

Risk Factor Analysis of Rheumatoid Arthritis Occurrence toward Community in Working Area of Pulau Barrang Lompoc Community Health Centre of Makassar City

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Abstract: Rheumatoid Arthritis (RA) is one of the biggest health problems in the world, both in developed and developing countries. This disease cause swelling toward synovium, where the swelling can cause cartilage and bone damage which later could affect the other joint functions. in other hand, this disease also impacted on comorbidities for other diseases such as increased risk of infection, cancer, and cardiovascular diseases including atrial fibrillation, stroke, and other autoimmune diseases. This research aims to determine the risk factors of RA occurrence upon the community in the work area of Pulau Barrang Lompo Community Health Centre in Makassar. The type of this research is analytic observational, with case control study design that held in work area of Pulau Barrang Lompo Community Health Centre, that is in Barrang Island Lompo and Barrang Caddi Island. The number of sample in this research consist of 49 in case group and 98 in control group. The sample was determined using exhaustive sampling technique for case group and purposive sampling for control group. Data were analyzed using Odds Ratio test and multiple logistic regression. The results showed that risk factors for the occurrence of RA were family history (OR = 4,675; CI95%: 1,940-11,267) and the salt consumption (OR = 2,847; 95% CI: 1,201-6,748). In this research, the most risky factor for RA occurrence is low level of education (OR = 8,677; 95% CI: 1,022-73,635).

Keywords: Risk Factor, Rheumatoid Arthritis, Island Area.

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I. Introduction

Rheumatoid Arthritis (RA) is the most common autoimmune disease which considered as one of the main cause of disability in humans¹. This disease causes swelling of synovium where this swelling can cause cartilage and bone damage which later can affect the other joint functions²⁻⁴. Parts of the body which firstly be attacked by this disease are the joints of the hands and feet, which can cause cartilage and bone damage. RA is often associated with the increaseing of infection risk, cancer, and cardiovascular disease including atrial fibrillation, stroke, and other autoimmune diseases⁴⁻⁸. In RA patients, the risk of fracture is increased, and the increased of osteoporosis is twice greater, even a young women with RA had an increased risk of fracture before the age of 50 compared with populations without RA⁹.

Most researchs shows that 50-70% of RA sufferers also suffering from sleep disturbance 2-3 times greater than the general population compared with people with other diseases such as obesity, hypertension, and respiratory illness¹. Direct impacts can be generated such as medical cost and hospital visit, as for the indirect impact is the loss of productivity due to absence or early retirement in a job and intangible cost as measured by the impact on quality of life. This risk increases with age, duration of disease, comorbidity and disability¹⁰.

The prevalence of RA is 0.8%, it 31st ranked at the global level. The prevalence of RA in western countries is 1-2% and it is believed that 1% of people worldwide suffering from this disease^{10,11}. The regional prevalence of RA which derived from the result of meta-analysis for the countries with low and middle income were Southeast Asia (0.40%), Eastern Mediterranean (0.37%), Europe (0.62%), America (1.25%), and the Western Pacific (0.42%). According to gender, the prevalence of RA were 0.16% for men and 0.75% for women¹¹.

In Indonesia, the prevalence of *Rheumatoid Arthritis* is still very limited, because it is widely still fused in joint disease group. Based on the diagnosis of health professionals, the prevalence of RA in Indonesia is 11.9%, while based on the diagnosis or symptom is 24.7%. In South Sulawesi, the prevalence of RA based on the diagnosis or symptom is 27,7%, where this number exceeds the national number, that is 24,7%¹². In

Makassar, RA ranks the 10th of the most disease in 2015 with a total of 23,809 cases, and in 2016 ranks 7th with 26,000 total of cases.

Rheumatic case in Makassar is spread in each area to the smallest islands. The highest number of health center visits in island areas is in Barrang Lompo health center, located in Ujung Tanah subdistrict, with total visits of 209 visits in 2016 and 515 visits in 2017.

The island area is an area that administratively far from the center of the city. The long distances of it have an impact on the increase of health problems, caused by inadequate access, facilities, and infrastructure due to the geographic conditions of the island-group which is separated by the sea¹³. In the health aspect, island communities are relatively more at risk of health problems and at risk in inadequate use of health infrastructure¹⁴. Moreover, the characteristic of communities in small isolated islet is less understanding of the importance of sanitation for health, due to lack of knowledge, so that the risk behaviors which is related to the health are possible to occur¹⁵.

II. Material and Methods

Location and Research Design

This research was conducted in the working area of Pulau Barrang Lompo Community Health Centre of Makassar City, which includes two islands namely Barrang Lompo and Barrang Caddi Island. The type of the research which used in this study is observational analytics with *case control study* design.

Population and sample

The population is the entire community in the working area of Barrang Lompo public health center of Makassar. The number of sample were 147 people, which consist of 49 for case groups and 98 for control group. Sampling in case group was done by *exhaustive sampling* technique that is sampling as a whole, while in control group is done by *purposive sampling* technique. Sample inclusion criteria in this research were those who had been treated at Puskesmas in 2016-2017, aged ≥ 20 years, living in the working area of Pulau Barrang Lompo Community Health Centre and willing to fill or participate in questionnaire.

Method of Collecting Data

The data was obtained after doing the interview and observation by *door-to-door* to respondent's house using questionnaire. In this research, the data about age was firstly diagnosed as obtained from medical records of patients. the data about family history, education, income, occupation, alcohol consumption and salt were measured using a list of questions on questionnaire. This study also uses food frequency questionnaire.

Data Analysis

The data was analyzed using SPSS version 20.0 univariate, bivariate, and multivariately. Univariate analysis is used to know the characteristics of data owned. Bivariate analysis is to determine the significance of relationship and the risk of each research variable (family history, alcohol, salt, education, income, and occupation). After the data were analyzed univariately, then the variable will be analyzed multivariately if the variable has the value of $p < 0.25$. Multivariate analysis was applied to determine the variables that affect the most of *Rheumatoid Arthritis* occurrence.

III. Result

Characteristics of Sample

Table 1. Shows about the number of RA occurrence based on 6 characteristics of respondents who are living in the working area of Barrang Lompo Public Health Center, Makassar. Based on the characteristics of area/subdistrict, the biggest RA occurrence was in Pulau Barrang Caddi subdistrict with the same percentage between case and control group, that is 61,2%. According to age, the most of RA occurrence is on group of 40-49 years old, with the number in case group is 34.7% and 31.6% in control group. According to gender characteristic, the highest of RA occurrence is on 'Women', which has a same percentage of both case and the control group, that is 83.7%.

As we can see from the table, on education characteristic, the highest of RA occurrence was on 'Primary School/Equivalent', where in case group numbered as 67.3% and in control group as 76.5%. On 'Non-School', the biggest proportion of RA occurrence was found in case group which numbered as 20.4%, compared with control group as 2.0%. Based on Job characteristic, the highest percentage of RA occurrence was on 'Non-Working', numbered as 73.5% in case group and 59.2% in control group. In Ethnic characteristic, the highest percentage of RA occurrence was in 'Makassar' ethnic which numbered as 83.7% in case group and 82.7% in control group.

Research Variable

Table 2. shows the result of bivariate analysis toward 6 variables of respondents who are living in the working area of Pulau Barrang Lompo Community Health Centre, Makassar. Based on the analysis results in this table, 'Family History' variable was obtained OR (*Odds Ratio*) of 4.675 with CI (*Confident Interval*) 95%: 1,940-11,267. On 'Salt' variable, as we can see, the OR value of it numbered as 2.847 and the value of CI numbered as 95%: 1.201-6.748. From the results of bivariate analysis in this table, it can be concluded that 'Family History' and 'Salt' were a risk factors of *Rheumatoid Arthritis* occurrence toward the community which living in the working area of Barrang Lompo Public Health Center of Makassar.

Furthermore, as we can see on 'Alcohol' variable, the OR value of it numbered as 1 and CI value as 95%: 0.351-2.847. On 'Education' variable, the OR value numbered as 6.698 and CI value as 95%: 0.845-53.096. 'Income' variable obtained OR value as 1.780 and CI value as 95%: 0.888-3.566. The last variable in the table, 'Work', obtained OR value as 1.090 and CI value as 95%: 0.405-2.934. From the results of bivariate analysis toward the variables contained in table 2 it can be concluded that the 'Education' and 'Income' variable are not the risk factors of the *Rheumatoid Arthritis* occurrence.

Multivariate Analysis

Table 3. shows the result of multivariate analysis. Multivariate analysis is the further analysis which is using *Backward Stepwise* (LR) method. The results of this analysis showed that the variable which most at risk for *Rheumatoid Arthritis* (RA) occurrence were 'Education' variable, with an OR value numbered as 8,677 and CI value as 95%: 1.022-73,635. The results of this statistical test conclude that 'Education' variable significantly risk 8.67 times greater toward the occurrence of *Rheumatod Arthritis* (RA) in communities who were living in the working area of Pulau Barrang Lompo Community Health Centre of Makassar.

Table 1. Distribution of Respondent Characteristics in Case Group and Control Group in Working Area of Pulau Barrang Lompo Community Health Centre of Makassar

Respondent Characteristics		Rheumatoid Arthritis Occurrence				Total	
		Case (n=49)		Control (n=98)			
		n	%	n	%	n	%
1	Area/Subdistrict						
	Barrang Lompo Island	19	38,8	38	38,8	57	38,8
	Barrang Caddi Island	30	61,2	60	61,2	90	61,2
2	Age Group (in year)						
	20 – 29	1	2,0	21	21,4	22	15,0
	30 – 39	15	30,6	31	31,6	46	31,3
	40 – 49	17	34,7	31	31,6	48	32,7
	50 – 59	13	26,5	11	11,2	24	16,3
	≥ 60	3	6,1	4	4,1	7	4,8
3	Gender						
	Female	41	83,7	82	83,7	123	83,7
	Male	8	16,3	16	16,3	24	16,3
4	Education						
	Non-School	10	20,4	2	2,0	12	8,2
	Elementary School	34	67,3	75	76,5	108	73,5
	Junior High School	5	10,2	9	9,2	14	9,5
	Senior High School	1	2,0	9	9,2	10	6,8
	College	0	0,0	3	3,1	3	2,0
5	Employment						
	Unemployment	36	73,5	58	59,2	94	63,9
	Fisherman	7	14,3	11	11,2	18	12,2
	Labor	0	0	2	2,0	2	1,4
	Trader	4	8,2	26	26,5	30	20,4
	Civil Servant/POLRI/TNI	0	0	1	1,0	1	0,7
	Others	2	4,1	0	0,0	2	1,4
6	Ethnicity						
	Makassar	41	83,7	81	82,7	122	83,0
	Bugis	3	6,1	13	13,3	16	10,9
	Bugis – Makassar	1	2,0	0	0	1	0,7
	Mandar	1	2,0	3	3,1	4	2,7
	Others	3	6,1	1	1,0	4	2,7

Source: Primary Data, 2018

Table 2. Bivariate Analysis Based on Research Variables in Working area of Pulau Barrang Lompo Community Health Centre of Makassar

Respondent Variables		Rheumatoid Arthritis Occurrence				P value	Total	
		Case		Control			OR	CI 95%
		n=49	%	n=98	%			
1	Family History (of Rheumatoid Arthritis)							
	With History	17	34,7	10	10,2	0,000	4,675	1,940 – 11,267*
	No History	32	65,3	88	89,8			
2	Alcohol							
	Consuming	6	12,2	12	12,2	1,000	1,000	0,351 – 2,847
	Not Consuming	43	87,8	86	87,8			
3	Salt							
	High Consumption	41	83,7	63	64,3	0,015	2,847	1,201 – 6,748*
	Low Consumption	8	16,3	35	35,7			
4	Education (in year)							
	< 9 tahun	48	98,0	86	87,8	0,061	6,698	0,845 – 53,096
	≥ 9 tahun	1	2,0	12	12,2			
5	Income							
	Low	29	59,2	44	44,9	0,102	1,780	0,888 – 3,566
	High	20	40,8	54	55,1			
6	Employment							
	Heavy Worker	7	14,3	13	13,3	0,865	1,090	0,405 – 2,934
	Light Worker	42	85,7	85	86,7			

*Significant Variable

Source: Primary Data, 2018

Tabel 3. Multivariate Analysis Result of Risk Factor of Rheumatoid Arthritis Occurrence in Working Area of Pulau Barrang Lompo Community Health Centre of Makassar

Research Variables	B	Wald	Sig.	OR	CI 95%	
					LL	UL
Family History	1,466	9,681	0,002	4,331	1,720	10,903
Salt	1,009	4,824	0,028	2,742	1,115	6,743
Education	2,161	3,922	0,048	8,677	1,022	73,635
Constant	-3,781	10,554	0,001			

*Significant Variable

Source : Primary Data, 2018

IV. Discussion

From the results of this research, the researcher found that those with a family history (father, mother, grandfather, or grandmother) which suffering from RA had a risk 4.6 times higher than those without family history of RA. The results of this research are in line with several researches from several countries, including in Europe¹⁶, America¹⁷, Iran¹⁸, and also in line with *case control* study which conducted in China¹⁹ and Indonesia²⁰.

This research also found that the respondents with mother which had a history of suffering RA was appeared 3 times more in the group of respondent who suffering from RA than the group of respondent which not suffering RA. These results are in line with the findings of several researchers which attempting to investigate the risk of RA in first-degree family using *case-control* design, that RA is more susceptible to those with mother which had a history of RA than father with a history of RA^{18,21}.

From the explanation above, it is proven that there is a trend where the RA disease can be inherited to family members. According to the result of a research that has been nailed in Finland and the UK, the genetic contribution has been estimated as 60% to the occurrence of RA²². According to a report from Norfolk, UK, tells that if one of the member of a identical twins suffering from RA, then another member has 15% of risk^{18,23,24}. This number of risk is much higher than the general population, which is numbered about 0.8%^{18,23,25}. RA is a disease which mediated by the immune system of the body. Most of inflammatory conditions in RA was generated by a complex interaction between genetic factors and various environmental factors²⁶.

On 'Salt' variable, the results of this study found that those with more consumption of salt (≥ 6 grams per day) were 2.8 times more risked to have RA than those with low salt consumption (< 6 grams per day). This finding is in line with several researches that is *case control* study in Navarra, Spain²⁷, and Sweden²⁸. But another research which conducted in America tells differently about salt consumption⁴.

Excessive salt consumption contributes to the development of autoimmune diseases. The excess of sodium increases the differentiation and activation of T helper 17 (Th17) cell line by inducing the *serum of glucocorticoid kinase 1* (SGK1). Th17 cell is involved in the pathogenesis of RA by interacting with

macrophages, fibroblast synoviocytes, chondrocytes and osteoblasts. The excess of sodium can also change the setting mechanism of the innate immune system, which will adaptive and expand CD14 ++ CD16 + monocytes, which will also increase in RA^{29,30}.

The association of salt consumption and inflammation has several explanations. The salt which consumed will change the endothelial function increasing production of *B-factor* growth transformation and modulation of *C-factor* vascular endothelial growth. High salt concentrations also increases interleukin-23R expression and increases T-cell differentiation. T-cell as the producer assistant of interleukin-17 is a type of cell that is dominant in arthritis and plays an important role in the development of arthritis to chronic destructive arthritis²⁷.

The results of this research also show that extracellular sodium plays an important role in the physiology of mammals, including maintenance of extracellular fluid volume, water balance, and potential evocation of cell membrane. Extracellular fluid contains about 95% of sodium content total of body. Most of sodium is consumed as a regular salt (sodium chloride).

From the results of this research can also be seen that about 70% (70.7%) people in this research consumes more salt. The high consumption of salt is also related to the socio-cultural aspects, where coastal communities prefer to consume a food with higher salt compared with people who living in mountainous area which consumes more vegetables and fruits. In addition, there also traditional food of island communities which high in salt, like *Roti Lasuna* and *Pallu Ce'la*.

In bivariate analysis, 'Education' variable is not a risk factor toward RA occurrence in this research, as the proportion of education level is more than 85% which dominated by low education level ('Non-School' and 'Elementary School') in both case and control group. In line with other researches which concludes that education is not at risk for RA occurrence, including research in China¹⁹. but in contrast with a research which conducted in the United States³¹, low education level is at risk for RA occurrence. However, in the result of multivariate analysis found a close relationship between education and the occurrence of RA. People with low education level are at risk 8 times having RA after controlled by 'Family History' and 'Salt'.

Education level of community in this study considered as low, that is most (91.2%) is < 9 years of education ('Non-School' and 'Primary School'). One of the factor that influenced the health's knowledges is the level of education. This is in line with the opinions of Perry and Potter (2005) which states that the level of education could increase one's knowledge about health. Education can affect one's health which aims to increase the self potential for the community to maintain, to keep, and to improve health. With a good level of education, nicely expected could affect the level of knowledge and attitude in receiving and understanding the knowledge about certain diseases. Sadiman (2002) argues that the status of education affects the opportunity to obtain information about the management of the disease.

As we can see from table 2, it was found that alcohol was not a risk factor for *Rheumatoid Arthritis*. This thing caused by sample distribution which homogeneous, where the largest percentage was found in those who never consumed alcohol with a percentage of 87.8% in both case and control group. The result toward 'Alcohol' variable in this research is in line with a research which conducted in America³ and China¹⁹. This finding is slightly different from several other researches that found a positive relationship between alcohol and RA occurrence, such as in Sweden³¹ and Spain²⁷.

'Income' variable in this research shows that income is not a risk factor for RA occurrence. The small number of samples in this research was not strong enough to prove that low family income is a significant risk factor of RA occurrence. The Family with low income is considered to have a low purchasing power to provide nutritious food for the family. Paying attention to food intake (nutrition) is one of the factor which can prevent people from *Rheumatoid Arthritis*. Conducted research in several countries such as in Taiwan³² and America⁴ also revealed that there is a relationship between family income and the occurrence of RA.

In this research, 'Job' variable were also considered as not the risk factor of RA occurrence because of the proportion of job which considered balance both in case and control group. Work or activity is one of the factors of RA occurrence, this is because the activity with physical load and physical pressure can increase the load of joint. This finding is in line with another research in Indonesia, that there is a positive relationship between work and the occurrence of RA³³.

V. Conclusion

The variable of 'Family History', 'Salt', and 'Education' are the variables that affect the occurrence of Rheumatoid Arthritis in this research. In bivariate analysis result, the 'Education' variable was not a risk factor, but in the multivariate analysis, 'Education' has a close relationship toward the occurrence of *Rheumatoid Arthritis*. From the most influential factors, after doing the multivariate test, it was found that the 'Education' variable (low education level) is the most risky factor for the occurrence of *Rheumatoid Arthritis* in the working area of Pulau Barrang Lompo Community Health Center of Makassar.

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