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Risk Factors Associated with Rheumatic Heart Disease: A Case Control Study

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Abstract: ***Patients who have certain risk factors for RHD may be susceptible to disease. Identifying modifiable risk factors may prevent transition of patient from Rhematic Fever to Rheumatic Heart Disease. Conditions such as poor living conditions and overcrowding increase risk of contracting group. A strep. pharyngitis which is responsible for prevalence of RF/RHD in developing countries. Other risk factors like genetic composition, lower age, female gender, History of infection and environmental factors like poor hygiene were identified for developing RHD.***

Keywords: Rheumatic Heart Disease, Rheumatic Fever

1. Introduction

- **Rheumatic heart disease (RHD)** is heart valve damage that arises as a complication of rheumatic fever years after the illness has resolved. It develops as a result of chronic inflammation and scarring of the heart valves triggered by rheumatic fever-an inflammatory autoimmune disease that can develop as a result of strep throat or scarlet fever. [1]
- Rheumatic heart disease, which continues to affect people in their prime and productive age, continue to be a significant contributor of the overall disease burden in India. [2]
- RF patients do not necessarily progress to RHD, however, RHD steadily deteriorates in people who have repeated attacks of RF. [3]
- Patients who have certain risk factors of RHD may be susceptible to the disease. Identifying modifiable risk factors may helps to prevent transition of patient from rheumatic fever to rheumatic heart disease condition [4]
- One of the risk factor as genetic composition, a study highlights that the risk of getting rheumatic fever with an RHD **family history** is nearly five fold higher than if you have no family history of RHD. [5]
- Conditions such as poor living conditions and overcrowding increase risk of contracting group A strep. pharyngitis which is responsible for the high prevalence of RF/ RHD in developing countries. [6]
- Another risk factors such as lower age, female gender, history of infection and environmental factors like poor hygiene also identified for developing RHD. [7]
- In present study comparison of risk factors were made between RHD patients and without RHD (with or without rheumatic fever) patients to determine the factors that may precipitate RHD.

2. Objectives

1) To analyze the socio - demographic distribution of Rheumatic heart disease patients with other patients consulted to the Medicine Department.
2) To ascertain the odds of socio - demographic risk factors exposure among rheumatic heart disease patients compare to patients without rheumatic heart disease.
3) To determine the odds of infection history among rheumatic heart disease patients compare to patients without rheumatic heart disease.

3. Research Methodology

Present case control study was conducted in the Medicine department of Saraswathi institute of medical sciences from **November 2020 to October 2021**.

Definition of case and control
Case - RHD was diagnosed by careful cardiac auscultation and colour Doppler echo cardiography.
Control - patient admitted for other disease and having non - cardiac ailments.

Sample size: Using Epi Info software version 7, based on the odd's ratio of 2.5 of the reference study [8], considering the 95 percent confidence interval and the 80 percent power of the study,

A sample size of 415 was calculated.

By employing the convenience sampling method until the sample size was reached, patients diagnosed with rheumatic heart disease who presented to the Medicine department were included in the study as cases.

A ratio of 1: 3 was used to match cases with controls for each case. Patients who did not have rheumatic heart disease were matched with cases for confounding factors like habits of taking alcohol, smoking, diabetes, and included as controls.

Inclusion criteria:
- Patients fulfill the definition for case and control.
- Patients willing to participate in study.

Exclusion criteria for control:
- Patients with presenting complain of Urinary tract infection.

- Patients with seeking care for upper respiratory tract infection.

Revised Jones criteria (2015) for diagnosis of Rheumatic fever

Carditis	Hyperpyrexia
Arthritis Chorea	Arthralgia, without other signs of inflammation
Erythema marginatum	Laboratory indicators of acute phase: ESR, CRP
Subcutaneous nodules	Prolonged PR interval in ECG

And evidence of antecedent streptococcal infection

- Throat swab culture or rapid antigen test
- Elevated/increasing anti - streptococcal antibody titer in serum (9)

4. Data Analysis & Interpretation

Two - thirds of cases were under 20 years old compared to the control group. It was found that cases were 4 times more likely present among patients with age less than nineteen years compare to their counter age group.

Female gender is more commonly present in RHD group than the control group.

There was no significant difference observed regarding the size of the family among both the groups, however presence of overcrowding is significantly seen among RHD patients group compare to controls.

Table 1: Distribution of the sociodemographic variables in the participants with respect to cases and controls

Sociodemographic variables in the participants

Variables	Cases (n=105)	Controls (n=310)	Odds ratio [CI]
Age			
<19 yrs	70 (66.7%)	108 (34.8%)	3.74* [2.342, 5.974] p < 0.001*
>19 yrs	35 (33.3%)	202 (65.2%)	
Sex			
Female	72 (68.6%)	113 (36.5%)	3.80* [2.371, 6.101] p< 0.001*
Male	33 (31.4%)	197 (63.5%)	
Family - size			
<5	45 (42.9%)	114 (36.8%)	1.28 [0.822, 2.023] p=0.134
≥5	60 (57.1%)	196 (63.2%)	
persons sharing the room			
<3	39 (37.1%)	157 (50.6%)	0.57* [0.366, 0.907] p=0.008*
≥3	66 (62.9%)	153 (49.4%)	

Table 2: Medical history of cases and controls

Sociodemographic variables in the participants			
Variables	Cases (n=105)	Controls (n=310)	Odds ratio [CI]
Family history of RHD			
Present	18 (17.1%)	7 (2.3%)	8.9* [3.62, 22.14] p < 0.001*
Absent	87 (82.9%)	303 (97.7%)	
History of Dental infection			
Present	74 (70.4%)	57 (36.5%)	10.59* [6.38, 17.62] p< 0.001*
Absent	31 (29.6%)	253 (63.5%)	
History of throat infection			
Present	67 (63.8%)	82 (26.5%)	4.90* [3.06, 7.86] p, 0.001*
Absent	38 (36.2%)	228 (73.5%)	
History of >3 episodes of Urinary tract infection			
Present	59 (56.2%)	37 (11.9%)	9.46* [5.65, 15.86] p<0.001*
Absent	46 (43.8%)	273 (88.1%)	

Rheumatic heart disease group is more commonly reported with history infection than the control group.

Positive history of Rheumatic heart disease is 9 times more common in RHD patient than the patients without RHD. The difference in frequency of presence of RHD in family is statistically significant.

There was a huge difference seen in presence of history of dental infection between case (70.4%) and control group (36.5%). Dental infection is 11 times more seen in patients with RHD than their counter group.

Past history of recurrent throat or upper respiratory infection seen time 5 time more common in patients of rheumatic heart disease (63.8%) than the control group (26.5%).

As hygiene is concern for rheumatic heart disease it was also found that urinary tract infection history was 10 time more common in RHD group (56.2%) of patients compare to control group (11.9%).

5. Conclusion & Recommendations

Rheumatic fever/rheumatic heart disease is a disease caused by poverty. As poverty is contributing factor for over - crowding and poor hygiene. Over crowding may precipitate respiratory infection in ill ventilated area as well as poor hygiene condition contribute to poor oral hygiene with tooth infection and recurrent urinary tract infection.

- As a risk factor family history also found significantly associated with RHD which is non modifiable risk factor though prevention of bacterial infection may decrease the triggering risk of developing RHD in such patients.
- Though dental infection, throat infection and urinary tract infection prevalent in general population also not all person with such infection develop RHD, but odds of being presence of such exposure factor in RHD suggest to draw light in such area to improve knowledge of patients regarding such risk factor to prevent conversion of rheumatic fever to rheumatic heart disease in susceptible population.

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