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THE RELATIONSHIP BETWEEN SOCIOECONOMIC AND DEMOGRAPHIC FACTORS AND RHEUMATIC HEART DISEASE AT DR. SOETOMO GENERAL HOSPITAL

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ABSTRAK

Penyakit jantung rematik (RHD) menjadi masalah kesehatan masyarakat terutama pada populasi berpenghasilan rendah di negara berkembang. Penelitian ini bertujuan untuk mengkaji hubungan antara faktor demografis dan sosial ekonomi serta kejadian RHD di RSUD Dr. Soetomo Surabaya. Penelitian ini merupakan penelitian analitik dengan pendekatan cross-sectional, pad 284 responden pada tahun 2024. Data primer dikumpulkan melalui kuesioner dan dianalisis menggunakan SPSS. Uji Chi-Square menunjukkan bahwa usia memiliki hubungan yang signifikan dengan RHD (p-0,000< 0,05) terutama pada individu berusia 40-59 tahun. Variabel lain, seperti jenis kelamin, wilayah pemukiman, kepadatan, dan status ekonomi, tidak menunjukkan hubungan yang signifikan. Temuan ini menunjukkan perlunya intervensi kesehatan masyarakat yang ditargetkan pada usia. Penelitian lebih lanjut direkomendasikan dengan sampel yang lebih besar dan klasifikasi terperinci dari tingkat keparahan RHD untuk meningkatkan strategi pencegahan dan manajemen penyakit.

ABSTRACT

The Relationship Between Socioeconomic and Demographic Factors and Rheumatic Heart Disease at Dr. Soetomo General Hospital. Rheumatic heart disease (RHD) is a public health problem, especially among low-income populations in developing countries. This study aims to examine the relationship between demographic and socioeconomic factors and the incidence of RHD at Dr. Soetomo General Hospital, Surabaya. This is an analytic study using a cross-sectional approach, with 284 respondents in 2024. Primary data were collected through questionnaires and analyzed using SPSS. The Chi-Square test revealed a significant relationship between age and RHD (p = 0.000 < 0.005), particularly among individuals aged 40-59 years. Other variables, such as gender, residential area, population density, and economic status, did not show a significant association. These findings underscore the need for targeted public health interventions specifically designed for specific age groups. Further research is recommended, utilizing larger sample sizes and a more detailed classification of RHD severity levels, to enhance prevention and disease management strategies.

INTRODUCTION

Rheumatic heart disease (RHD) is a global health problem that remains prevalent in developing countries and generally affects individuals with low socioeconomic status. Although the global burden of RHD is decreasing, the disease remains endemic in poor regions, with a mortality rate of more than 0.15 per 100,000 children aged 5–9 years[(1)]. South Asia, Sub-Saharan Africa, and Oceania are regions with the highest prevalence, reaching 444 cases per 100,000 people in endemic

countries, compared to only 3.4 cases in non-endemic countries in 2015 [(2)]. RHD is a long-term consequence of acute rheumatic fever (RF), which arises from an autoimmune response to Group A Streptococcus infections such as strep throat or scarlet fever. Although the incidence of RF and RHD has declined over the past 50 years in developed countries, the disease remains an issue in developing nations, with a 2020 WHO report noting that approximately 12 million people worldwide suffer from RF and RHD, with 3 million experiencing heart failure and mortality rates ranging from 1.8 per 100,000 in the Americas to 7.6 per 100,000 in Southeast Asia[(3)]. Rheumatic heart disease is a chronic heart valve disease caused by Group A Beta Hemolyticus Streptococcus (GAS) bacteria.

According to the National Institute of Health Research and Development, Ministry of Health of the Republic of Indonesia (2013), the symptoms typically appear 14 to 28 days after infection. They may include persistent rheumatic fever, joint pain with movement, difficulty breathing, skin rash or nodules over the joints/bones (subcutaneous nodules), symptoms of heart failure, and red spots (erythema)[(4)]. If these symptoms worsen, they can lead to serious health problems such as heart complications and progression to RHD. There is a risk of contracting this bacterium in unhygienic environments. Poor nutrition and a weakened immune system can also contribute to the development of RHD. The Streptococcus bacteria that commonly cause rheumatic heart disease are S. pyogenes, and the most common valve injury resulting from RHD is mitral stenosis (MS), a condition where the mitral valve cannot open properly[(2)]. According to the BPJS Kesehatan report as of December 2024, heart diseases, including rheumatic heart disease (RHD), are recorded as catastrophic diseases with the highest number of cases and financial burden in the National Health Insurance (JKN) program in Indonesia. There were 22,550,047 cases of heart disease throughout 2024, far surpassing the number of stroke (3.89 million) and cancer (4.24 million) cases.

The expenditure for heart disease treatment also reached the highest figure, amounting to Rp 19.25 trillion, compared to stroke (Rp 5.8 trillion) and cancer (Rp 6.48 trillion) [(5)]. This data provides strong evidence that heart disease, including RHD as one form of chronic heart disease, poses a significant burden on the national health financing system. This fact underscores the urgency of conducting studies and formulating public health policies focused on controlling non-communicable diseases (NCDs), particularly by strengthening primary prevention, early detection, and ongoing care for RHD. This is crucial, given the extremely high cost of treatment and its substantial impact on the country's social health insurance system.

Several studies in Indonesia have shown that the incidence of RHD ranges from 0.3 to 0.8 per 1,000 school children[(6)(7)]. Therefore, the incidence of RF in Indonesia is estimated to be higher than this value. Meanwhile, factors such as demographics and socioeconomic status related to RF and RHD play an indirect role in the incidence of these conditions. Population density, nutritional status, housing conditions, environmental conditions, and low awareness of these diseases can influence the occurrence of rheumatic fever or rheumatic heart disease among populations in developing countries. According to Rudiktyo et al., the demographic parameters included in this study are age and gender[(8)].

Additionally, environmental demographic parameters, such as residential areas and housing density, were also taken into consideration. The socioeconomic parameter is the family welfare level, as defined by the National Population and Family Planning Board (BKKBN) [(9)]. Based on this description, this study aims to examine the relationship between socioeconomic demographic factors and rheumatic heart disease at Dr. Soetomo General Hospital, Surabaya, during the research period.

METHODS

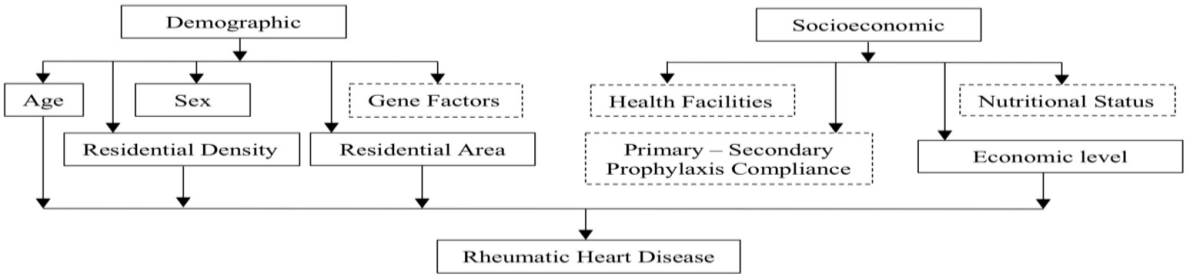
This research is a cross-sectional study that will be analyzed using an analytical and descriptive approach, focusing on the relationship between sociodemographic and economic factors and rheumatic heart disease through primary data from questionnaires and secondary data from

medical records of patients with rheumatic heart disease who have been treated at the Integrated Heart Service Center (PPJT) of Dr. Soetomo General Hospital, Surabaya, from January 2024 to December 2024. The association between demographic and socioeconomic variables and the incidence of rheumatic heart disease (RHD) is tested using Chi-Square analysis to determine whether there are statistically significant differences in proportions.

The five independent variables analyzed include age, gender, residential area, housing density, and economic level. The population of this study consists of all patients treated at the Integrated Heart Service Center (PPJT) of Dr. Soetomo General Hospital, Surabaya, from January 2024 to December 2024. The sample of this research consists of patients who have been treated at the Integrated Heart Service Center (PPJT) of Dr. Soetomo General Hospital, Surabaya, from January 2024 to December 2024 and have complete medical record information, after the researchers obtained an Ethical Feasibility Statement Letter from Dr. Sutomo General Hospital (1142/KEPK/X/2024).

The sample size was determined using purposive sampling, a method in which samples are selected based on specific criteria. In this study, the specific criteria were the availability of complete medical records and questionnaire data. From the total population in 2024, a total of 7,650 RHD and non-RHD patients were identified, and a sample of 284 RHD and non-RHD patients was selected. The consideration for selecting these samples was based on the completeness of data and information from the patients' medical records. Rheumatic heart disease (RHD) is associated with two main factors: demographic and socioeconomic. Demographic factors include age, gender, area of residence, housing density, and genetic factors. Socioeconomic factors include access to healthcare facilities, nutritional status, adherence to primary and secondary prophylaxis, and socioeconomic level. The variables examined by the researchers are age, gender, residential area, housing density, and economic level. Below is the conceptual framework of the research.

Figure 1. Conceptual Framework



RESULTS

3.1 Respondent Description

The following presents descriptive data of respondents based on rheumatic heart disease (RHD) status and demographic and socioeconomic characteristics, including age, gender, residential area, housing density, and economic level. This table provides an overview of the distribution of respondents in the RHD and non-RHD categories, which serves as a preliminary basis for analyzing the relationship between independent variables and RHD incidence.

Table 1. Data of respondents based on rheumatic heart disease (RHD)

No.	Category	Criteria	Amount	Percentage (%)
1.	Age (years old)	< 20	7	2,46
		20-29	54	19,01
		30-39	51	17,96
		40-49	60	21,13
		50-59	64	22,54
		≥ 60	48	16,90
2.	Gender	Male	120	42,25
		Female	164	57,75
3.	Settlement	City	23	8,10
		Village	261	91,90
4.	Population density	> 4	95	33,45
		≤ 4	189	66,55
5.	Economy	Pre-prosperous family	6	2,11
		Prosperous family	278	97,89

Source: Data processing results SPSS, 2025

Based on descriptive data from 284 respondents studied, in terms of age variables, the majority of respondents were in the 30-39 year age group with a total of 54 people (19.01%), followed by the 40-49 year age group with 51 people (17.96%), and the ≥ 60 year age group with 48 people (16.90%). In terms of gender, 261 respondents (91.90%) were female, while 23 (8.10%) were male, indicating that the majority of respondents in this study, whether suffering from RHD or not, were female. Regarding residential areas, the distribution of respondents was relatively even; however, 189 people (66.55%) lived in high-density areas, while 95 people (33.45%) lived in low-density areas. In terms of economic level, the data indicate that most respondents (approximately 97.89%, or 278 people) came from lower-middle-income groups. Only a small proportion (2.11% or 6 people) came from higher economic groups, which suggests that socioeconomic conditions may be a significant risk factor in the prevalence of rheumatic heart disease in the study area. This data reflects the characteristics of the target population and serves as an important basis for testing the hypothesis of relationships between demographic and socioeconomic factors and the incidence of RHD.

3.2 Hypothesis Test Results

Next, the relationship between demographic and socioeconomic variables and the incidence of rheumatic heart disease (RHD) was examined using the Chi-square test to determine whether statistically significant differences existed in the proportions. The five independent variables analyzed included age, gender, residence, residential density, and economic level. Based on the results of the chi-square statistical test on the five independent variables suspected to influence the incidence of rheumatic heart disease (RHD), it was found that age was the most significant and statistically strong variable. The chi-square value of 31.011 indicates a significant difference in the proportion of RHD cases between age groups. The contingency coefficient of 0.314 reinforces this result, showing a medium-strength relationship. Thus, age can be considered the dominant factor closely related to the risk of RHD, and policy interventions should prioritize the most vulnerable age groups, especially those aged 40-59 years, as shown in previous cross-tabulations.

Meanwhile, the gender variable did not show a significant relationship with the incidence of RHD. The very low Chi-Square value of 0.520 and the contingency coefficient of only 0.043 indicate that the proportion of RHD sufferers between men and women is not statistically different. Although descriptively, women show a slightly higher proportion of sufferers, the difference is not strong enough to be concluded as a meaningful relationship. Therefore, gender is not a primary predictive

variable in the context of this disease. The residential area variable showed interesting results, with a chi-square value of 3.832. The contingency coefficient of 0.115 indicates a weak but significant relationship.

Table 2. The Relationship Between Age, Gender, Residential Area, Housing Density, Economic Status, and Heart Disease Patients

Category		Patients with Heart Disease						*p-value*
		RHD		Non RHD		Total		
		n	%	n	%	n	%	
Age (y.0)	< 20	3	2,11	4	1,41	7	2,46	0.000
	20-29	18	6,34	36	12,68	54	19,01	
	30-39	20	7,04	31	10,92	51	17,96	
	40-49	42	14,79	18	6,34	60	21,13	
	50-59	43	15,14	21	7,39	64	22,54	
	≥ 60	16	5,63	32	11,27	48	16,90	
Gender	Male	57	20,07	63	22,18	120	42,25	0.471
	Female	85	29,93	79	27,82	164	57,75	
Settlement	City	16	5,63	7	2,46	23	8,10	0.050
	Village	126	44,37	135	47,54	261	91,90	
Population	> 4	47	16,55	48	16,90	95	33,45	0.900
Density	≤ 4	95	33,45	94	33,10	189	66,55	
Economiy	Pre-prosperous	1	0,35	5	1,76	6	2,11	0.099
	family	141	49,65	137	48,24	278	97,89	
	Prosperous family							

Source: Data processing results SPSS, 2025

Based on the results of the previous Chi-Square test, it was found that age is a statistically significant factor associated with the incidence of rheumatic heart disease (RHD), with a p-value = 0.000. This indicates that the 40–59-year age group has the highest proportion of RHD cases. Meanwhile, the variables of gender (p = 0.471), residential density (p = 0.900), and economic level (p = 0.099) did not show significant associations, even though descriptively, most patients came from the lower economic group. The variable of settlement area yielded a p-value = 0.050, which is at the threshold of significance, indicating that people living in rural areas tend to experience RHD more often than those in urban areas. These findings underscore the importance of age as the main predictor of RHD, as well as the need to pay attention to geographic context in efforts to prevent and intervene in heart disease within the community. The findings also reflect that both urban and rural living environments have the potential to influence the incidence of RHD. In particular, the higher proportion of RHD sufferers in rural areas suggests that environmental factors such as access to healthcare services, sanitation, and lifestyle may play a role in increasing the risk of RHD. Therefore, the area of residence should be considered as a variable in the planning of area-based RHD prevention programs. Meanwhile, the residential density variable did not show a significant relationship with the incidence of RHD, with a very low Chi-Square value of 0.016 and a significance value of 0.900. The contingency coefficient of 0.007 confirms that the relationship between the number of residents in a house and the incidence of RHD is very weak and insignificant. Although housing density is often associated with the risk of infectious diseases and poor sanitation, in the context of rheumatic heart disease, these results suggest that this factor does not significantly contribute to variations in the disease's incidence in the studied population. Finally, the economic level variable also did not show a statistically significant association with the occurrence of RHD. Although the Chi-Square value of 2.724 is slightly higher than that of residential density, the significance value remains above the threshold, namely 0.099 (p > 0.05), and the contingency coefficient of 0.097 shows a weak

relationship. This may be due to the dominance of respondents from the lower-middle economic group, resulting in insufficient data variability.

DISCUSSION

Based on the results of the Chi-Square statistical test on five independent variables suspected to influence the incidence of rheumatic heart disease (RHD), it was found that age is the variable with the most significant and statistically strong association. The statistical analysis yielded a Chi-Square value of 31.011 with a significance level of p = 0.000, as well as a contingency coefficient of 0.314, indicating a moderate strength of association. Descriptive data show that the 40–59-year age group has the highest proportion of RHD sufferers. This finding indicates that although RHD is commonly considered a long-term consequence of childhood rheumatic fever, its impact is significant during the productive age. In line with this, the study by Rahmawaty et al. noted that the transition from childhood to adulthood is a crucial phase in the development of RHD[(10)]. Globally, studies by Carapetis et al. and Zühlke & Steer emphasize that complications such as heart failure and premature death due to RHD commonly occur in young adults in developing countries[(11)]. In Indonesia, Setyonaluri and Flora highlight that age is a significant factor influencing disease patterns, including chronic illnesses such as RHD[(12)]. Therefore, public health policy approaches must involve cross-age strategies as suggested by Watkins et al. and Remenyi et al., who underscore the importance of access to prophylaxis, early detection, and ongoing interventions among adult age groups[(13)(14)].

On the other hand, the gender variable did not show a significant association with RHD incidence. The chi-square value of 0.520 and p = 0.471, along with a contingency coefficient of 0.043, confirm the absence of a meaningful difference in proportions between men and women. Although descriptively more women suffer from RHD, this proportion is not statistically significant, most likely due to the unequal distribution of respondents, where men represent only 8.1%. Research by Ghani, Susilawati, and Novriani indicates that gender differences have a greater impact on the type of coronary heart disease than on RHD[(15)]. The study by Marijon et al. links the higher incidence of RHD among women in developing countries more to social barriers, limited access to health services, and the burden of domestic work, rather than solely to biological predisposition [(16)].

Meanwhile, the research by Zühlke & Steer also confirms that cultural and social factors more influence differences in RHD incidence between genders than direct medical factors[(17)]. According to Mutagaywa, when it comes to outcomes after Percutaneous Balloon Mitral Valvuloplasty (PBMV), there are conflicting results for men and women, with some studies finding that female gender is a predictor of poor outcomes. In contrast, others find no significant difference[(18)]. According to Mutagaywa, women are more susceptible to rheumatic heart disease as a result of menopause, which leads to decreased estrogen levels. As a result, cardiac defenses become weaker, making women more vulnerable to bacterial infections such as Group A Streptococcus, which can cause rheumatic fever and rheumatic heart disease.

Furthermore, analysis of the residential area variable reveals a trend towards a near-significant relationship with the occurrence of RHD (Chi-square = 3.832, p = 0.050, contingency coefficient = 0.115). Although in absolute terms, more cases of RHD are found in urban areas, the prevalence is proportionally higher among residents of rural areas. This reflects a disparity in access to healthcare services between urban and rural areas. Research by Tarani and Kautsar revealed that rural populations face limitations in access to medical services, low health literacy, and delays in diagnosis, all of which can exacerbate initial streptococcal infections(19). Globally, Carapetis and colleagues have emphasized the importance of area-based interventions in addressing the burden of RHD, including expanding early detection coverage and distributing prophylactic antibiotics in remote regions[(11)]. Meanwhile, the variable of residential density did not show a significant relationship with the incidence of RHD (X^2 = 0.016, p = 0.900, contingency coefficient = 0.007). Whether in households with ≤4 people or >4 people, the proportion of RHD patients was relatively balanced.

This indicates that the number of occupants in a house is not the main factor in the occurrence of RHD within the context of this study. In theory, residential density is often linked to a higher risk of infectious diseases and poor sanitation. However, the study by Sliwa et al. in the African context also found no significant association between household crowding and heart disease(20). In fact, research by Rahmawaty et al. emphasizes that adherence to prophylactic treatment is more important than living conditions in preventing RHD[(10)].

Findings from Marijon et al. state that residential density only becomes a risk factor when combined with poor sanitation, minimal ventilation, and limited access to healthcare services—variables that were not explored in this study[(16)]. Additionally, the economic level variable did not show a statistically significant relationship with the incidence of RHD ($X^2 = 2.724$, $p = 0.099$, contingency coefficient = 0.097). Although almost all patients were from lower-middle economic groups, the uneven distribution (with a majority of 97.9% classified as poor) resulted in low data variation. The studies of Ghani, Susilawati, and Novriani state that low-income communities are at higher risk for heart diseases, including RHD, due to barriers in accessing healthcare and delays in treatment[(15)]. Watkins et al. also assert that socioeconomic conditions are a key determinant of RHD in developing countries[(13)]. Tarani and Kautsar's review adds that economic status indirectly affects health through environmental channels, nutrition, and treatment-seeking behavior(19). Therefore, although the data in this study did not show significance, the economic variable remains important and should be analyzed further using more complex statistical approaches, such as logistic regression or Structural Equation Modeling (SEM).

Overall, the findings of this study confirm that age is the most significant risk factor in the occurrence of RHD. At the same time, the variables of gender, housing density, and economic level do not exhibit a statistically significant relationship, despite their importance from a policy perspective. The variable of place of residence demonstrates a significant trend, indicating that spatial conditions and access to healthcare services in remote areas remain major challenges in the prevention and control of RHD. Therefore, RHD management policies should consider cross-age approaches, improvement of healthcare quality in rural areas, as well as comprehensive socioeconomic interventions to reduce the disease burden sustainably. Prevention and control can be achieved through enhanced diagnosis, secondary prevention, improved healthcare facilities, and other measures that reduce the incidence of rheumatic heart disease [(21)].

CONCLUSION

This study confirms that age is the most significant demographic factor associated with the occurrence of rheumatic heart disease (RHD), particularly affecting individuals aged 40–59 years. The strong statistical significance ($X^2 = 31.011$, $p < 0.000$) highlights the role of cumulative exposure to streptococcal infections and delayed treatment over time. These findings reinforce the importance of early echocardiographic screening, especially in children aged 5–15 years, to detect mild valve abnormalities before they develop into chronic RHD. Early detection and timely intervention are crucial for reducing complications and enhancing long-term outcomes in at-risk populations. Conversely, the variables of gender, housing density, and economic level do not show a statistically significant association with the incidence of RHD.

Although a slightly higher percentage of cases were found among women and in lower economic groups, these differences are not compelling. Housing areas showed a borderline relationship, suggesting that rural populations may be more vulnerable due to limited access to healthcare. Despite statistical limitations, these social and structural factors remain important considerations in shaping future RHD prevention strategies.

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