

ORIGINAL ARTICLE

Process documentation of detection of rheumatic activity via throat swab culture among school children of Tripura in Northeast India

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ABSTRACT

Rheumatic fever/rheumatic heart disease is a significant problem in children and young adults of our nation and hence needs attention on priority basis. This process documentation describes in brief how rheumatic activity (rheumatic fever and/or rheumatic heart disease) detection is being conducted via throat swab culture towards establishment of a RF/RHD registry in Tripura. Tripura is a state in North-East India which borders Bangladesh, Mizoram and Assam. This is a twinning project with PGIMER, Chandigarh. Agartala Govt. Medical College collects samples of throat swabs from school children (5-15 years) and also children coming to OPD/IPD. Agartala Govt. Medical College registers Rheumatic Fever and Rheumatic Heart Disease cases on basis of Jones' criteria and ECHO cardiography respectively and provide secondary prophylaxis to all these cases at its paediatric OPD. There are three sub-registries functioning under AGMC in 3 districts, where cases are registered and secondary prophylaxis are provided. All the throat swab samples are cultured for the identification of Group A Beta haemolytic streptococcus at Dept. of Microbiology, AGMC. Beta haemolytic streptococcus strains are sent to PGIMER, Chandigarh for emm typing. This is supported by preparation and distribution of educational material; leaflets (Bengali) on RF/RHD were distributed to 33 schools. Doctor's guideline modules, leaflets and posters to doctors of sub-registries were distributed. Various survey and study related forms include child record form, school survey form, consent form, registration form, patient card, requisition form, and monthly report form. Total 33 schools have been visited till now. Till date total number of throat swabs collected from schools was 1165.

Key words: Rheumatic fever, Rheumatic registry, School children, Throat swab culture

INTRODUCTION

Group-A β haemolytic Streptococcus (GAS) is an important species of gram-positive extracellular bacterial pathogen responsible for wide range of human infections including pharyngitis, tonsillitis, skin infections (impetigo, erysipelas and cellulitis), sepsis, osteomyelites and fasciitis. GAS is also responsible for non-suppurative sequelae such as acute rheumatic fever/rheumatic heart disease and acute glomerulonephritis. ⁽¹⁾ Carapetis et al. (2005) ⁽²⁾ recently reviewed worldwide population based data to estimate the burden of GAS diseases and

highlighted deficiencies in the available data. They estimated at least 517,000 deaths each year due to severe GAS infections and over 6.16 million GAS pharyngitis cases per year. Incidence of streptococcal pharyngitis has been reported to be 8-18 episodes per week per 1000 children in the age group of 5-15 years in India. Clinical scoring card for diagnosis of Group-A Streptococcal sore throat was developed by Nandi et al. (2002). ⁽³⁾ Shet and Kaplan (2004) ⁽⁴⁾ have also recently addressed the burden of group-A Streptococcal disease in India and discussed treatment options standardized by the World Health Organization.

Initially M protein was exploited for identification by serotyping for the GAS. Besides identification, M protein also plays an important role in pathogenesis. The fibrillar, cell wall anchored M protein confers resistance to uptake by phagocytic cells and is the major virulent antigen of GAS. Recently it has also been reported that M protein is highly rich in unmethylated CpG motifs. Many studies designed to develop a GAS vaccine have focused on the variable amino terminal (Hu et al, 2002)⁽⁵⁾ and conserved carboxyl terminal (Batzloff et al, 2004)⁽⁶⁾ regions of M protein, but due to heterogeneity among the GAS strains and cross reactivity, no vaccine is available and recently the multivalent vaccines are investigated but not much success is obtained in this context as multivalent vaccines provides region specific protection, means protection against emm types prevalent in particular region (Hu et al, 2002).⁽⁵⁾

Dey et al. (2005)⁽⁷⁾ conducted an emm based survey of 59 GAS isolates from a hospital and tried to develop a vaccine based on the N-terminal region of M protein. But not much success was obtained due to the heterogeneity among the M types. But recently Chhatwal et al. (2004)⁽⁸⁾ found that in murine infection model sfbl/CTB neither elicited opsonizing antibodies nor prevent systemic bacterial growth. So, identification of this organism is essential for its prevention and control. An epidemiological survey of RHD was undertaken among school children at Agra and prevalence rate of 5.1/1000 was observed. Maximum no. of cases obtained was from government schools and in middle socio-economic groups. (Mathur and Wahal, 1982).⁽⁹⁾

The regional variations in the same country are also difficult to explain. So the striking fall in incidence of RF/RHD among so called developed countries during last 50 years and the persistently high incidence in developing countries, including regional variations confronted in India needs constant updating of the RF/RHD registries at different centres to have clear picture of this disease prevalence in Indian scenario.

THE STUDY AREA

Tripura is a state in North-East India which borders Bangladesh, Mizoram and Assam. Previously there were 4 districts but since August 2012 there are 8 districts. The field of study includes Sadar, Sepahijala and Gomati Districts. The main registry is at Agartala Govt. Medical College at Sadar District. Sub registries are at Mohanpur Community Health Centres of Sadar District, Bishalgarh Sub-Divisional Hospital of Sepahijala District and Tripura Sundari District Hospital of Gomati District. Total population of Tripura is 36.7 Lakhs. Out of which our study area covers around 8 Lakhs population.

THE PROPOSAL

This project was sanctioned from Nov, 2011 and project work started from April, 2012. This is a twinning project with PGIMER, Chandigarh. Agartala Govt. Medical College (AGMC) collects samples of throat swabs from school children (5-15 years) and also children coming to OPD/IPD. AGMC registers Rheumatic Fever and Rheumatic Heart Disease cases on basis of Jones' criteria and ECHO cardiography respectively and provide secondary prophylaxis to all these cases at its paediatric OPD. To all the admitted cases of Rheumatic Fever and Rheumatic Heart Disease primary prophylaxis is provided at paediatrics ward. There are three sub registries functioning under AGMC in 3 districts, where cases are registered and secondary prophylaxis are provided. All the throat swab samples are cultured for the identification of Group-A Beta haemolytic streptococcus at Dept. of Microbiology, AGMC. Beta haemolytic streptococcus strains are sent to PGIMER, Chandigarh for emm typing.

OBJECTIVES

1. To determine the prevalence of RF/RHD in school children aged 5-15 yrs.
2. To determine the profile of Group-A beta haemolytic streptococcal strains prevalent in school children aged 5-15 yrs.
3. To establish a registry of RF/RHD in Tripura and make sub-registries in other districts.

METHODOLOGY

Registry component

This includes diagnosis of RF/RHD cases in school children and establishment of a main registry of RF/RHD cases at the Dept. of paediatrics, AGMC and three sub-registries at Sadar district (previously west district), Sepahijala and Gomati district (previously South district) Secondary prophylaxis is given on Tuesdays and Saturdays at Children OPD, Dept of Paediatrics, AGMC. ASO test kits, Benzathine Penicillin injections and recording registers are provided to all sub-registries. Training workshops are organized at AGMC and CMO offices for training of healthcare staffs and community awareness. Registrations are done on the basis of Jones' criteria and ECHO cardiography for RF and RHD cases respectively.

Epidemiology component

This includes the enrolment of school children in the age group of 5-15 years for throat swab collection. Throat swabs are collected from both pharyngitis and healthy children group. All these throat swabs are cultured on blood agar plates.



Figure 1 and 2: Throat swab collection and blood pressure measurement at a school in Sadar district, Tripura

PROGRESS

Immediately school health survey was initiated. Total 33 schools were visited. 1165 school children (5-15 years) were examined and throat swabs were collected both from pharyngitis and non-pharyngitis cases. Total cases of pharyngitis were 588 and non-pharyngitis was 577. ASO was done both for suspected rheumatic fever

Suspected samples are sub-cultured for further identification. Gram staining procedure is also done. After identification of single colonies, grouping is done with the help of Streptex kit. As soon as the Group-A Beta haemolytic streptococci are identified, they are sent to the Dept. of Experimental Medicine and Biotechnology, PGIMER Chandigarh for reconfirmation and emm typing.

Utilization, printing of health education materials

Following educational materials were prepared: Leaflets (Bengali) on RF/RHD were distributed to 33 schools. Doctor's guideline modules, leaflets and posters to doctors of sub-registries were distributed.

cases and proved cases from which 19 were positive. From school survey the throat swabs that were collected, after culturing, resulted in 1063 non haemolytic growths and 52 with no growths. 46 cultures resulted in alpha haemolytic and 4 resulted in Group-G. Till date total number of throat swabs collected from schools was 1165.

PREPARATION OF STUDY FORMS

Child Record Form: This form consists of child's name, communicating address, anthropometric measurements, clinical finding. This is used in OPD and IPD cases.

School Survey Form: This form consists of name of school, ID of school, name of child, anthropometric measurements, BP and clinical findings. Any suspected case of RF/RHD child, record form is filled up.

Consent Form: This form consists of description about the disease, procedure of throat swab collection and guardian's consent.

Registration Form: After cases are proved they are registered in this form under category of RF/RHD (6 categories) and given separate registration ids. It consists of lab findings and dates of secondary prophylaxis.

Patient Card: This is similar to registration form which consists of diagnosis and dates of secondary prophylaxis which are handed over to patient.

Requisition Form: All the cases for throat swab culture from schools are entered in it.

Monthly Report: This consists of result of throat swab culture, ASO, number of registered cases, number of injection used and is sent to PGI, Chandigarh every month.

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REFERENCES

1. Bisno AL. Group-A streptococcal infections and acute rheumatic fever. *N Engl J Med.* 1991; 325 (11):783-793.
2. Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal diseases. *Lancet Infect Dis.* 2005; 5(11):685-694.
3. Nandi S, Kumar R, Ray P, Vohra H, Ganguly NK. Clinical score card for diagnosis of group A streptococcal sore throat. *Ind J Pediatr.* 2002; 69(6): 471-475.
4. Shet A, Kaplan E. Addressing the burden of group A streptococcal disease in India. *Ind J Pediatr.* 2004; 71(1): 41-48.
5. Hu MC, Walls MA, Stroop SD, Reddish MA, Beall B, Dale JB. Immunogenicity of a 26-Valent Group A Streptococcal vaccine. *Infect Immun.* 2002; 70(4):2171-2177.
6. Batzloff M, Yan H, Davies M, Hartas J, Good M. Preclinical evaluation of a vaccine based on conserved region of M protein that prevents group A streptococcal infection. *Indian J Med Res* 2004; 119(Suppl):104-107.
7. Dey N, McMillan DJ, Yarwood PJ, Joshi RM, Kumar R, Good MF, Sriprakash KS, Vohra H. High diversity of group A streptococcal emm types in an Indian community: The need to tailor multivalent vaccines. *Clin Infect Dis.* 2005; 40 (1): 46-51.
8. Chhatwal GS, McArthur J, Currie Iii, Sriprakash KS, Talay SR, Chin J, Walker SR. Intranasal vaccination with streptococcal fibronectin binding protein sfb 1 fails to prevent growth and dissemination of *Streptococcus pyogenes* in a murine skin infection model. *Infect Immun.* 2004; 72 (12):7342-7345.
9. Mathur KS, Wahal PK. Epidemiology of rheumatic heart disease - a study of 29,922 school children. *Indian Heart J.* 1982; 34(6):367-371.

STUDY PROTOCOL

Case registration at sub-registry level

Cases are registered at sub-registry. Patient can come to the doctor from either general OPD/referred by health worker or school teacher. On examination, if doctor suspects Acute Rheumatic Fever (on the basis of Jones' criteria) or Rheumatic Heart Disease (auscultation) then the patient is registered.

Rheumatic Fever

- Patient's blood sample is sent for ASO test in the laboratory.
- The patient is registered only if the RF is confirmed, after the report.
- If ECHO required, then the patient will be sent to referral centre.
- After the confirmation, patient is registered and put on secondary prophylaxis.
- Case registration file of the case is filled and retained at sub registry and patient card is given to the patient, to be brought on each fixed injection day.
- Health education is given to the patient.

Rheumatic Heart Disease

- On auscultation, if doctor is sure about RHD then the case is registered.
- If doctor is not sure about the diagnosis, then ECHO is done to referral centre on fixed day.
- After ECHO confirmation, patient is registered and put on secondary prophylaxis.
- Case registration file of the case is filled and retained at sub registry and patient card is given to the patient, to be brought on each fixed injection day.
- Health education is given to the patient.

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