used here, means that TB is diagnosed in a patient and is reported within the national surveillance system, and then to WHO. While the emphasis is on new smear-positive cases, here also present the numbers of all TB cases reported - smear-positive and smear-negative pulmonary cases - in addition to those in whom extra pulmonary disease is diagnosed. The number of cases notified in any year is the sum of new and relapse cases. Case reports that represent a second registration of the same patient/episode (i.e. re-treatment after failure or default) are presented separately. The number of cases notified is usually smaller than the estimated incidence because of incomplete coverage by health services, under-diagnosis, or deficient

recording and reporting. Above column chart shows cases notified by type of TB, in the year 2005 New Smear Positive Pulmonary cases were of 828 cases, or 37% of all cases notified in the region. New Smear-Negative Pulmonary and Extra-Pulmonary cases represented 17% and 21%, respectively, of all notified new cases. Relapse and re-treatment cases, the proportions of relapse and re-treatment cases represent 15% and 4% of all notified cases, respectively. However, the true percentages could be slightly higher, given under reporting by the region. In 2006, New smear positive pulmonary cases were of 1155 cases, or 49% of all cases notified in the region. New smear-negative pulmonary and extra-pulmonary cases represented 8% and 16%, respectively, of all notified new cases, in this particular year. Relapse cases were of 14% followed by 5% of default cases. In 2007, 48% new smear positive cases were notified; new smear negative tuberculosis & extra pulmonary tuberculosis were 257 and 351 or 10% & 15% respectively. In this year relapse rate was of 13% & treatment after default was 7% of total registered patients. The case detection rate is increasing each year and was 47% in 2008; new smear negative and extra pulmonary cases were of 7% and 17% respectively. Here percentage shows 14% and 6% notification under the roof of relapse and treatment after default, in this particular year treatment after failure rate was only of 2%.

Sputum smear-positive cases are the focus of DOTS programme because they are the principal source of infection to others, because sputum smear microscopy is a highly specific (if somewhat insensitive) method of diagnosis and because patients with smear-positive disease typically suffer higher rates of morbidity and mortality than smear negative patients. So, here the treatment outcome of the new smear positive patients has been studied.

Treatment success in DOTS programmes is the percentage of new smear-positive patients who are cured (negative on sputum smear examination), plus the percentage who complete a course of treatment, without bacteriological confirmation of cure. Cure and completion are among the six mutually exclusive treatment outcomes. The sum of cases assigned to these outcomes, plus any additional cases registered but not assigned to an outcome, adds up to 100% of cases registered (i.e. the treatment cohort)⁷. The assessment of treatment outcomes for a given calendar year always lags case notifications by one year, to ensure that all patients registered during that calendar year have completed treatment. The treatment success rates among new smear-positive cases enrolled for treatment during 2004. The overall cure rate in the region for new smear-positive cases was 87% and the

completion rate 4%, for the cases registered in 2004. The case fatality rate among new smear-positive cases was 4%; the re-treatment cases as are the default rates which were also substantially of 5% in the same year. In year 2005 treatment outcome of new smear positive patients shows that 88% cured successfully. The 5% patients had died among all new smear positive registered patients. In this particular year treatment failure rate was only 1% and retreatment rate as defaulter was only 3%. Here in year 2006 the treatment success rate achieved was 88% and the treatment completion rate 1% for the total 1155 cases registered. The success rate among re-treatment cases was substantially lower, 3% only. Similarly, while the case fatality rate among new smear-positive cases was only 3%. The cured rate in year 2007 was 87%. The fatality rate was 4% and failure rate was 2% from all registered cases of new smear positive on particular year.

The Age Group wise comparison of male patients, 2005-2008 are shown in above figure. The age distribution shows a peak in the 15-44 year age groups in all mentioned years. More than 80% of TB patients are between 15 and 54 years age - socially and economically the most active sections of society.

Above figure shows notification of Age Group wise comparison of female patients from 2005-2008. Here picture clearly shows lower notification of patients compare to male patients. In this figure the number of notification of Age Group of 0-14 yrs. were higher than male patients. The age distribution shows a peak in the 15-44 yrs. Age Groups from 2005 to 2008. Female patients were also up to 80% from Age Groups of 15-44 years in all mentioned year.

Both women and men with TB are likely to be in their most productive years, that is, in the age range 15-44 years old⁸. At this age men are typically responsible for earning and supporting their families, whereas women as workers, mothers and caregivers usually have families and children who suffer additionally from their illness and death. Research findings uniformly suggest that prior to adolescence there is little difference between men and women in terms of their TB infection rates. From approximately age 15 yrs. onwards, however, when both biological and social changes associated with adolescence differentiate the sexes more markedly, men begin to overtake women in their rates of infection. Moreover, as they grow older, men have a higher likelihood of progressing from infection to disease⁹.

Gender issues in tuberculosis control in New smear positive Pulmonary Tuberculosis: TB is nevertheless a leading infectious cause of death among

women. In 1998, about three-quarters of a million women died of TB and over 3 million contracted the disease, accounting for about 17 million disability adjusted life years. (DALYs)¹⁰. Higher rates reported for TB in young and early middle-aged women in industrialized settings earlier in the century raise the question of whether under detection of women TB patients in poor countries may be due to various problems of access to care^{11, 12}. A striking finding in India has been greater use of the private medical sector by women in the age group 15-24 years, indicating a tendency to avoid public health services among women of marriageable age¹³. Worldwide, over a billion people live in absolute poverty and seventy percent of these are women¹⁴. Health risks of poverty are far greater for females than for males, of which infectious diseases are a major part¹⁵.

Gender and Tuberculosis Control Varying biological factors between the sexes influence susceptibility and immunity to diseases. Gender roles and relations influence the degree of exposure to infection and access to disease prevention and control resources shared by both sexes, they may have different manifestations or natural histories or differ in the severity of their consequences in women and men:

- ✓ Overall there are twice as many male cases of TB as female cases¹⁶.
- ✓ More smear positive male tuberculosis patients are diagnosed than female¹⁷.
- ✓ TB is the leading cause of deaths among women of reproductive age, accounting for 9% of the deaths worldwide; compared with war 4%, HIV 3% and heart disease 3%^{18,19}.
- ✓ Progression from infection to disease is as much as 130% high in women and case fatality rates are 27-41% higher among girls and young women²⁰.

Despite such disparities in the epidemiology of TB between the two sexes, gender was not an issue in tuberculosis control until recently.

From Figures 5-(1 to 4), it is apparent that there is a little difference in number of cases between males and females in 0-14 yrs. age-group (up to adolescence) and following this, a significant difference between males and females at each age group where males outnumber the females. This similar pattern of age and sex distribution occurred during the period 2005 to 2008. This low detection of female cases remains a troubling public health issue demanding urgent focused studies. The difference between the number of sputum positive cases reported among males and females may be due to biological differences between the disease epidemiology between

the two sexes, an unequal access to health care and health care seeking behavior, differential referral for sputum microscopy by the health care delivery provider, and under-reporting of female cases. These are some of the questions requiring urgent attention as females actually comprise a larger portion of TB cases and if they are not presenting for testing etc., it has major implications in terms of treatment and care for women, and also leaves within the population many 'potential' infectious TB cases capable of infecting non-infected persons. The social consequences of TB are found to be severe for women to the extent of, rejection by husband, rejection by in-laws, reduced chances of marriage^{21, 22, 23}. The course of a disease may be different in women and men because of differential response to illness between men and women; differential societal response, to male and female sickness; and difference in accessing health care. This data tries to illustrate the prevalence of a gender perspective in health in general and Tuberculosis control in particular.

DISCUSSION

The task undertaken deals with a key issue related to national Health Care and also to the priority sector of researches in Ayurveda. Ayurveda is supposed to play a key role in management of various chronic infective and non-infective diseases including Tuberculosis. However this prospect needs to be scientifically and clinically backed up thoroughly for its due inclusion in national Health Care planning. The observation of continuously rising trend of TB at various places in India despite of intensive programs like DOTs and substantial funding from international agencies, says for some inherent drawbacks of planning and also some peculiarities of the disease epidemiology and spectrum.

Tuberculosis is not a simple infective disease which can be treated merely with antibiotics. It has its clear relations to variety of socio-economic factors favoring to its precipitations, non-compliance and spread. Unless these issues are handled appropriately, an effective Tuberculosis control can never be achieved.

Tuberculosis is amongst the priority area of "National Health Programme." The department of AYUSH, Ministry of Health & Family welfare, Government of India has given due importance to this disease which is well comparable to clinical condition described as *Shosha & Rajayakshma* in ancient medical literature - *Ayurveda*. Since time immemorial, the disease Rajayakshma has taken a heavy toll in sufferings of human life. Its impact on civilized and uncivilized human race can be traced even up to pre historic era which is reflected by its notions in the earliest literature i.e. Vedas

and the oldest medical texts. It was termed as Rajayakshma because first of all it had contracted *Chandra*, the King of *Nakshatras*' and also because it is very difficult to treat. Main cause behind the disease is lower immunity and also considering preventive aspect of the disease the medical fraternity is engaged in trying to find a specific cure for the disease in spite of the repeated failure and disappointment but Ayurveda has its complete solution in the form of *Rasayana Drugs* (Rejuvenating Drugs). *Charaka* has prescribed many formulations containing *Rasayana Drugs*. After going through the classics it is found that *Charaka* has used *Pippali* in the maximum formulations i.e. 16 out of 37 given in the treatment of *Rajayakshma* and *Sushruta* has used *Ashwagandha* frequently i.e. in 5 formulations out of 27 in the management of *Shosha*. *Vagabhata* has also depicted use of *Rasayana* in the treatment of *Rajayakshma*^{24,25,26}. *Pippali* has also shown effect on *Mycobacterium tuberculosis*; *Piper longum* has shown the presence of the alkaloids piperine (4-5%) and piperlongumine (m.p. 124-25), and two new liquid alkaloids, one of which is designated as alkaloid A. Alkaloid A showed significant in vitro antitubercular activity against *Mycobacterium tuberculosis* H-37 Rv strains; it inhibited the growth of the bacillus in 20 microg/ml. concentration²⁷. In addition to the resurgence of tuberculosis, another recent concern is the coincident increase in the number of cases of multidrug-resistant tuberculosis (MDR-TB) which is a major problem in tuberculosis treatment and control. Currently, there are very few antitubercular drugs available and relatively old. The percentage of drug-resistant tuberculosis tends to increase. Therefore imperative to develop new antitubercular drugs. Recently, the 1-acetoxychavicol acetate (ACA) which was extracted from the rhizomes of *Alpinia galanga*, the natural herb that commonly used to flavor food in Thailand has been reported to inhibit a non-virulent reference strain of *M. tuberculosis*, H37Ra. Since the further development of ACA as a new antitubercular drug need to know the potential of this compound on several strains of *M. tuberculosis*, especially on the clinical isolates²⁸. Demethoxycurcumin, isolated from the rhizomes of *Curcuma longa*, was found to possess antitubercular activity against *Mycobacterium tuberculosis* H (37) Rv strain at 200 microg/ml. Derivation of this active principle yielded a potent agent 6, exhibiting considerable activity with a minimum inhibitory concentration (MIC) value of 7.8 microg/mL. H (37)Rv: *Mycobacterium tuberculosis* H (37)Rv strain MIC: minimum inhibitory concentration²⁹.

As per one another study Protective effect of *Tinospora cordifolia*, *Phyllanthus emblica* and their

combination against antitubercular drugs induced hepatic damage, is observed. This study investigated the hepatoprotective effect of two Indian medicinal plants *Tinospora cordifolia* (Tc), *Phyllanthus emblica* (Pe), and their combination, in a rat model of isoniazid, rifampicin and pyrazinamide induced hepatic damage. Hepatic damage was assessed using a composite score assigned to histopathological findings of degeneration, necrosis and fibrosis. The antituberculosis treatment (ATT), when given for 90 days, induced significant degeneration and necrosis (score: 7.5; $p < 0.01$ vs vehicle) associated with morphological changes. However, no change was found in the serum bilirubin and liver enzymes. Co-administration of silymarin (positive control, 50 mg/kg) with ATT protected against necrosis (score: 1.5; $p < 0.001$ vs ATT). Tc (100 mg/kg) showed a reduction in liver damage (score: 6.5), which was not statistically significant. On the other hand, Pe (300 mg/kg) prevented the necrotic changes to a significant extent (grade: 100; $p < 0.05$ vs ATT; score: 5.5). Combination of Tc and Pe in their therapeutic doses (1:3) significantly prevented the necrosis (score: 3.5; $p < 0.001$ vs ATT). Similar effects were seen even when the doses were halved and were comparable to the silymarin group. Thus, this study proves the synergistic protective effects exerted by the combination of Tc and Pe when co-administered with ATT³⁰. Total 25 research studies at post graduate level have been carried out on pulmonary tuberculosis (*Rajayakshma*) at M.D. and Ph.D level in different Ayurveda institutes across India³¹. Most of the Thesis title of studies suggest the use of Rasayana drugs as an adjuvant in the management of tuberculosis.

CONCLUSION

Unhygienic living conditions, overcrowding, poverty and intemperance contribute immensely to the dissemination of Pulmonary Tuberculosis even today. Unless these causes are redressed, the nation will be riddled with tuberculosis and all its efforts to cure the disease will be like attempting to bailout water from leaky ship. Morbid process produced in the body by impaired nutrition and metabolism favors the development of pathogenic conditions which ensues the manifestation of pathological conditions. It is man that through his, environment speaks the last word in the causation, the continuation and the cure of Tuberculosis. After 2005 DOTS covers all the maximum area. Notification of all kind of TB patients was increased after 2005. Afterwards it was constant up to 2008. In Jamnagar the gender difference were 2:1 from male : female. The age distribution shows a peak in the 15-44 yrs. age groups. These were the most productive years of life and such a

way it may give economically fall to our country. Progression from infection to active TB faster than men do, but the reported incidence of pulmonary TB among women is nearly always lower than for men. It remains unclear whether and to what extent these differences are a true reflection of disease incidence. The challenge of discovering new, urgently needed anti-TB drugs from natural sources requires a truly interdisciplinary and multidisciplinary research.

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हिन्दी सारांश

गुजरात राज्य के जामनगर जिला में राजयक्ष्मा रोग का सर्वेक्षण एवं इसके नियन्त्रण में भारतीय चिकित्सा की भूमिका का अध्ययन

पूर्वी व्यास, आशिष के. जयस्वाल, एफ. डी. घांची एवं एच. एम. चन्दोला

गुजरात के सौराष्ट्र क्षेत्र में स्थित जामनगर जिला का सन् २००५-०८ में हुआ सर्वेक्षण अध्ययन बताता है कि महिलाओं की अपेक्षा पुरुषों में २ गुना अधिक राजयक्ष्मा रोग पाया गया है। व्याधि क्षमत्व का कम होना, कुपोषण, निर्धनता और साफ-सफाई की कमी इसके मुख्य कारण हैं जिनके कारण यह संक्रमण तेजी से फैल रहा है। साथ ही औषधि को निर्धारित समय तक उचित मात्रा में न लेना भी इस रोग के उन्मूलन में बाधक है। १५ से ४४ वर्ष के आयु समूह में यह रोग बहुतायत से पाया गया है। सरकार के अनेक प्रयासों के बावजूद यह रोग समूल नष्ट नहीं किया जा सका है। अतः यह आवश्यक है कि राष्ट्रीय स्वास्थ्य कार्यक्रम के अन्तर्गत राजयक्ष्मा रोग के समूल उन्मूलन के लिए टी. बी. चिकित्सा में आयुर्वेदिक रसायन औषधियों के सम्मिलित प्रयोग को प्रोत्साहित किया जाए। अनेक वैज्ञानिक अध्ययनों से स्पष्ट हुआ है कि पिप्पली, गुडूची और आमलकी का जब टी. बी. की विशिष्ट औषधियों के साथ प्रयोग किया गया तो यकृत पर आधुनिक टी.बी. औषधियों के विषाक्त प्रभाव में पर्याप्त कमी पायी गई। अतः रसायन औषधियों का कारगर उपयोग राजयक्ष्मा की प्रभावी चिकित्सा में सहायक हो सकता है।

