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Factors Associated with Joint Diseases in The Coastal Community of Laha Village in Ambon, Indonesia

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ABSTRACT

Joint diseases have remained a public health concern in the world for decades. These conditions are not only experienced by the elderly but can also occur at a relatively young age. The research objective was to analyze the factors associated with joint disease in the Laha Village in Ambon City. Data were derived from a household health survey in the Laha Village, Ambon City coastal area, in 2022. The dependent variable in this study was the occurrence of joint disease, with the independent variables consisting of demographic status, lifestyle, and dietary patterns. Data analysis used the multivariate logistic regression method. In this study, the prevalence of joint disease in coastal communities in Laha Village was 14.8%. The results of data analysis showed that demographic factors that were significantly related to joint disease were: respondents' age of 60-71 years (aOR=19.74; 95CI%:7.01-16.66; p<0.001) and those who did not work outside the house (aOR=2.00; 95 CI%: 1.0 - 3.94;p=0.041). A significant association was found between joint diseases and those who did not smoke cigarettes (aOR=3.85; 95%CI: 1.65-8.98; p=0.002). We also found that joint disease was also associated with dietary patterns, which were the habit of rarely consuming meat (aOR=2.77; 95 CI%: 1.26-6.10; p=0.011) and the habit of not consuming soft drinks (aOR=2.86; 95 CI%: 1.19-6.86; p=0.012). However, not consuming salty foods reduced the likelihood of developing joint disease (aOR=0.35; 95% CI: 0.13-0.94; p=0.038). The results of this study demonstrated the importance of having a healthy lifestyle and balanced diet to reduce the incidence of joint disease.

Keywords: Joint disease, coastal area, healthy lifestyles

Introduction

Joint disease has been a public health problem worldwide for decades (Long et al.,2022). This disease is characterized by painful disorders in the joints accompanied by stiffness, redness, and swelling that is not caused by impact or accident. These joint diseases include osteoarthritis (OA), pain due to high uric acid or acute or chronic hyperuricemia (gout arthritis/GA), and rheumatoid arthritis (RA) (Kemenkes RI, 2018).

OA affected around 3.3-3.6% of the general population globally, causing moderate to severe disability in around 43 million people (Sen & Hurley, 2023). Based on the 2019 Global Burden of Disease (GBD) data, the prevalence of GA in individuals aged 15 to 39 years increased from 1990 to 2019 (Zhang et al., 2023). RA was found in approximately 1% of the Caucasian race, with a ratio of women being affected more often than men (Gurning et al., 2022). RA causes disability and increases the risk of cardiovascular disease, lymphoma, and death (Senthelal et al., 2023).

According to the 2018 Basic Health Research (Riskesdas), the prevalence of joint disease in Indonesia was 7.3 percent, with a prevalence in Maluku Province of 5.1%. The demographic risk factors of the joint disease reported were being over 75 years old, female, low educated, farmers,

and from rural sides (Kemenkes, 2018). Joint disease, especially RA, is included in the ten most common diseases in coastal areas in Indonesia (Gurning et al., 2022).

Joint disease could cause pain, swelling, loss of function, stiffness, deformity, weakness, and instability. Fatigue, sleep disturbances, emotional disturbances, and symptoms of the underlying systemic disease might accompany this condition. In addition, there could be pain in the morning and at rest, which may initially improve with activity but may worsen with excessive use and activity (Senthelal et al., 2023). Various factors can influence the occurrence of joint disease. Risk factors for OA joint disease include obesity, genetics, ethnicity, diet, trauma, and specific physical or occupational activities that imply biomechanical stress (eg, pressure, weight bearing) throughout the body (Dragon et al., 2017). Interactions between genes and environmental factors, such as tobacco, cause RA (Chauhan et al., 2023), and risk factors for GA include genetics, food, and co-morbidities (Fenando et al., 2023).

In 2022, Pattimura University conducted a household health survey in Laha Village, one of Ambon City's coast villages. Using this data, this study aimed to analyze the relationship between joint disease and sociodemographic characteristics, lifestyle, and dietary patterns, which are essential aspects of patient health management.

Material and Methods

This study is structured using normative legal study methods, is a study performed by examining the sources of library

Data source and study sites

Data were derived from a household health survey conducted in November 2022 in Laha Village, Ambon City coastal area, by the Faculty of Medicine Universitas Pattimura. Geographically, the administrative area of Laha Village under the Teluk Ambon Sub-district is divided into six hamlets with 9 neighborhood associations. The physical condition of the area in the southern part is relatively flat and linear along the coast, stretching from east to west, while the northern part is hilly with an area of approximately 17 Km2. It consists of 14 km^2 of land area and 3 km^2 of ocean, has a coastline of 3.5 km, with boundaries to the north bordering Tawiri Village, to the south with Hatu Village, to the west with Kaitetu Village. to the east with Ambon Bay (Rahayu et al., 2022).

Respondents
Instruments

The questionnaire was adapted from the 2018 Basic Health Research questionnaire by the Ministry of Health of the Republic of Indonesia (2018). The questionnaire was converted into the Commcare application, through which interviewers collected all information collected. This questionnaire was in *Bahasa Indonesia* and covered several topics such as sociodemographic characteristics, lifestyle, and dietary patterns.

Data collection procedure

The research permit for conducting the survey was obtained from the administrative leaders of Laha Village. The data collection process was carried out for ten days and was collected by final-year students of the Faculty of Medicine, Pattimura University.

Variables

The dependent variable in this study used was joint disease as a binary variable (yes or no). This variable was based on the information given by respondents if they had ever been diagnosed with joint disease by a doctor. If the respondent answers 'yes', they will be coded 1 and 0 if otherwise. The independent variables in this study were divided into three groups: the respondents' sociodemographic characteristics, lifestyle, and dietary patterns. Sociodemographic characteristics consisted of respondent's age (18-30, 31-40, 41-50, 51-60, 61-70, and >70 years), gender

(male and female), and occupation (not working/still at school/housewife, civil servant/self-employed, and farmer or fisherman). Lifestyle characteristics included strenuous physical activity (yes and no), smoking status (ever smoked and never smoked), and drinking alcohol (yes and no). Heavy physical activity was based on whether the respondent performed strenuous physical activity continuously every day for at least 10 minutes each session. The habit of alcohol consumption related to consumption of alcoholic beverages in the past month before the interview.

The characteristics of the dietary pattern consisted of eating salty foods, fatty foods, burned foods, meat foods, soft drinks, and instant noodles. Diet patterns in the past month were classified as often, seldom, and never. This classification consisted of the number of times consuming this food, i.e., never consumed, one to two times per week or less than three times per month (rare), then more than once per day, once per day, and three to six times per week (frequent).

Statistical analysis

In the first stage, descriptive statistics are used to examine the distribution of all variables in the analysis. In the second stage, bivariable logistic regression was performed to obtain the unadjusted odds ratio (OR) of each potential predictor as a measure of the estimated relationship between the dependent variable and each independent variable. In the final stage, multivariable logistic regression was performed to obtain the adjusted odds ratio/aOR). Data were analyzed using STATA/MP 17.0.
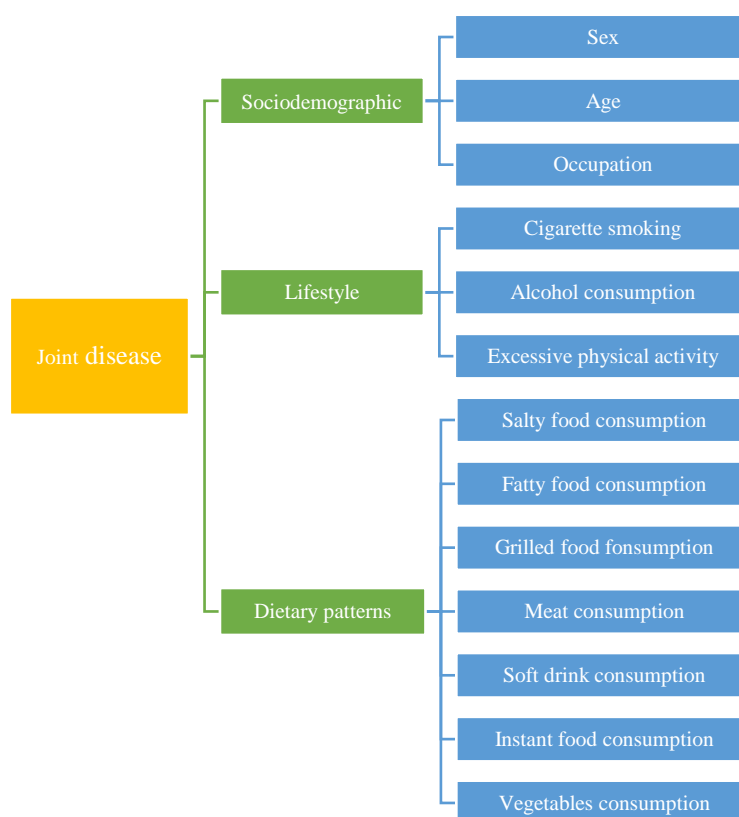

Figure 1. Analytical framework

Ethics clearance

The ethics statement number for this research is 160/FK-KOM.ETIK/VIII/2022 issued by the Ethics Committee of the Faculty of Medicine, Pattimura University. All respondents who agreed to participate in this study were requested to sign the informed consent form.

Results and Discussion

Results

The analysis used information collected from 677 respondents living in the coastal area of Laha Village. The prevalence of joint disease in Laha Village was 14.8%. The characteristics of the respondents in this study according to their sociodemographic characteristics, lifestyle, and dietary patterns are shown in Table 1.

Table 1. Sociodemographic Characteristics, Lifestyle, and Diet of Respondents

Variable	n	%	Joint Disorders		p
			n	%	
Socio-demographic Characteristics					
Sex					
Male	257	39	35	13.6	*0.376*
Female	396	60.6	64	16.2	
Age (years)					
18-30	193	29.6	12	6.2	
31-40	159	24.3	22	13.8	
41-50	151	23.1	27	17.9	***<0.001***
51-60	89	13.6	16	18.0	
61-70	40	6.1	15	37.5	
>70	21	3.2	7	33.3	
Occupation					
Informal Workers	401	61.4	64	16	
Formal Workers	119	18.2	13	13	*0.358*
Not Working/Housewives	133	20.4	22	16.5	
Life Style					
Excessive Physical Activity					
Yes	336	49.6	47	13.8	*0.465*
No	341	50.4	53	15.8	
Cigarette Smoking					
Yes	165	24.9	17	10.3	***0.047***
No	497	75.1	83	16.7	
Alcohol Consumption in the Past Month					
Yes	36	5.4	5	13.9	*0.834*
No	626	94.6	95	15.2	
Dietary Pattern					
Salty Food Consumption					
Often	343	51.0	51	14.9	
Rarely	242	36.0	38	15.7	*0.789*
Never	87	12.9	11	12.6	
Fatty Food Consumption					
Often	391	58.2	55	14.1	
Rarely	239	35.6	33	13.8	***0.036***
Never	42	6.3	12	28.6	
Grilled Food Fonsumption					
Often	389	57.9	58	14.9	
Rarely	256	38.1	36	14.1	*0.526*
Never	27	4.0	6	22.2	
Meat Consumption					
Often	197	29.3	22	11.2	

To be continued…

Rarely	170	25.3	30	17.6	*0.187*
Never	305	45.4	48	15.7	
Soft Drink Consumption					
Often	113	16.8	13	11.5	
Rarely	252	37.5	27	10.7	***0.008***
Never	307	45.7	60	19.5	
Instant Food Consumption					
Often	190	28.3	28	14.7	
Rarely	389	57.9	51	13.1	*0.070*
Never	93	13.8	21	22.6	
Vegetables Consumption					
Never	11	1.7	9	18.2	
Not everyday	263	40.6	38	14.4	0.920
Everyday	374	57.7	57	15.2	

Table 1 shows that the most common joint disease was found in the age group 41-50 years (17.9%), while the least was in the age group >70 years (6.2%). The percentage of joint disease in women was higher (16.2%) than in men (13.6%). By occupation, the most common joint disease was found in farmers (16%), and other occupations such as civil servants and entrepreneurs (13%).

Factors associated with joint disease

Table 2 shows the univariate logistic regression analysis results to examine the association of sociodemographics, lifestyle, and eating patterns with joint diseases. The results showed that factors related to joint disease from sociodemographic factors were respondents' age, smoking habits, and dietary patterns. However, the results of the multivariate analysis showed that respondents' age, occupation, smoking status, and dietary patterns remained significantly associated with joint disease.

We found a significantly increased odds of joint disease along with the increased age of respondents. Respondents aged 61-70 years had the highest odds of developing joint diseases (aOR=19.74; 95% CI: 7.01-16.66; *p<0.001*). These results were almost the same as research conducted by Paerunan et al. (2019) who found that OA is most common in the age group 60-75 years. OA is a chronic joint disease often found in the elderly population due to the loss of the ability of tissues and cells in the body to maintain homeostasis with age, especially when experiencing stress (Anderson & Loeser, 2010). Other studies stated that OA and joint aging were not the same, as an aging process causes an increased risk for a person experiencing OA. In the general aging process, there is an accumulation of advanced glycation end products causing the cartilage to appear slightly browned and thinner when compared to young adults who are smooth and intact. As a result of the accumulation of advanced glycation end products, it can change the biomechanical properties of cartilage to become more brittle and susceptible to degeneration. Joints affected by OA could experience damage characterized by loss of cartilage and osteophytes and thickening of the subchondral bone (Loeser, 2017).

We found that respondents who did not work outside the house, including housewives, had significantly higher odds of developing the joint disease when compared to informal workers (aOR=2.00; 95%CI: 1.02-3.94; *p=0.041*). Housewives played an essential role in the family's quality of life and the environment. However, housewives often experience musculoskeletal disorders due to housework and lack of physical activity. These musculoskeletal problems could have been also associated with leisure time physical activity (Saat et al., 2022).

Interestingly, our study found the odds of developing joint disease were significantly increased in respondents who did not smoke (aOR=3.85; 95%CI: 1.65-8.98; *p=0.002*), who never consumed soft drinks (aOR=2.86; 95% CI: 1.19-6.86; *p=0.012*).and who rarely consumed meat

(aOR=2.77; 95%CI: 1.26-6.10; p=0.011). However, those who never consumed salty food had a reduced likelihood of experiencing joint diseases (aOR=0.35; 95%CI: 0.13-0.94; *p=0.038*).

These unexpected findings could be due to the inverse causation, as respondents with health problems, including joint diseases, will be more cautious and avoid high-risk behavior, including cigarette smoking as well as soft drinks, salty food, and meat consumption. This is supported by the reduced percentage of those risk behaviors along with the increased age of respondents (Figure 2).

Research by Gustina et al. (2020), showed that smoking had a significant effect on the incidence of joint disease. Smoking can damage cells and inhibit joint cartilage cell proliferation, increase oxidant pressure which affects cartilage loss, and increase carbon monoxide content in the blood which causes tissue hypoxia and inhibits bone formation. Compared to non-smokers, smokers will feel an excessive sensation of pain in the joints due to loss of cartilage (Amin et al., 2007). This study could also show different results as there are other factors that could affect the development of joint diseases.
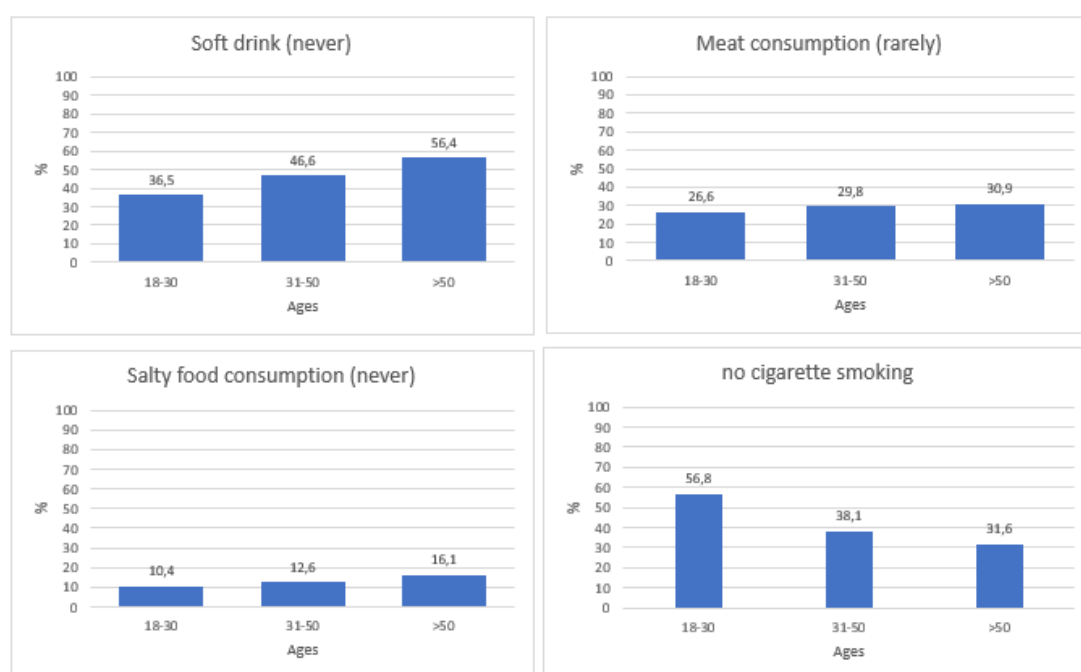

Figure 2. The percentage of risky behavior increases with the age of the respondent

In this study, it was found that never eating salty foods reduced the likelihood of joint diseases. This study is the same with Salgado et al. (2015) who linked high sodium intake with RA. RA is a complex disease resulting from the interaction of many genetic and environmental factors. Increased in vitro salt concentrations induce the expression of glucocorticoid-regulated kinase 1. This kinase plays an important role in the cellular stress response. Research on high salt concentrations in vitro and animal models induces the expression of interleukin-23R and increases the differentiation of helper T cells that produce interleukin-17. Helper T cells that produce interleukin-17 are the predominant cell type in arthritis and play an important role in developing chronic destructive arthritis. This suggests that glucocorticoid-regulated kinase 1 may be a common pathway in the pathogenesis of RA and obesity (Salgado et al., 2015). The study in Laha Village obtained different results, presumably because respondents who had been diagnosed with joint disease by a doctor would reduce or not consume foods that could potentially worsen the respondent's condition. Laha Village is also known as a coastal area, so most of the people will

consume seafish. A study shows that respondents with higher fish consumption tend to experience RA (Hatami et al., 2022).

Table 2. Factors associated with joint disease in Laha village community

Variable	Univariate				Multivariate			
	OR	95% (CI)		*p*	aOR	95% (CI)		*p*
Socio-demographic Characteristics								
Sex								
Male	1.00				1.00			
Female	1.22	0.78	1.90	*0.377*	0.81	0.43	1.52	*0.523*
Age (years)								
18-30	1.00				1.00			
31-40	2.42	1.15	5.06	***0.019***	2.80	1.25	1.92	***0.012***
41-50	3.28	1.60	6.72	***0.001***	5.12	2.20	6.28	***<0.001***
51-60	3.30	1.49	7.33	***0.003***	6.43	2.48	11.91	***<0.001***
61-70	9.04	3.80	21.52	***<0.001***	19.74	7.01	16.66	***<0.001***
>70	7.51	2.56	22.18	***<0.001***	17.49	4.70	55.58	***<0.001***
Occupation								
Informal Workers	1.00				1.00			
Formal Workers	1.07	0.55	2.10	*0.827*	1.49	0.70	3.19	*0.297*
Not Working/Housewives	0.90	0.52	1.55	*0.709*	2.00	1.02	3.94	***0.041***
Life Style								
Excessive Physical Activity								
Yes	1.17	0.76	1.79	*0.466*	1.17	0.70	1.94	*0.534*
No	1.00				1.00			
Cigarette Smoking								
Yes	1.00				1.00			
No	1.74	1.00	3.03	***0.049***	3.85	1.65	8.98	***0.002***
Alcohol Consumption in the Past Month								
Yes	1.00				1.00			
No	1.10	0.42	2.92	*0.834*	0.58	0.15	2.21	*0.430*
Dietary Pattern								
Salty Food Consumption								
Often	1.00				1.00			
Rarely	1.06	0.67	1.68	*0.782*	0.96	0.52	1.75	*0.896*
Never	0.82	0.41	1.66	*0.598*	0.35	0.13	0.94	***0.038***
Fatty Food Consumption								
Often	1.00				1.00			
Rarely	0.97	0.61	1.55	*0.928*	0.75	0.40	1.38	*0.361*
Never	2.44	1.18	5.05	***0.016***	1.51	0.55	4.11	*0.413*
Grilled Food Consumption								
Often	1.00				1.00			
Rarely	0.93	0.59	1.46	*0.765*	1.03	0.58	1.82	*0.910*
Never	1.63	0.63	4.21	*0.313*	0.81	0.23	2.80	*0.741*
Meat Consumption								
Often	1.00				1.00			
Rarely	1.70	0.94	3.08	*0.078*	2.77	1.26	6.10	***0.011***
Never	1.48	0.86	2.54	*0.151*	1.76	0.90	3.45	*0.095*

To be continued…

Soft Drink Consumption								
Often	1.00				1.00			
Rarlely	0.92	0.45	1.86	*0.823*	1.37	0.57	3.26	*0.473*
Never	1.86	0.98	3.55	*0.057*	2.86	1.19	6.86	***0.018***
Instant Food Consumption								
Often	1.00				1.00			
Rarlely	0.87	0.53	1.43	*0.593*	0.74	0.40	1.40	*0.366*
Never	1.68	0.89	3.16	*0.104*	0.99	0.43	2.27	*0.995*
Vegetables Consumption								
Never	1.00				1.00			
Not everyday	0.69	0.14	3.33	*0.645*	1.05	0.15	6.50	*0.996*
Everyday	0.79	0.16	3.76	*0.770*	1.34	0.21	8.53	*0.756*

Conclusion

Based on this study, it can be concluded that joint disease has a significant relationship with age over 60 years, not working or housewife, not smoking, rarely consuming meat, and never consuming soft drinks, while never eating salty foods can reduce the risk of joint disease. The results of this study indicate that it is necessary to improve a healthy lifestyle and balanced dietary behavior to reduce the incidence of joint disease.

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