

Evaluation of Knowledge Regarding Rheumatic Fever and Its Prevention among Doctors at a Tertiary Cardiac Care Unit

Salman Ahmed¹, Ghazanfar Ali Shah¹, Tahir Saghir¹, Shehzad Khatt¹, Naveen Roy¹, Romana Awan¹, Syed Abdul Bari¹, Jawaaid Akbar Sial² and Khadijah Abid^{3*}

¹Department of Adult Cardiology, NICVD, Tando Mohammad Khan, Pakistan

²Department of Adult Cardiology, NICVD, Karachi, Pakistan

³Department of Public Health, SZABIST, Karachi, Pakistan

ABSTRACT

Background: Rheumatic heart disease is one of the most frequent types of acquired heart disease, and it is one of the leading causes of morbidity and death. Awareness of doctors regarding rheumatic fever and how to prevent it is important for primary and secondary prevention.

Objective: The study aimed to assess the knowledge of rheumatic fever and its prevention and the association of knowledge with cardiology working experience among local doctors working at a tertiary cardiac care unit.

Methodology: It was a cross-sectional study conducted at the department of cardiology of a national institute of cardiovascular disease and its satellite centers, Karachi, Pakistan from December, 2020 to June 2021. Doctors of age more than 25 years of either gender were included in the study. A self-administered questionnaire, circulated through emails was used to collect data on age, gender, designation, total years of experience, and years of experience in the cardiac unit and 10 questions to assess the knowledge regarding rheumatic fever and its prevention. Based on the correct response, the doctors were categorized as either having adequate knowledge or inadequate knowledge regarding various aspects of rheumatic fever. Data was entered and analyzed using SPSS version 21.

Results: A total of 225 participants were approached, out of which 200 responded and completed the survey with response rate of 88.9%. The mean age of the doctors was 37.40±6.55 years. Most of the participants were males (87.5%). About 82% of the doctors had adequate knowledge about the mechanism of rheumatic fever. A large proportion of participants answered correctly about prophylaxis post-surgery (58%). Doctors with more than 2 years of experience in the cardiology department had better knowledge about the mechanism ($p=0.017$), diagnosis ($p=0.005$), post-surgery prophylaxis ($p=0.005$), duration of secondary prophylactic treatment ($p=0.03$), drug of choice for secondary prophylaxis ($p=0.026$) as compared to doctors with up to 2 years of experience in the cardiology department.

Conclusion: Knowledge regarding the duration of secondary prophylaxis and primary prophylaxis was low among doctors. Years of working experience in the cardiology unit was a significant factor in the knowledge of the mechanism, diagnosis and recurrence of rheumatic fever and it is also associated with duration and drugs of secondary prophylaxis.

Keywords: Awareness, post-exposure prophylaxis, rheumatic fever, rheumatic heart disease prevention.

INTRODUCTION

Rheumatic fever (RF) is a type of autoimmune disease caused by infection with Group-A hemolytic streptococci (GAS) [1]. RF has an impact on a variety of organs, including the skin, joints, bone, and heart [2]. Long-term damage is only identified in the cardiac valves, which can lead to stenosis or regurgitation, resulting in hemodynamic instability. This cardiac condition is known as Rheumatic heart disease (RHD) [2, 3].

RHD is one of the most frequent types of acquired heart disease, and it is one of the leading causes of morbidity and death [3, 4]. The global disease burden of RF in 2005 was estimated to be 471,000 cases, with RHD prevalence ranging from 15.6 million to 19.6 million cases [3, 4]. Every year, RHD claims the lives of

288,348 people in poor and middle-income nations [5]. In Pakistan, the prevalence of RHD has been estimated at 88 million cases, with 500,000 people from rural Pakistan [6].

The optimal management of RHD is a combination of primary group A streptococcal infection treatment, treatment of ongoing underlying inflammation to prevent the development of primary RF, and secondary prophylaxis to prevent subsequent attacks and treatment of residual heart disease if someone develops RF [7, 8]. A single incident of RF does not cause valvular damage, but recurrent episodes can result in valvular damage [3, 7]. With each episode of RF, the valvular damage worsens which leads to heart failure and arrhythmias, necessitating valvular intervention [9].

A study conducted at Khartoum shows awareness of doctors regarding RF and how to prevent it is average when it comes to primary and secondary prevention [10]. Inadequate treatment and subsequent prophylaxis of RF and RHD are caused by a lack of awareness

*Corresponding author: Khadijah Abid, Department of Public Health, SZABIST, Karachi, Pakistan; Email: khadijahabid@gmail.com
Received: January 25, 2022; Revised: September 16, 2022; Accepted: September 23, 2022
DOI: <https://doi.org/10.37184/lnjpc.2707-3521.5.1>

among doctors [10, 11]. Physicians, on the other hand, are thought to be crucial in improving adherence and preventing disease development. Additionally, there is no literature available for Pakistani doctors in this regard. Therefore, we assessed the awareness of pathogenesis, signs, symptoms, pertinent laboratory work-up treatment, and secondary prophylaxis of RF and also the effect of cardiology working experience on knowledge among physicians working in a tertiary cardiac care center in Karachi, Pakistan. This research could aid in the designing of seminars and lectures to improve RF knowledge and promote secondary prophylaxis.

METHODOLOGY

It was a cross-sectional study conducted at the department of cardiology of a national institute of cardiovascular disease and its satellite centers, Karachi, Pakistan from Dec 2020 to Jun 2021. The sample size of 196 was estimated using an online Open Epi sample size calculator by taking frequency of awareness of physicians regarding prevention of RF and RHD as 50% [10], absolute precision as 7% and 95% confidence level. Doctors of various cadres (Assistant professors, post fellows, postgraduate trainees, medical officers and house officers) of age more than 25 years of either gender were included in the study. Doctors who had less than one month of medical training were excluded from the study. Non-probability convenience sampling technique was applied for sample selection.

The study was started after taking approval from the ethical review committee of the hospital (ERC-65/2020). Participants were asked to fill out a consent form online while maintaining confidentiality. The name of the participants was kept confidential. A self-administered and online questionnaire was used to collect data on age, gender, designation, total years of experience, and years of experience in the cardiac unit. The second part of the questionnaire had 8 questions to assess the knowledge regarding RF. Question 1 included 4 sub-questions regarding the mechanism of GAS throat infection. Question 2 included 5 sub-questions regarding clinical/laboratory findings of GAS throat infection. Q3 and 4 both were merged to measure knowledge level for primary prophylaxis. Question 3a included 5 questions regarding treatment (primary prophylaxis) of GAS throat infection. Question 3b was about the prescription drug for GAS throat infection in a patient allergic to penicillin. Question 4 included 5 sub-questions regarding the recurrence of RF. Question 5 included 3 sub-questions regarding secondary prophylaxis like its duration. Question 6 was regarding the frequency of secondary prophylaxis. Question 7 was regarding the site of administration of benzathine penicillin G injection. Question 8 was regarding the drugs for secondary prophylaxis. Every sub-question had responses as true or false/yes or no. Like Answering all the sub-questions correctly was considered as adequate knowledge for that component/question. The questionnaire was designed

by the authors themselves after an extensive literature review [9-14]. The questionnaire was developed on Google docs and distributed through emails. The list of emails was obtained from hospital administration and reminder emails were sent every 7th day for 1 month.

Data was entered and analyzed using Statistical Package for Social Science version 21 (SPSS v.21). The distribution of quantitative data was assessed using Shapiro-Wilk's test. The quantitative data such as age was normally distributed, therefore, presented as mean \pm standard deviation. While the quantitative data such as years of experience in the cardiology department was non-normal therefore, presented as the median with interquartile range (IQR). Frequency and percentages were reported for categorical variables like gender, designation and knowledge items regarding RF and its prevention. Chi-square/Fisher exact test was applied to assess the association between cardiology working experience and knowledge regarding RF and its prevention. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

After inflating the sample size by 15% for non-respondents, a total of 225 participants were approached, out of which 200 responded and completed the survey, yielding a response rate of 88.9%. The mean age of the 200 doctors was 37.40 \pm 6.55 years. Males made up the majority of the participants (n=175, 87.5%). Among the 200 doctors, 137(68.5%) were postgraduate trainees, 28(14%) were consultants, 16(8%) were assistant professors, and 19(9.5%) were junior doctors [*i.e.* 15(7.5%) medical officers and 4(2%) house officers].

Doctors had a median of 5 years of overall work experience (IQR: 4 to 7 years). Out of 200 doctors, more than half of the doctors had up to five years of overall work experience (52%). The median work experience of doctors in the cardiac department was two years (IQR: 1 to 4 years). Out of the total doctors, 97(48.5%) of the

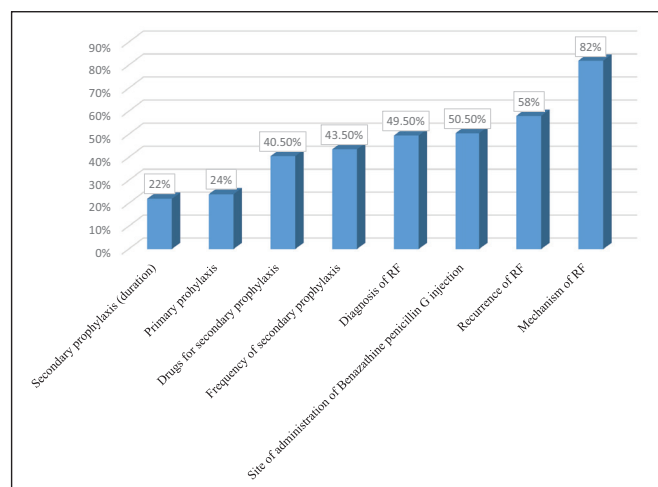


Fig. (1): Frequency distribution of adequate knowledge regarding rheumatic fever and secondary prophylaxis.

Table 1: Stratification of knowledge regarding rheumatic fever and secondary prophylaxis with respect to doctors' cardiology experience.

Question No.	Knowledge Items	Cardiology Experience		p-value
		Up to 2 Years n(%)	More than 2 Years n(%)	
Knowledge about Rheumatic Fever				
1	Mechanism of RF	78 (47.6)	86 (52.4)	0.017
2	Diagnosis of RF	41 (41.4)	58 (58.6)	0.005
3	Primary prophylaxis	30 (62.5)	18 (37.5)	0.080
4	Recurrence of RF	52 (44.8)	64 (55.2)	0.027
Knowledge about Secondary Prophylaxis				
5	Secondary prophylaxis (duration)	29 (65.9)	15 (34.1)	0.030
6	Frequency of secondary prophylaxis	43 (49.4)	44 (50.6)	0.606
7	Site of administration of benzathine penicillin G injection	47 (46.5)	54 (53.5)	0.156
8	Drugs for secondary prophylaxis	34 (42)	47 (58)	0.026

participants had more than 2 years of working cardiology experience and 96(48%) had more than 5 years of experience in the cardiology department. A descriptive analysis of knowledge regarding RF and its prevention is displayed in Fig. (1).

Doctors with more than 2 years of work experience in cardiology departments had significantly higher knowledge of RH mechanism ($p=0.017$), diagnosis ($p=0.005$), and post-surgery prophylaxis ($p=0.027$) than doctors with less than 2 years of work experience in cardiology departments. Furthermore, doctors with more than 2 years of work experience in the cardiology department had substantially higher knowledge of secondary prophylaxis medications ($p=0.026$) than doctors with less than 2 years of work experience in the cardiology department (**Table 1**).

DISCUSSION

RF can occur following a sore throat. It is considered a disease in underprivileged countries, owing to low sanitation, immunity, and other health-related factors [5, 15, 16]. Although the number of individuals with RF and associated problems has reduced in recent years, South Asian countries still have a higher proportion of RF patients than other regions of the world [17, 18]. This problem could be caused by a lack of awareness among doctors and caregivers concerning GAS pharyngitis, RF, and their long-term consequences [10, 13, 14]. Hence, in this study, we assessed the knowledge of Pakistani doctors working at a tertiary care cardiac hospital and its satellite facilities on RF and how to prevent RF.

Although a vast majority of doctors were aware of the mechanism (82%) and 58% of the doctors knew about the recurrence of RF. Furthermore, 49.5% knew about the diagnosis of RF i.e. clinical/laboratory findings of GAS throat infection in RF patients. Osman *et al.* [10] also revealed that the knowledge of doctors regarding RF was average even after a teaching session, thus, needed more effective intervention for improvement. Osman *et al.* [10] also reported a low awareness regarding the diagnosis GAS pharyngitis in their study (38%). The variation in findings might be due to variation in exposure to RHD cases in both countries. While

another study by Danbauchi *et al.* [19] found that 76% of the physicians made the right diagnosis of RHD. These findings are important because primary RF treatment after a GAS pharyngitis episode is critical for reducing the occurrence of RF [17, 20]. As a result, doctors and caregivers must be made more aware of the risks and symptoms of both the preceding streptococcal pharyngitis and RF.

Secondary prophylaxis for RF is proven to be very efficient and cost-effective [20, 21]. In this study, the proportion of doctors with adequate knowledge about the duration of secondary prophylaxis was found to be very low (22%). About 50.5% had correct knowledge regarding the site of administration of the injection. However, there was a general lack of awareness about the drug to be used and the frequency of doses, for which only 40.5% and 43.5% answered correctly. Another study done by Osman GM showed roughly similar results [10]. In the study by Techane *et al.* found that 74.5% of health workers knew about the drug of choice for secondary prophylaxis and 84.7% responded that Benzathine penicillin is the drug of choice for the treatment of sore throat to prevent acute RF [22]. Hence, there is an urgent need to raise awareness through regular lectures and better teaching protocols as secondary prevention plays an important role in overall mortality and morbidity associated with RF.

In the current study, doctors with more than 2 years of experience in a cardiology unit had considerably higher knowledge of the mechanism, clinical findings and recurrence of RF, and drugs for secondary prophylaxis, but knowledge of secondary prophylaxis duration was significantly lower in those who had >2 years' experience than those having up to 2 years experiences (34.1% *versus* 65.9%). This necessitates additional efforts to raise the understanding of these fundamental concepts of RF among junior doctors. However, time spent in the cardiology department was not associated with knowledge of primary RF prophylaxis, frequency of secondary prophylaxis and site of administration of benzathine penicillin G injection. Doctors with shorter experience had lesser awareness this may be because protocols for RF primary and secondary prophylaxis are

not deeply stressed during the undergraduate years. And most of the understanding is developed through on-job training and education.

Our study had a few drawbacks, the first of which was that it only included doctors from a single center. Second, the vast majority of the participants were postgraduate trainees, implying that they would have a higher education than the ordinary general practitioner in our country. Finally, all of the doctors worked in a cardiac care unit, which has a higher rate of RF and RHD, resulting in enhanced exposure and knowledge of the disease among the study participants. Due to the limitations of the study, results cannot be generalized. More research, with a broader and more diverse group of doctors, is needed to gain a better grip on the subject.

CONCLUSION

Knowledge regarding the duration of secondary prophylaxis and primary prophylaxis was low among doctors. Years of working experience in the cardiology unit was a significant factor in the knowledge of the mechanism, diagnosis and recurrence of RF and it is also associated with duration, and drugs of secondary prophylaxis.

ETHICS APPROVAL

The study was started after taking approval from the ethical review committee of the hospital (ERC-65/2020). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki declaration.

CONSENT FOR PUBLICATION

Written informed consent was obtained from all the eligible participants.

AVAILABILITY OF DATA

Data is available from the corresponding author on a reasonable request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

We thank all the doctors at our hospital and satellite centers for participating in the study.

AUTHOR'S CONTRIBUTION

SA, JAS, GAS, TS and SK: Conception or design of the work, Final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. SAB, SK, NR, RA: Drafting

the work or revising it critically for important intellectual content, Final approval of the version to be published. KA: The acquisition, analysis, or interpretation of data for the work, Final approval of the version to be published.

REFERENCES

1. Zühlke LJ, Beaton A, Engel ME, Hugo-Hamman CT, Karthikeyan G, Katzenellenbogen JM, *et al.* Group A Streptococcus, Acute Rheumatic Fever and Rheumatic Heart Disease: Epidemiology and Clinical Considerations. *Curr Treat Options Cardiovasc Med.* 2017;19(2):15. DOI: <https://doi.org/10.1007/s11936-017-0513-y>.
2. Guo Q, Wang Y, Xu D, Nossent J, Pavlos NJ, Xu J. Rheumatoid arthritis: pathological mechanisms and modern pharmacologic therapies. *Bone Res.* 2018;6:15. DOI: <https://doi.org/10.1038/s41413-018-0016-9>.
3. Sika-Paotonu D, Beaton A, Raghu A, Steer A, Carapetis J, Ferretti JJ, *et al.* Acute Rheumatic Fever and Rheumatic Heart Disease. 2017 Mar 10 [Updated 2017 Apr 3]. In: Ferretti JJ, Stevens DL, Fischetti VA, editors. *Streptococcus pyogenes: Basic Biology to Clinical Manifestations* Oklahoma City (OK): University of Oklahoma Health Sciences Center; 2016. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK425394/>.
4. Carapetis JR, Beaton A, Cunningham MW, Guilherme L, Karthikeyan G, Mayosi BM, *et al.* Acute rheumatic fever and rheumatic heart disease. *Nat Rev Dis Primers.* 2016 Jan 14;2:15084. doi: <https://doi.org/10.1038/nrdp.2015.84>.
5. WHO. Rheumatic Heart Disease: World Health Organization; 2021 [cited 2021 19 September]. Available from: <https://www.who.int/news-room/fact-sheets/detail/rheumatic-heart-disease>.
6. Rizvi SF, Khan MA, Kundi A, Marsh DR, Samad A, Pasha O. Status of rheumatic heart disease in rural Pakistan. *Heart.* 2004;90(4):394-9. DOI: <https://doi.org/10.1136/hrt.2003.025981>.
7. Barik R. Secondary prophylaxis to control rheumatic heart disease in developing countries: Put into a cage if can't be killed. *Indian Heart J.* 2018;70(6):907-10. DOI: <https://doi.org/10.1016/j.ihj.2018.01.001>.
8. Watkins DA, Beaton AZ, Carapetis JR, Karthikeyan G, Mayosi BM, Wyber R, *et al.* Rheumatic Heart Disease Worldwide: JACC Scientific Expert Panel. *J Am Coll Cardiol.* 2018;72(12):1397-416. DOI: <https://doi.org/10.1016/j.jacc.2018.06.063>.
9. Chamberlain-Salaun J, Mills J, Kevat PM, Rémond MGW, Maguire GP. Sharing success – understanding barriers and enablers to secondary prophylaxis delivery for rheumatic fever and rheumatic heart disease. *BMC Cardiovasc Disord.* 2016;16(1):166. DOI: <https://doi.org/10.1016/j.jacc.2018.06.063>.
10. Osman GM, Abdelrahman SM, Ali SK. Evaluation of physicians' knowledge about prevention of rheumatic fever and rheumatic heart disease before and after a teaching session. *Sudan J Paediatr.* 2015;15(2):37-42.
11. Mekonen KK, Yismaw MB, Abiye AA, Tadesse TA. Adherence to Benzathine Penicillin G Secondary Prophylaxis and Its Determinants in Patients with Rheumatic Heart Disease at a Cardiac Center of an Ethiopian Tertiary Care Teaching Hospital. *Patient Prefer Adherence.* 2020;14:343-352. DOI: <https://doi.org/10.2147/PPA.S238423>.
12. Maria MR. Awareness of rheumatic heart disease prevention among primary health care providers and people aged nine years and above in Kinondoni municipality Dar es salaam, Tanzania: Muhimbili University of Health and Allied Sciences; 2011.
13. Mougrabi MM, Aljuaid RS, Alrabie AD, Althumali NK, Alkhalidi LH, Alotaibi WD. Awareness of rheumatic fever and rheumatic heart disease among the population in taif, Saudi Arabia 2020. *J Family Med Prim Care.* 2021;10(8): 3056-63. DOI: https://doi.org/10.4103/jfmpc.jfmpc_2550_20.
14. Zühlke LJ, Engel ME. The Importance of Awareness and Education in Prevention and Control of RHD. *Glob Heart* 2013;8(3):235-9. DOI: <https://doi.org/10.1016/j.ghheart.2013.08.009>.

15. Baker MG, Gurney J, Oliver J, Moreland NJ, Williamson DA, Pierse N, *et al*. Risk Factors for Acute Rheumatic Fever: Literature Review and Protocol for a Case-Control Study in New Zealand. *Int J Environ Res Public Health*. 2019;16(22):4515. DOI: <https://doi.org/10.3390/ijerph16224515>
16. Almadhi AA, Alshammri MR, Altamimi NO, Hadal SA, Al Madhi AA, Salahie MS. Rheumatic Fever and Rheumatic Heart Disease-Related Knowledge, Attitude, and Practice in Saudi Arabia. *Cureus*. 2021;13(11):e19997. DOI: <https://doi.org/10.7759/cureus.19997>.
17. Kumar RK, Tandon R. Rheumatic fever & rheumatic heart disease: the last 50 years. *Indian J Med Res*. 2013;137(4):643-58.
18. Islam AKMM, Majumder AAS. Rheumatic fever and rheumatic heart disease in Bangladesh: A review. *Indian Heart J*. 2016;68(1): 88-98. DOI: <https://doi.org/10.1016/j.ihj.2015.07.039>.
19. Danbauchi S, Alhassan M, David S, Wammanda R, Oyati I. Spectrum of rheumatic heart disease in Zaria, Northern Nigeria. *Ann Afr Med* 2004;3(1):17-21.
20. Robertson KA, Volmink JA, Mayosi BM. Antibiotics for the primary prevention of acute rheumatic fever: a meta-analysis. *BMC Cardiovasc Disord*. 2005;5(1):11. DOI: <https://doi.org/10.1186/1471-2261-5-11>
21. Hajar R. Rheumatic Fever and Rheumatic Heart Disease a Historical Perspective. *Heart Views*. 2016;17(3):120-6. DOI: <https://doi.org/10.4103/1995-705X.192572>
22. Techane T, Legesse B, Ayalew Y, Hailu A. Rheumatic heart disease knowledge and associated factors among nurses working in cardiac centers at public and private hospitals of Addis Ababa: cross sectional study. *BMC Nurs*. 2022;21(1):130. DOI: <https://doi.org/10.1186/s12912-022-00910-5>