

Awareness of rheumatic fever and rheumatic heart disease among the population in taif, Saudi Arabia 2020

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ABSTRACT

Objective: Studies assessing knowledge about rheumatic fever (RF) and rheumatic heart disease (RHD) are scarce in KSA. The aim of this study was to assess the awareness about ARF and RHD among the population at Taif city, Saudi Arabia. **Methods:** A cross-sectional study was done on 716 of residents of Taif city. A pre-designed questionnaire that collected data about the participants' demographic characters, their history of sore throat and medication used, participants' knowledge about cause and complications of sore throat, its relation to RHD, treatment, primary and secondary prevention of RHD. **Results:** 77% of the participants had a history of sore throat, of them 58.4% took antibiotics as a self-medication. A significant higher prevalence of previous history of sore throat was present among 42-50-year-old females, graduated, and those with an income above 10000 SR. Participants with an age of 18-24 years and graduated, had significantly higher percent of those who knew about: cause and complications of sore throat, sore throat is associated with heart diseases, and if treating sore throat can prevent heart disease. Females had a significantly higher percent of those who knew about: complications of sore throat, being extremely aware of that primary prevention of sore throat by using antibiotics such as penicillin and being extremely aware of secondary prevention of recurrence RF and decrease progression of RHD. **Conclusion:** Raising awareness about ARF and RHD through health education programs is needed.

Keywords: Awareness, fever, heart, population, rheumatic, Taif

Introduction

Acute rheumatic fever (ARF) and its sequels rheumatic heart diseases (RHD) are preventable delayed immune response to infections by Group A streptococcal, and those with an age ranging from 5 to 15 years are at a greater risk.^[1] Incidence

of acute rheumatic fever has declined in the developed world. However, RHD remains a significant cause of cardiovascular disease.^[1] And in 2015 there were 319,400 cases of death from RHD.^[2]

Host immunity and lifestyle like living in crowded or low-income areas are factors that increase the ARF and RHD rate.^[3] In 2018, a study done in Cameroon showed that the awareness level of RHD is low, and the excellent knowledge about RHD was associated with an age below 36 years, level of education and previous hearing about RHD.^[4] Another study showed that

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females were more likely to present with ARF, but less likely to have recurrent attacks.^[5]

It was found that educational intervention can help in raising the awareness about ARF and RHD by 17.6% and 32% respectively.^[6] Schools are a RHD health promotion forum, as they are the most vulnerable population.^[7] A study done in India in 2020 reported that 81% of the participants had poor knowledge about RHD.^[8] In the kingdom of Saudi Arabia (KSA), a study was done in 2011 and showed that there was a significant decline in the frequency of new hospital admissions due to ARF.^[9] Another study done in 2019 showed that levels of knowledge, attitude, and awareness of RF were high when compared with other studies.^[10]

The only study done in Taif city in 2018 to assess the prevalence of RHD and its risk factors among cardiac patients revealed that high knowledge of the disease could significantly reduce the risk of RHD development.^[11] Knowledge of ARF and RHD is still limited in Saudi Arabia, that is why this study aimed to assess the knowledge and awareness about ARF and RHD among the population at Taif city, Saudi Arabia 2020.

Subjects and methods

1. 1. Study design: a descriptive cross-sectional study.
1. 2. Study setting: an electronic online survey was carried out.
1. 3. Study population: the inclusion criteria were all residents of Taif city with an age above 18 years. And the exclusion criteria were all residents younger than that age.
Ethical issues arise here: every single **participant** has the right to refuse or accept the participation in study. a written consent was obtained at the beginning of the online survey.
1. 4. Study instrument: a pre-designed questionnaire designed to collect data about the participants' demographic characters, their past history of sore throat and medication or treatment used and who prescribed it. The questionnaire included items to assess the participants' knowledge about cause and complications of sore throat, its relation to RHD, treatment, primary and secondary prevention of RHD and cause of non-compliance to secondary prevention.

Our questionnaire was adopted from a previous study conducted by Nkoke C *et al.*, 2018.^[4] A standardized methodology was followed in the validation of this questionnaire that included focus group discussion, expert evaluation, pilot study, reliability and validity assessment etc. Three experts in the field of RHD and one biostatistician was involved in the validation of our questionnaire. A pilot study was done on 20 participants and the data obtained was used for reliability and validity analysis. We checked the content validity and face validity of the questionnaire by expert

evaluation and focused group discussion. An exploratory factor analysis was performed to check the construct validity of the questionnaire. Items with correlation coefficient >0.7 were removed. In reliability check, internal consistency was done, but test/retest reliability could not be performed because of paucity of time. A Cronbach's α value >0.7 was considered for the questionnaire to be internally consistent.

1. 5. Ethical considerations: the study was approved by the research ethics committee of Taif university, KSA. Registered at Taif university research Ethical committee between MAY 2020 to MAY 2021 (Application number 41-00176).
1. 6. Data analysis: the SPSS statistical program **version 25** was used for data analysis. Numbers and percentages were used for expressing the qualitative data and the Chi-square (χ^2) test was applied for testing the relationship between variables. A statistical significance was considered with a *P* value of < 0.05 .

Results

In this study, 45.5% of the participants had an age ranging from 18-24 years, 86.7% were females, 86.9% were from Taif city, and 77.5% had a graduate level of education. Of the participants, 53.6% had 4-5 rooms in their house and 45.9% had an income ranging from 1000-5000 SR.

Figure 1 shows that that 77% of the participants (No. =555) had a past history of sore throat. Figure 2 shows that of the participants who had a past history of sore throat (No. =555), 58.4% took antibiotics for treatment and for 45.4% a doctor/health care professional prescribed the medication.

Table 1 shows that a significant higher prevalence of previous history of sore throat was found among participants with an age ranging from 42-50 years (89%), females (79.7%), and those not from Taif city (86.2%), participants with a graduate level of education (79.3%), and those with an income above 10000 SR ($p = <0.05$).

Table 2 shows that 56% of the participants reported that the cause for sore throat is bacteria, 16.9% developed complications for untreated sore throat before, 40.2% know complications develop due to untreated sore throat 36.5% said that sore throat can be associated with heart diseases, 24.7% thought that treating sore throat prevent heart disease, and 53.5% heard of (RHD).

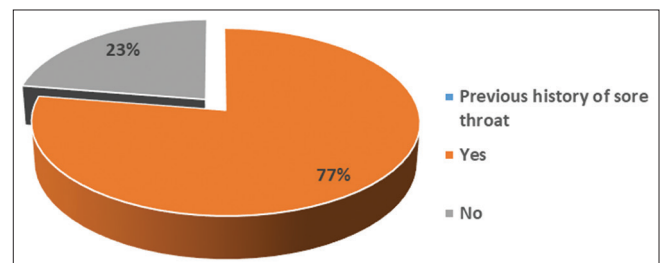


Figure 1: Distribution of the studied participants according to their past history of sore throat (No. = 716)

Table 1: Relationship Between Having a Previous History of Sore Throat and the Participants' Demographic Characters (n=716)

Variable	Had Sore Throat No. (%)	Did Not Have No. (%)	Chi-Squared test	P
Age				
18-24	239 (73.3)	87 (26.7)	14.76	0.01
25-30 years	49 (80.3)	12 (19.7)		
31-35 years	49 (72.1)	19 (27.9)		
36-42 years	82 (79.6)	21 (20.4)		
42-50 years	133 (89)	14 (11)		
More than 50 years	23 (74.2)	8 (25.8)		
Gender				
Male	60 (63.2)	35 (36.8)	12.95	<0.001
Female	495 (79.7)	126 (20.3)		
Region				
From Taif city	474 (76.2)	148 (23.8)	4.65	0.03
Not from Taif	81 (86.2)	13 (13.8)		
Education				
Primary school	6 (46.2)	7 (53.8)	9.91	0.01
Secondary school	85 (72.6)	32 (27.4)		
Graduate level	440 (79.3)	115 (20.7)		
Post graduate level	24 (77.4)	7 (22.6)		
How many rooms are there in your house?				
2-3	48 (67.6)	23 (32.4)	4.44	0.1
4-5	302 (78.6)	82 (21.4)		
6 or more	205 (78.5)	56 (21.5)		
Income				
1000-5000 SR	232 (70.5)	97 (29.5)	18.55	<0.001
5000-10000 SR	103 (79.8)	26 (20.2)		
Above 10000 SR	220 (85.3)	38 (14.7)		

Only 5.5% and 5.2% were very aware and extremely aware about medical or surgical treatment options for RHD, respectively, 19.2% were extremely aware that primary prevention is by using antibiotics, 25.3% and 11.6% were very aware and extremely aware of the secondary prevention respectively [Table 3].

Table 4 shows that participants with an age ranging from 18-24 years had a significantly higher percent of those who knew about the: cause and complications of sore throat, sore throat is associated with heart diseases, and if treating sore throat can prevent heart disease. In the same time the same age group, gender and educational level had a significantly higher percent of those who heard of (RHD), were extremely aware of any medical or surgical treatment options for RHD, were extremely aware of that primary prevention and secondary prevention ($p = <0.05$).

Table 5 shows that female participants had a significantly higher percent of those who knew about: complications of sore throat, hearing of (RHD), being extremely aware of that primary prevention and secondary prevention ($p = <0.05$) ($p = >0.05$).

Table 6 shows that participants with a graduate level of education were a significantly higher percent of those who knew about: cause and complications of sore throat, if sore throat is associated with heart diseases, and those who heard of (RHD) ($p = >0.05$).

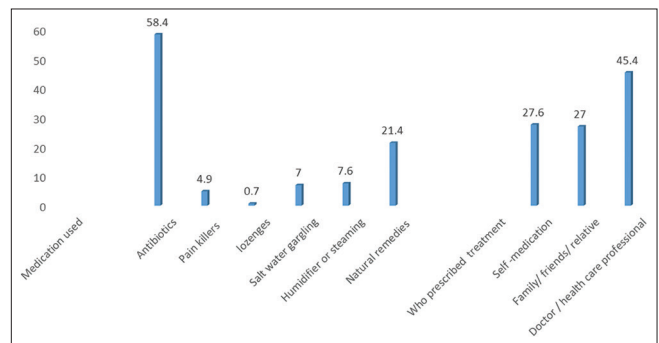


Figure 2: Distribution of the participants with a past history of sore throat according to medication or treatment used and who prescribed it (No. = 555)

Discussion

In the present study, 23% of the participants had a past history of sore throat, which is lesser than that seen in a study done in Cameroon (71.1%).^[4] More than half of the participants of this study (58.4%) reported taking antibiotics for treatment as self-medication prescription for sore throats. This figure is higher than that reported in a previous study (45.5%).^[4] This result agrees with previous studies which found that Self-medication prescription with antibiotics is highly prevalent among Saudi community.^[12-14]

In this study, females had a significant higher prevalence of a history of sore throat compared to male participants. Similar

Table 2: Response of the Studied Participants to Cause, Complications Sore Throat and Its Relation to RHD

Variable	n (%)
According to you what is the cause or reason for sore throat?	
Bacteria	401 (56)
Family Heredity/genetics	7 (1)
Other causes	106 (14.8)
I don't know	202 (28.2)
Had you developed any complications for untreated sore throat anytime	
Yes	121 (16.9)
No	475 (66.3)
I don't Remember	120 (16.8)
Do you know any complications that could develop due to untreated sore throat?	
Yes	288 (40.2)
No	428 (59.8)
Can sore throat be associated with any heart diseases?	
Yes	261 (36.5)
No	202 (28.2)
I don't know	253 (35.3)
Do you think treating sore throat prevent heart disease?	
Yes	177 (24.7)
No	194 (27.1)
I don't know	345 (48.2)
Have you heard of rheumatic heart disease (RHD)?	
Yes	383 (53.5)
No	333 (46.5)
Do you suffer from RHD?	
Yes	7 (1)
No	621 (86.7)
I don't know	88 (12.3)

result was recorded in a study done in Zambia.^[15] About the impact of sex on outcomes after management there were studies showed a female predominance for RHD and female sex as a predictor of poor outcomes.^[16]

Of the participants in the present study, prevalence of sore throat was 77%. This prevalence is somewhat in agreement with the study done in Cameroon where the prevalence was 71.1%.^[4] Recent research using echocardiography have shown that school children have a high prevalence of RHD.^[17]

A significant higher prevalence of previous history of sore throat was present among participants with an age ranging from 42-50 years in the present study. this is in contrast with the previous study results,^[4] where most of cases were below the age of 35.

More than 80 percent of ARF were found to occur in societies with low and middle incomes^[18] What was found among participants in this study is that those with an income above 10000 SR had a significant higher prevalence of previous history of sore throat. This study showed that (53.5%) of the respondents heard about rheumatic heart disease. Higher

figures were present in previous studies. Of these studies is that done in Cameroon (82%).^[4] More than half (56%) of the participants of this study believed that the cause of sore throat is bacteria. This is a better result compared to the previous study,^[4] where 73% of their respondents did not know the causes of sore throat.

Of our participants, 40.2% said that they know about complications that could develop due to untreated sore throat, while 29% of the Cameroon study were aware of any complications. This difference gives us a good impact about our community's knowledge and understanding of the consequences of sore throat. Only 36% (36.5%) of the participants of the present study said that sore throat can be associated with heart diseases. Nearby results were obtained from a previous study,^[4] where 30% know that sore throat could be associated with heart disease.

This study shows that only 5.5% and 5.2% were very aware and extremely aware about the medical or surgical management options for RHD, respectively. In contrast a study done in Iran reported that 86% of the participants had good knowledge about RHD management.^[19] About 41.7% were not at all aware that primary prevention of sore throat can be using antibiotics such as Penicillin, compared to 66% of the participants in Iran study who had poor to moderate knowledge about primary prevention.^[19] In addition, 50.2% of our participants were not at all aware of the secondary prevention of recurrent rheumatic fever and the importance of decreasing progression of RHD. A similar result was found in a study done on a Jamaica community which revealed that 80% of the participants had low knowledge about RF and secondary prophylaxis.^[20] Only 35.1% of our participants had non-compliance to secondary prevention, where the reason was feeling healthy. This finding agrees with a previous study done in Fiji which showed that 46% of the participants had non-compliance to secondary prevention, where the most common reasons for missing injections were feeling well and healthy.^[21]

This work showed that participants with an age ranging from 18-24 years had a significantly higher percent of those who knew about the cause and complications of sore throat. The same age group, gender and educational level had a significantly higher percent of those who heard about RHD. In comparison with a Cameroon study^[4] respondents with an age less than 35 years showed high level of knowledge about RHD. A reason behind their high knowledge, about this age group, could be the web browsing and social media exposure.

This study also found that female participants had a significantly higher percentage of knowledge about the primary prevention of sore throat by using antibiotics such as Penicillin. A similar result was found in the Iranian study.^[19] Females were found to be more interested in the treatment because they try to avoid frequent sore throats among their children.^[22] This work found also that 91.6% of females were more extremely knowledgeable about

Table 3: Awareness of the Studied Participants About Treatment, Primary and Secondary Prevention of RHD and Cause of Non-Compliance to Secondary Prevention

Variable	No. (%)
Are you aware of any medical or surgical treatment options for RHD?	
Not at all aware	77 (10.8)
Slightly aware	0 (0.0)
Moderately aware	560 (78.5)
Very aware	39 (5.5)
Extremely aware	37 (5.2)
Are you aware of that primary prevention of sore throat by using antibiotics such as penicillin?	
Not at all aware	298 (41.7)
Slightly aware	0 (0.0)
Moderately aware	280 (39.2)
Very aware	0 (0.0)
Extremely aware	137 (19.2)
Are you aware of secondary prevention of recurrence rheumatic fever and decrease progression of rheumatic heart disease?	
Not at all aware	359 (50.2)
Slightly aware	0 (0.0)
Moderately aware	92 (12.9)
Very aware	181 (25.3)
Extremely aware	83 (11.6)
If you are not compline in for secondary prevention of recurrence rheumatic fever, what is the reason for that?	
Fear of pain of injection	0 (0.0)
Fear of reaction of medicine used (anaphylaxis)	54 (7.5)
I don't believe in secondary prevention	8 (1.1)
I feel healthy	253 (35.1)
Other reasons	237 (33.1)
More than one reason	164 (22.9)

the secondary prevention of recurrence of RF and decreased RHD's progression, and 91.3% of females were knowledgeable about complications. While fewer mothers had a good level of knowledge about other aspects of treatment in Iran community.^[19]

In our study the participants with a graduate level of education were a significantly higher percent of those who knew about the cause and complications of sore throat if sore throat is associated with heart diseases, and those who heard about it. Our outcomes are comparable to those concluded by the Cameron study.^[4] In contrast, a study done in India reported that there were generalized lack of awareness of RHD in this region, irrespective of their educational status.^[8] These finding shows us the importance of education level in understanding the disease.

In agreement with this result is that observed in another study, showed one of the major contributors to the burden of RHD is lack of education.^[10,23,24]

Limitations

Being a study done through an online survey necessitates conducting future studies including a larger and more representative sample of the Saudi community.

Conclusion

In this study, participants with an age ranging from 18-24 years and with a graduate level of education were a significantly higher

percent of those who knew about the: cause and complications of sore throat, sore throat is associated with heart diseases, and treating sore throat can prevent heart disease. Female participants had a significantly higher percent of those who knew about the: complications of sore throat, hearing of (RHD), being extremely aware of primary prevention of sore throat by using antibiotics, and secondary prevention of recurrence RF and decrease progression of RHD. The study found an urgent need to raise the awareness about RF/RHD and sore throat and its complication among Saudi community.

A major cause of cardiovascular disease appears to be RHD. Awareness in the community should also be raised because we noticed a low level of awareness about the cause and how to handle the sore throat. 58% of our participants use antibiotics and are not prescribed by a doctor. and 59% do not know about the complication of sore throat. and 35% of them don not know if the sore throat associated with heart disease or not. 78% not at all aware about of any medical or surgical option for RHD. Also, 41% not at all aware about the primary prevention. 12% of them moderately aware about the secondary prevention of RF.

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Table 4: Relationship Between Awareness of the Studied Participants and Their Age

Variable	n (%)						Chi-squared test	P
	1	2*	3*	4*	5*	6*		
Cause of sore throat								
Bacteria	211 (52.6)	33 (8.2)	28 (7)	52 (13)	62 (15.5)	15 (3.7)	31.03	0.009
Family Heredity/genetics	2 (28.6)	0 (0.0)	2 (28.6)	1 (14.3)	2 (28.6)	0 (0.0)		
Other causes	41 (38.7)	14 (13.2)	10 (9.4)	14 (13.2)	20 (18.9)	7 (6.6)		
I don't know	72 (35.6)	14 (2.9)	28 (13.9)	36 (17.8)	43 (21.3)	9 (4.5)		
Know complications of untreated sore throat								
Yes	151 (52.4)	20 (6.9)	23 (8)	25 (8.7)	60 (20.8)	9 (3.1)	22.71	<0.001
No	175 (40.9)	41 (9.6)	45 (10.5)	78 (18.2)	67 (15.7)	22 (5.1)		
Sore throat associated with heart diseases								
Yes	37 (52.5)	18 (6.9)	23 (8.8)	36 (13.8)	36 (13.8)	11 (4.2)	28.32	0.002
No	94 (46.5)	23 (11.4)	24 (11.9)	29 (14.4)	29 (14.4)	3 (1.5)		
I don't know	95 (37.5)	20 (7.9)	21 (8.3)	38 (15)	62 (24.5)	17 (6.7)		
Treating sore throat prevent heart disease								
Yes	95 (53.7)	10 (5.6)	14 (7.9)	21 (11.9)	26 (14.7)	11 (6.2)	23.79	0.008
No	90 (46.4)	21 (10.8)	17 (8.8)	37 (19.1)	26 (13.4)	3 (1.5)		
I don't know	141 (40.9)	30 (8.7)	37 (10.7)	45 (13)	75 (21.7)	17 (4.9)		
Hearing of (RHD)								
Yes	169 (44.1)	27 (7)	34 (8.9)	45 (11.7)	90 (23.5)	18 (4.7)	22.42	<0.001
No	157 (47.1)	34 (10.2)	34 (10.2)	58 (17.4)	37 (11.1)	13 (3.9)		
Aware of any medical or surgical treatment options for RHD?								
Not at all aware	40 (51.9)	7 (9.1)	8 (10.4)	7 (9.1)	4 (18.2)	1 (1.3)	33.55	0.004
Moderately aware	241 (43)	46 (8.2)	51 (9.1)	85 (15.2)	109 (19.5)	28 (5)		
Very aware	16 (41)	5 (12.8)	7 (17.9)	8 (20.5)	1 (2.6)	2 (5.1)		
Extremely aware	29 (78.4)	2 (5.4)	2 (5.4)	1 (2.7)	3 (8.1)	0 (0.0)		
Aware of that primary prevention of sore throat by using antibiotics such as penicillin?								
Not at all aware	128 (43)	25 (8.4)	29 (9.7)	57 (19.1)	48 (16.1)	11 (3.7)	27.14	0.002
Moderately aware	116 (41.4)	23 (8.2)	25 (8.9)	37 (13.2)	63 (22.5)	16 (5.7)		
Extremely aware	81 (59.1)	13 (9.5)	14 (10.2)	9 (6.6)	16 (11.7)	4 (2.9)		
Aware of secondary prevention of recurrence RF and decrease progression of RHD?								
Not at all aware	152 (42.3)	34 (9.5)	33 (9.2)	62 (17.3)	62 (17.3)	16 (4.5)	25.19	0.04
Moderately aware	50 (54.3)	5 (5.4)	8 (8.7)	11 (12)	13 (14.1)	5 (5.4)		
Very aware	71 (39.2)	17 (9.4)	19 (10.5)	23 (12.7)	41 (22.7)	5 (5.4)		
Extremely aware	52 (62.7)	5 (6)	8 (9.6)	7 (8.4)	11 (13.3)	10 (5.5)		

*(P value < 0.05). N.B: 1=age from 18-24 years, 2=age from 25-30 years, 3=age from 31-35 years, 4=age from 36-42 years, 5=age from 42-50 years, 6=More than 50 years

Table 5: Relationship Between Awareness of the Studied Participants and Their Gender

Variable	Male No. (%)	Female No. (%)	Chi-squared test	P
Cause of sore throat				
Bacteria	63 (15.7)	338 (34.3)	5.48	0.13
Family Heredity/genetics	0 (0.0)	7 (100)		
Other causes	12 (11.3)	94 (88.7)		
I don't know	20 (9.9)	182 (90.1)		
Know complications of untreated sore throat				
Yes	25 (8.7)	263 (91.3)	8.81	0.003
No	70 (16.4)	358 (83.6)		
Sore throat associated with heart diseases				
Yes	28 (10.7)	233 (89.3)	4.85	0.08
No	24 (11.9)	178 (88.1)		
I don't know	43 (17)	210 (83)		
Treating sore throat prevent heart disease				
Yes	21 (11.7)	156 (88.1)	1.9	0.38
No	22 (11.3)	172 (88.7)		
I don't know	52 (15.1)	293 (84.9)		

Contd...

Table 5: Contd...

Variable	Male No. (%)	Female No. (%)	Chi-squared test	P
Hearing of (RHD)				
Yes	40 (10.4)	343 (89.6)	5.7	0.01
No	55 (18.5)	278 (83.5)		
Aware of any medical or surgical treatment options for RHD?				
Not at all aware	14 (18.2)	83 (81.8)	2.2	0.53
Moderately aware	72 (12.9)	488 (78.1)		
Very aware	4 (10.3)	35 (89.7)		
Extremely aware	4 (10.8)	33 (89.2)		
Aware of that primary prevention of sore throat by using antibiotics such as penicillin?				
Not at all aware	53 (17.8)	245 (82.2)	9.65	0.008
Moderately aware	27 (9.6)	253 (90.4)		
Extremely aware	14 (10.2)	123 (89.8)		
Extremely aware				
Aware of secondary prevention of recurrence RF and decrease progression of RHD?				
Not at all aware	59 (16.4)	300 (83.6)	7.95	0.04
Moderately aware	12 (13)	80 (87)		
Very aware	16 (8.8)	165 (91.2)		
Extremely aware	7 (8.4)	76 (91.6)		

Table 6: Relationship Between Awareness of the Studied Participants and Their Educational Level

Variable	1*	2*	3*	4*	Chi-squared test	P
Cause of sore throat						
Bacteria	2 (0.5)	62 (15.5)	319 (79.6)	18 (4.5)	47.9	<0.001
Family Heredity/genetics	1 (14.3)	0 (0.0)	3 (42.9)	3 (42.9)		
Other causes	1 (0.9)	16 (15.1)	84 (79.2)	5 (4.9)		
I don't know	9 (4.5)	39 (19.1)	149 (73.8)	5 (92.5)		
Know complications of untreated sore throat						
Yes	1 (0.3)	38 (13.2)	236 (81.9)	13 (4.5)	9.89	0.01
No	12 (2.8)	79 (18.5)	319 (74.5)	18 (4.2)		
Sore throat associated with heart diseases						
Yes	1 (0.4)	38 (14.6)	205 (78.5)	17 (6.5)	17.11	0.009
No	5 (2.5)	26 (12.9)	167 (82.7)	4 (2)		
I don't know	7 (2.8)	53 (20.9)	183 (72.6)	10 (4)		
Treating sore throat prevent heart disease						
Yes	2 (1.1)	23 (13)	144 (81.4)	8 (4.5)	9.03	0.17
No	4 (2.1)	24 (12.4)	159 (82)	7 (3.6)		
I don't know	7 (2)	70 (20.3)	252 (73)	16 (4.6)		
Hearing of (RHD)						
Yes	3 (0.8)	68 (17.8)	298 (77.8)	14 (3.7)	6.71	0.08
No	10 (3)	49 (14.7)	257 (77.2)	17 (5.1)		
Aware of any medical or surgical treatment options for RHD?						
Not at all aware	1 (1.3)	8 (10.4)	64 (83.1)	4 (5.2)	12.32	0.19
Moderately aware	12 (2.1)	102 (18.2)	421 (75.2)	25 (4.5)		
Very aware	0 (0.0)	2 (5.1)	35 (89.7)	2 (5.1)		
Extremely aware	0 (0.0)	4 (10.8)	33 (89.2)	0 (0.0)		
Aware of that primary prevention of sore throat by using antibiotics such as penicillin?						
Not at all aware	6 (2)	44 (14.8)	233 (78.2)	15 (5)	5.47	0.48
Moderately aware	6 (2.1)	49 (17.5)	211 (75.4)	14 (5)		
Extremely aware	1 (0.7)	24 (17.5)	110 (80.3)	2 (1.5)		
Extremely aware						
Aware of secondary prevention of recurrence RF and decrease progression of RHD?						
Not at all aware	9 (2.5)	54 (15)	277 (77.2)	19 (5.3)	4.88	0.84
Moderately aware	1 (1.1)	18 (19.6)	71 (77.2)	2 (2.2)		
Very aware	2 (1.1)	31 (17.1)	141 (77.9)	7 (3.9)		
Extremely aware	1 (1.2)	14 (16.9)	65 (78.3)	3 (3.6)		

*(P value < 0.05). N.B: 1=primary school, 2=secondary school, 3=graduate level, 4=post graduate education

Conflicts of interest

There are no conflicts of interest.

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