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Prevalence and Factors Associated with Rheumatic Heart Disease among NCD Patients Attending Butaro District Hospital.

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Abstract:

Background

Rheumatic heart disease (RHD) is the leading cause of acquired heart disease in children and young adults worldwide, with a significant associated problem of morbidity and mortality. Africa has long been considered the region of the world with the highest RHD load and significant load in Rwanda.

Objective

This study aimed to determine prevalance of RHD,and to identify the associated factors that played a role in its development among NCD patients in Butaro District Hospital, Burera District.

Methods

A cross sectional study design was conducted with quantitative approach and 384 patients was collected among NCD patients followed at Butaro district hospital. Simple Random sampling was used to select the study participants. Data was extraction from record and self-administered questionnaire from respondents and analyzed using SPSS version 21.0. Descriptive statistics were using to find prevalence and logistic regression analysis was used to identify the associated factors where P value<0.05 was considered as significant.

Results

The majority (65.1%) of them were aged 35 years and above, about 67.2% of them were female and 63.8% of them were illiterate with a prevalence 36.2% among NCDs patients at BDH. The development of RHD was associated to the factors such as gender [AOR = 2.149, 95% CI: (1.282-3.601)]; being unemployed [AOR = 3.494, 95% CI: (1.702-7.173)], family size [AOR = 7.639, 95% CI: (3.948-14.7783)], water supply [AOR = 36.316, 95% CI: (36.316-266.807)], sleeping area [AOR = 7.746, 95% CI: (3.812-15.741)], brushing teeth after meal and wake up [AOR = 8.885, 95 % CI: (1.094-72.157)]. On the other hand, marital status (separated/divorced) [AOR = 0.096, 95% CI: (0.027-0.338)] had preventive effect on the development of RHD.

Conclusion

The burden of the RHD associated to the factors of poverty and poor hygiene. Good oral hygiene and awareness about the symptoms of RHD are very important aspects to reduce the risk against RHD development.

Introduction

Globally, the prevalence of rheumatic fever (RF) and rheumatic heart disease (RHD) has decreased dramatically; however, in developing countries, RF remains a leading cause of heart disease and, as a result, death in children and young adults [1]. In 2005, it was estimated that over 2.4 million children aged 5-14 years had RHD worldwide, with less developed countries such as Bangladesh accounting for 79% of all cases [2].

The prevalence of RF defined by the revised jones criteria among children aged 5-15 years in rural Bangladesh [3]. These are conservative estimates, particularly if echocardiographic screening is used; actual figures are likely to be much higher. RHD is a huge burden on the health system in resource-limited countries; RF and RHD problems will have to compete for limited resources with other more immediate and urgent health concerns, such as malnutrition, diarrheal diseases, and tuberculosis. If initiatives based on evidence-based practice are implemented in the coming years, the prevalence of RF and RHD will fall significantly in low-income countries as well [4].

Rheumatic heart disease is a preventable but serious public health problem in low and middle-income countries, as well as in marginalized communities in high-income countries, including indigenous peoples. Rheumatic heart disease is thought to affect 30 million people worldwide, and it was estimated in 2015 that it was responsible for 305000 deaths and 11.5 million disability-adjusted years of life lost. Sixty percent of these deaths occurred prematurely (that is, before the age of 70), though these figures are highly uncertain due to incomplete data in countries. Despite the availability of effective prevention and treatment measures, the contribution of rheumatic heart disease to overall global mortality has remained stable between 2000 and 2015. RHD exists in every country on the planet. In 2015, the African, South-East Asian, and Western Pacific regions were the worst affected, accounting for 84% of all prevalent cases and 80% of all estimated deaths due to rheumatic heart disease. India, in the South-East Asia Region, has the highest global prevalence, accounting for approximately 27% of all cases worldwide. The burden of rheumatic heart disease is especially concentrated in China and

indigenous populations living in Australia, New Zealand, and the Pacific Island States in the Western Pacific Region. Rheumatic heart disease persists in some Eastern Mediterranean countries, including Egypt, Sudan, and Yemen. However, because most regions lack good and reliable data, the regional burdens of rheumatic heart disease may be underestimated [5].

Rheumatic heart disease persists in some Eastern Mediterranean countries, including Egypt, Sudan, and Yemen. However, because most regions lack good and reliable data, the regional burdens of rheumatic heart disease may be underestimated. Africa was long thought to be the region of the world with the greatest burden of RHD [6]. It is currently estimated that (RHD) affects approximately 70 million people worldwide, with 1.4 million deaths per year. The vast majority of these reports come from Central Asia and Sub-Saharan Africa [7]. In Uganda, RHD is the most common cause of heart disease in people aged 15 to 49. An inappropriate immune response triggered by an infection with rheumatogenic strains of Group A beta-hemolytic streptococcus is central to the complex pathogenesis of RHD. However, only 3-6% of those infected develop acute rheumatic fever and genetic host susceptibility factors are thought to play a key role in disease development [8].

In Rwanda, no much research conducted on RHD but the one done show the prevalence was 6.8/1000 children examined (95% CI: 4.2/1000–10.9/1000). Seventeen met World heart federation (WHF) criteria for Rheumatic Heart Diseases, 13 fulfilled criteria for ‘borderline’ RHD and four were ‘definite’ RHD. None of these 17 had been previously identified. In its Conclusion, these data indicate a significant burden of RHD in Rwanda and support a need for defined public health RF control programs in children there [9]. At the same time, a retrospective study, in 3 NCDs clinic (Rwinkwavu hospital, Kirehe hospital and Butaro hospital), revealed that the heart failure had a heavy burden from rural population; it was found that RHD was affected 26.8% in general among participants of the study [10].

Rwanda, like most sub-Saharan African countries, has high rates of RHD (>123 000 cases estimated by the Global Burden of Disease Study) and extremely few cardiologists with only four working in the public sector [11]. The above situation has motivated researcher to carry out this study that was aimed on identifying the Prevalence and factors associated with rheumatic heart diseases among NCDs patients attending Butaro District Hospital, Burera District.

Methods

Research Design

A cross-sectional study that has used quantitative research approach to help researcher in gathering data on RHD among NCDs patients at Butaro District Hospital. The concern patient was taken randomly while they were visiting the hospital.

Target population

The target population was NCDs patients referred to Butaro District Hospital. The data was collected in three months July to September,2021. The 95% confidence interval was considered and 50% as prevalence because there is no RHD prevalence from previous study among NCDs patients which known in Rwanda.

Inclusion criteria

All NCDs patient who visited Butaro district hospital from July to September 2021 were included.

Exclusion criteria

Patients without a NCDs-confirmed and unclear indication of information diagnosis at the time of the study were excluded from this analysis.

Sample size

The total required sample size in Butaro District Hospital was calculated using fisher formula:

$$\mathbf{n} = \frac{\mathbf{Z^2 p\,(1-p)}}{\mathbf{d^2}} \qquad z = \frac{(1.96)^2\ 0.5\ (1-0.5)}{(0.05)^2} = 384$$

Where:

n= sample size

P= Prevalence of the condition/health state (50% since the prevalence is unknown)

d=Absolute error precision

z= standard normal variate

Sampling technique

All population participated in the study filled a designed questionnaire after initial training and for children, questionnaires were filled by their parents

On the hand, quantitative data on demographic characteristic such us age, gender, marital status, education, occupation, and living area; and some questions related to the knowledge on the factors of RHD such us having recurrent throat and fever, having join pain. The quantitative data was collected in the period of two months using a structured questionnaire. The whole exercise has been coordinated by the researcher himself and supervised by the assistants (nurses) of the researcher; to minimize the researcher's bias. Copies of the questionnaire was administered by trained research assistants.

Data collection instruments

Data is often used to generate new hypotheses based on the results of data collected about different variables. Participation was voluntary and informed consent was requested for each patient to be involved in the study. The questionnaire attached were informed consent help to record provide information. Researcher assistant reads questionnaire for participants one after another and tick right responses accordingly.

Procedures of data collection

The research instrument was structured and developed to gather information according to the study objective. In gathering quantitative information from respondents (NCDs patients from Butaro District Hospital), the researcher used questionnaires. This research tool contained closed ended questionnaires related to the study objectives and assistants checked the file of the patients before administrating the questionnaire. Research assistants was recruited and trained on the study objective, questionnaire content and how to ensure privacy and confidentiality of study participants. The collected data was checked for incompleteness and inconsistency and cleaned by researcher. All questionnaires and entered data were kept secure by the researcher. Access was restricted to unauthorized person. Name and other private information of participants was not required in the study.

Data analysis

Data were entered in Excel 2013 and exported the SPSS version 21.0 and encoded then verified omission errors. Data analysis was descriptive statistics, percentage and frequency and inferential. Comparison between categorical variables and binary logistic regression analysis was performed for comparing independent variables and dependent variable and $p<0.05$ were considered significant.

Ethical consideration

The data collection was started after authorization of different authorities: the approval letter from Mount Kenya University, approval letter from Butaro district hospital. The researcher informed the respondents that the participation is voluntarily, and they have signed a consent form for confidentiality of data no names could appeared only codes has to be used. For children the consent was signed by their parents. All information about this study must be kept confidentially, this means the privacy and confidentiality are very important components for any research study project to be protected. The participants and respondents 'information have right to be privacy and confidentiality.

Results

The general objective of the study was to determine prevalence and factors associated with rheumatic heart diseases (RHD) among NCD patients attending Butaro District hospital, Burera District. Two specific objectives were deduced from the overall objectives including to determine prevalence of RHD among NCD patients and to identify the associated factors among NCD patients attending Butaro District hospital, Burera District.

The prevalence of RHD among NCD's patients at BDH was represented by figure 1

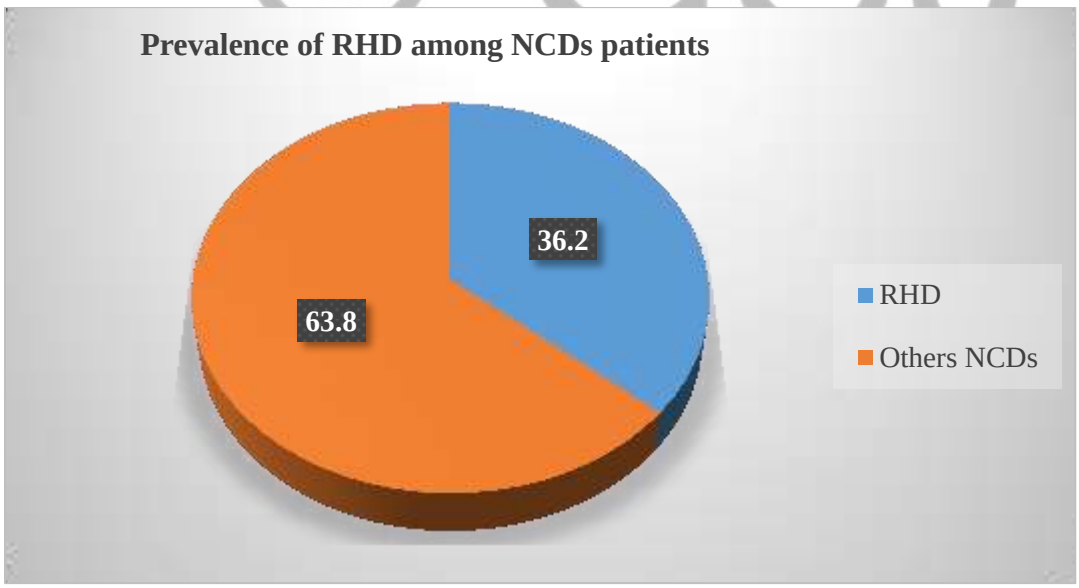

Figure 1. Prevalence of RHD among NCDs patients at BDH.

As shown in figure 1 data recorded revealed that the prevalence of RHD among NCDs patients was 36.2%, and 63.8% for other participants with NCDs.

Association between Socio demographic characteristic and RHD

The table 1 represent the cross-tabulation of association between RHD prevalence and socio-demographic factors. It contains frequency, percentages, chi-square, and P-value

Table 1. Socio-demographic factors of respondents.

Variables		RHD		P value *
	Frequency (%)	**Yes**	**no**	
Age				**<0.001***
5-15	32(8.3)	16(50)	16(50)	
16-25	53(13.8)	31(58.5)	22(41.5)	
26-35	49(12.8)	15(30.6)	34(69.4)	
>35	250(65.1)	77(32.8)	173(69.2)	
Gender				**0.016***
Male	126(32.8)	35(27.8)	91(72.2)	
Female	258(67.2)	104(40.3)	154(59.7)	
Marital status				**<0.001***
Single	89(23.2)	47(52.8)	42(47.2)	
Married	264(68.8)	89(33.7)	175(66.3)	
Separate/Divorce	31(8.1)	3(9.7)	28(90.3)	
Level of education				**0.005***
Primary school	116(30.2)	56(48.3)	60(51.7)	
Secondary or above	23(6.0)	6(26.1)	17(73.9)	
Illiterate	245(63.8)	77(31.4)	168(68.6)	
Father's education				0.689
Primary school	25(6.5)	11(44.0)	14(56.0)	
Secondary or above	5(1.3)	2(40.0)	3(60.0)	
Illiterate	354(92.2)	126(35.6)	228(64.4)	
Mother's education				0.376
Primary school	14(3.9)	3(21.4)	11(78.6)	
Secondary or above	1(0.3)	0(0.0)	1(100)	
Illiterate	369(96.1)	136(36.9)	233(63.1)	
Area of living				**<0.001**
Urban	29(7.6)	0(0.0)	29(100)	
Rural	355(92.4)	139(39.2)	216(60.8)	
Occupation				**<0.001***
Famer	288(75.0)	86(29.9)	202(70.1)	
Professional	16(4.2)	4(25.0)	12(75.0)	
Unemployed	80(20.8)	49(61.3)	31(38.8)	
Father's occupation				0.442

Famer	364(94.8)	130(35.7)	234(64.3)	
Professional	1(0.3)	0(0.0)	1(100)	
Unemployed	19(4.9)	9(47.4)	10(52.6)	
Mother's occupation				0.814
Famer	369(96.1)	134(36.3)	235(63.7)	
Unemployed	15(3.9)	5(33.3)	10(66.7)	
Size of family				**<0.001***
<5	296(77.1)	76 (25.7)	220(74.3)	
>=5	88(22.9)	63(45.3)	25(10.2)	
Person into room				**0.001***
<5	285(74.2)	89(31.2)	196(68.8)	
>=5	99(25.8)	50(50.5)	49(49.5)	
Ubudehe Social class				**0.001***
Ubudehe category 1	136(35.4)	56(41.2)	80(58.8)	
Ubudehe category 2	152(39.4)	64(42.1)	88(57.9)	
Ubudehe category 3	96(25.0)	19(19.8)	77(80.2)	
Water supply				**<0.001***
Supply of surface	58(15.1)	1(1.7)	57(98.8)	
Tubewell/ground water	326(84.9)	138(42.3)	188(63.8)	
Sleeping area				**<0.001***
On bed	114(29.7)	11(9.6)	103(90.4)	
On floor	270(70.3)	128(47.4)	142(52.6)	
Brushing teeth of meal and wake up				**<0.001***
Yes	42(10.9)	1(2.4)	41(97.6)	
No	342(89.1)	138(40.4)	204(59.6)	

Table 1. show that there are various factors examined for association, the study shown a statistical significance between RHD and respondents age (P value <0.001**),** gender (P value 0.016), marital status (P value <0.001), education level (P value 0.005), occupation (P value <0.001), residence area (P value <0.001), family size (P value <0.001), room sharing (P value 0.001), ubudehe category (P value 0.001), water supply (P value <0.001), Sleeping area (P value <0.001), Brushing teeth of meal and wake up (P value <0.001), knowledge of RHD (P value 0.002), Recurrent sore throat with fever (P value <0.001) and having join pain at knees and ankles with fever (P value <0.001).

Table 2 represent the logistic regression of socio-demographic characteristics that became statistically significant (P<0.05) and shows in the previous table 1 and the Adjusted Odds ration were calculated to determine its statistical association with the RHD occurrence.

Table 2: Logistic regression to examine association between RHD occurrence and independent variables.

Variables	AOR	95%CI		P value *
		Lower	**Upper**	
Age				
5-15	**ref**			
16-25	1.997	0.719	5.542	0.184
26-35	1.507	0.401	5.662	0.544
>35	1.083	0.286	4.097	0.906
Gender				
Male	**ref**			
Female	2.149	1.282	3.601	**0.004***
Marital status				
Single	ref			
Married	0.454	0.279	0.740	**0.002***
Separate/Divorce	0.096	0.027	0.338	**<0.001***
Level of education				
Primary school	**ref**			
Secondary or above	0.521	0.155	1.743	0.29
Illiterate	0.573	0.314	1.044	0.069
Occupation				
Famer	**ref**			
Professional	1.282	0.324	5.070	0.459
Unemployed	3.494	1.702	7.173	**<0.001***
Size of family				
<5	**ref**			
>=5	7.639	3.948	14.7783	**<0.001***
Person room				
<3	**ref**			
>=3	0.696	0.364	1.331	0.273
Ubudehe Social class				
Ubudehe category 1	**ref**			
Ubudehe category 2	1.272	0.775	2.088	0.053
Ubudehe category 3	0.573	0.3	1.096	0.233
Water supply				
Surface water	36.316	4.943	266.807	**<0.001**
Tubewell/ground water	**ref**			
Sleeping area				
On bed	**ref**			
On floor	7.746	3.812	15.741	**<0.001***

Brushing teeth of meal and wake up				
Yes	**ref**			
No	8.885	1.094	72.157	**<0.001***

***Statistically significant at P value <0.05; CI=Confidence interval; ref: reference =1**

As shown in the table 4.4 multivariate shows statistical association between the significant increased risk to develop RHD and other factors.

Female were 2.147 more time likely to develop RHD than male (AOR=2.147, 95% CI 1.282-3.601) with the p-value 0.004. Being 5 and more family member were 7.639 more time likely to develop from RHD than being less 5 family members (AOR= 7.639, 95% CI: 3.948-14.7783) with the p-value <0.001. Using the surface waters were 36.316 more time likely to develop RHD than the one who are using water from tube well or ground water (AOR = 36.316, 95% CI: 4.943- 266.807) with the p-value <0.001. Sleeping of the floor were 7.746 more time likely to develop RHD than those who are sleeping on the bed (AOR = 7.746, 95%CI: 3.812–5.741) with the p-value <0.001. Respondent who was not brushed teeth after meal and waked up were 8.885 more time likely to develop RHD than the those who used to brush after meals and wake up, (AOR = 8.885, 95% CI: 1.094-72.157) with the p-value <0.001. Being unemployed were 3.494 more time likely to develop RHD than those who were the farmer (AOR= 3.494, 95% CI: 1.702-7.173) at p-value <0.001. Being separated/divorced with its partner were 0.204 less time likely to develop RHD than those who were single (AOR= 0.204, 95% CI: 0.44-0.936) at p-value 0.041**.**

Discussion

People from low and middle income are the most affected by RHD. It is considered as a common condition in that region of the world. About 33 million people are living with RHD around the world [12].

The finding of this study shows that the prevalence of RHD among NCDs patients attending NCD clinics at Butaro district hospital is 36.2 percent, which was not similar with several studies done by [13] with the prevalence of 8 percent at Taif city, Ethiopian, and by [14] among patients who were referred for the cardiopathy, with the prevalence of 54.8 percent. The finding of this study is slightly similar (34.0 percent) to study reported in hospital admission [15] [16]

This high prevalence at BDH can be explained by the fact that the patients from Burera district and its district surrounded are referred to BDH instead of being referred to the referral hospitals in Kigali. Others reason should be that PIH/IMB with collaboration with the MoH provides a cardiologist for every mouth for consultation and for surgery if necessary. Different studies with

raised prevalence of RHD is because the majority of the participants were selected among NCDs or among cardiovascular disease patients.

The finding showed that there is a significant difference females compared to males, females are more likely to develop the RHD than males. In contrast the study done in Taif city among cardiac patient [13] revealed that there is a no significant difference between females and males. This may be explained by the fact that majority of the participant in the study was females. According to study done in Bangladesh, in many populations, ARF and RHD are more common in females than males [2]. They increased exposure to group A streptococcus because of greater involvement of women in child rearing, or reduced access to preventive medical care for girls and women is unclear.

The finding of this study showed that there is an increased risk of developing RHD among unemployed, in line with this finding, the study done by [7] in Uganda revealed that unemployment status was significantly associated with RHD. This can be explained by the fact that most people living in rural area are in the informal sector, making it difficult to ascertain their actual level of income. Furthermore, in developing countries, income is generally low across the board, and a threshold might not have been reached where difference in social classes leads to a difference in disease risk factors.

The finding of this study showed that the sleeping of the floor was found to be significantly associated with a high risk to develop RHD. In the study done in Aceh province in 2020, revealed factor that worsened the spread of RHD was significantly correlated to the time interacted with the environment [17]. A study in Bangladesh has investigated association of socioeconomic status and nutritional status with the risk of rheumatic fever and RHD [4]. Authors concluded that Rheumatic fever and RHD was significantly associated with low income, poor living conditions and poor nutritional status in terms of low height-for-age [18].

In addition, it has been shown that Acute Rheumatic Fever and RHD are more prevalent in rural and remote areas as well as in urban slums, but this likely reflects other risk factors, such as greater household crowding due to low socioeconomic status or limited access to medical resources. There is also a potential link between insufficient nutrition in childhood and susceptibility to Acute Rheumatic Fever, however, it is unclear whether this occurs because insufficient nutrition can increase susceptibility to developing aggressive autoimmune responses to the S. pyogenes infection, or because poor nutrition is connected to household overcrowding

and other factors associated with poverty that increases susceptibility to S. pyogenes infections [19] [17].

The finding of this study showed that water supplied from the surface was significantly associated with the development of RHD. General poor condition or standard of housing was associated with increased risk of ARF or RHD. Home dampness was associated with ARF. There were no clear trends among other specific housing characteristics and facilities (e.g. electricity, kitchen facilities, light, potable water, sewerage, and ventilation) and Group A Streptococcus (GAS) infection or ARF/RHD [20]. However, in some high-income countries, there are population groups that live in poverty and have high rates of ARF and RHD, including the Indigenous populations of northern and central Australia and New Zealand [21].

The finding of this study showed that no brushing after meal and no brushing at all was appeared significantly associated to with the occurrence of RHD. In contrast with the finding of the study, research done in Kinshasa [22] revealed that brushing habit after meal was not significantly associated with RHD. It is exerted a protective effect against rheumatic fever. The research done by [23] revealed that oral hygiene is essential to decrease the risk of rheumatic fever and RHD occurrence. Poor oral hygiene possibly perpetuates streptococcal infection leading to RF, non-association of oral hygiene practice with RHD risk indicates that the pathogenesis of RHD following RF is probably independent of streptococcal infection.

The study showed that being married or separated/Divorced partner was the protective factors.

Conclusion

Out of 384 respondents, the prevalence of RHD was 36.2%. The occurrence of RHD was associated with gender, size of the family, water supply, sleeping area, regular brushing teeth after meal and wake up. The occurrence of RHD was associated with having recurrent sore throat including fever and having join pain on knees, ankles both with fever.

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Conflict of interest

The authors declare that they have no competing interests.

Author's contributions

CM designed the study, collected data and writes a manuscript. JBM analyzed, interpreted the data. ER and JO supervised the study, contributed to data analysis and manuscript writing. All authors read and approved the final manuscript.

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