Impact of smoking and obesity on rheumatic disease in persons of productive age

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ABSTRACT

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Arthritis is a disease of the joints that causes pain and musculoskeletal stiffness, and may cause limitation of joint movement. Age, obesity, smoking behavior, and occupation are risk factors for rheumatic diseases. The objective of the present study was to evaluate the role of body mass index (BMI), smoking behavior, and occupation on rheumatic disease among persons of productive age in Indonesia. A cross-sectional study was conducted using National Basic Health Research data. The inclusion criterion was age 15-64 years. Rheumatic disease diagnosis was based on interview results and was defined as the presence of a history of rheumatic disease diagnosed by health professionals and/or rheumatic symptoms in the past 12 months. The study sample consisted of 609.097 persons who fulfilled the inclusion criterion. Compared to persons with normal BMI, rheumatic disease was more prevalent in the overweight (OR 1.25; 95%CI 1.21—1.29) and the obese (OR 1.52; 95%CI 1.47—1.56), but less prevalent in the underweight (OR 0.91; 95%CI 0.88—0.93). Compared to non-smokers, rheumatic disease was more prevalent in every day smokers (OR 1.65; 95%CI 1.60—1.70), occasional smokers (OR 1.41; 95%CI 1.35—1.47), and ex-smokers (OR 1.85; 95%CI 1.76—1.95). Measures for prevention of rheumatic disease are needed, e.g. through education to increase knowledge about the impact of smoking and obesity on rheumatic disease.

Keywords: Rheumatic disease, smoking, body mass index, productive age

INTRODUCTION

Rheumatic disease comprises more than 100 disorders and conditions, constituting a health problem frequently experienced by the community. The most frequently encountered rheumatic diseases are osteoarthritis (OA) and rheumatoid arthritis (RA).[1] In 2001 there was an estimated 43 million people in America who reportedly had rheumatic disease.[2] One study stated that rheumatic disease was the cause of impaired mobility and agility in more than 30% of the elderly population.[3] The reported prevalence of rheumatic diseases or disorders vary considerably in a number of countries, being 33% in Australia, 26.3% in Bangladesh, 18.2% in India, and 14.9% in Vietnam.[4-7] The varying prevalence between countries indicates differences in the definition of rheumatic disease.

OA is the most frequently encountered type of arthritis throughout the world, particularly among the elderly, and the principal cause of disability both in developed as well as in developing countries.[8] The symptoms of OA initially appear around the age of 40 years and by the age of 50 years female OA patients outnumber males.[9] The etiology of OA is still undetermined, but the risk factors of OA are: (i) ethnicity; (ii) overweight; iii) joint injury; (iv) overuse of joints; (v) infrequent excercise; (vi) nerve injury; and vii) advanced age. There is a dearth of data on OA prevalence, due to problems of definition and methods of determining the onset of the disease. Worldwide, the proportions of male and female OA patients have been estimated at 9.6% and 18.0%, respectively.[10] In Australia, the incidence of OA in females is higher than in males of all age groups (2.95 per 1000 vs 1.71 per 1000 population). In females, the peak incidence is at age 65–74 years, while in males it is at age 75 years and over.[10] In Malaysia the prevalence of OA is around 10–20%.[11]

The incidence and prevalence of RA increase with age up to the age of 70 years and subsequently decrease. Females suffer from RA twice as frequent as males. The prevalence of RA in industrial countries is around 0.3-1%, while in developing countries it is estimated to be less than 0.3%.[10]

Although rheumatic disease is rarely fatal, the resulting pain may be extremely uncomfortable/incapacitating and may lead to limitations in activity and thus affect quality of life. The course of the disease is chronic, and if not properly treated may result in mild disability (joint damage) to severe disability (paralysis).

The data collected by the National Basic Health Research 2007 *(Riskesdas 2007)* include data on rheumatic disease and various variables such as individual characteristics,

BMI, and smoking behavior. [12] In this connection it was desired to analyze the *Riskesdas* 2007 data to determine the role of obesity and smoking on rheumatic disease in persons of productive age in Indonesia. This study is part of the research project on "Factors associated with rheumatic and inherited diseases in Indonesia according to Riskesdas data".[13]

METHODS

Design of the study

The study was of cross-sectional design, and attempted to attain the research objectives using the *Riskesdas* 2007 data.

Subjects of the study

The inclusion criterion of the study was age 15-64 years, resulting in a sample size of 609.097.

Data collection

The variables came from 3 types of questionnaire, i.e. the RKD07.RT (Riskesdas 2007 Household questionnaire), the RKD07.IND (Riskesdas 2007 Individual questionnaire), and the Susenas 2007 VSEN2007.K questionnaire (National Socio-economic Survey of the 2007 Census). Data on individual characteristics were obtained from the RKD07.RT questionnaire and data on rheumatic disease, smoking and BMI from the RKD07.IND questionnaire. Data on per capita household expenditure were from the Susenas 2007 VSEN2007.K questionnaire.[17]

The diagnosis of rheumatic fever was based on two questions, viz. (i) had respondent in the past 12 months been diagnosed as having rheumatic joint disease/rheumatism by health personnel and (ii) did respondent in the past 12 months ever suffer from aches/pain/stiffness/swelling around the joints and/or joint stiffness on waking up or after a long rest, that did not result from accidents.[14]

Data analysis

Data analysis was by means of the SPSS program version 15.0. Univariate, bivariate and multivariate analysis was performed on variables with p≤0.25 or on variables with p>0.25 that were theoretically influential. The level of significance was set at < 0.05 and the confidence interval at 95%.

RESULTS

A total of 609.097 respondents aged 15-64 years were recruited in this study. Only the data on the variables age, gender and type of residence were collected for an identical total of 609.097 (100%). Data on education, per capita expenditure, occupation, smoking, and BMI were obtained in differing percentages, i.e. respectively 99.63%, 99.61%, 99.59%, 99.54% and 97.04%.

The proportion of respondents aged 15-44 years was 71.9% while those between 45-64 years of age accounted for 28.1 %. The sample comprised 52% females and 48% males, among whom 55% were rural residents and 45% were urban residents. A total of 71.8% respondents had an educational level of junior high school *(SMP)* and lower, while 28.2% had an educational level of senior high school *(SMA)* and above. Among the respondents, 56.8% had a monthly per capita household expenditure in the 1-3 quintile range and 43.2% in the 4-5 quintile range. On the aspect of occupation, 32.6% of the respondents were farmers/fishermen/laborers, 21.4% housewives, 15.4% entrepreneurs, 11% employees, 17.2% without occupation and without education, and 2.4% "other".

The proportion of respondents with normal BMI was 67.5%, overweight 9.2%,

Table 1. Bivariate relationship between individual characteristics and rheumatic disease

Characteristics	N	Rheumatic disease (%)		OR*	95%CI**	p
		Yes	No			
Age (years)						
45-64	164.607	50.7	49.3	3.88	3.80—3.95	0.0001
15-44	444.490	21.0	79.0			
Gender						
Female	315.061	31.0	69.0	1.19	1.17—1.21	0.0001
Male	294.036	27.4	72.6			
Education						
≤ junior high *(SMP)*	435.168	33.7	66.3	2.27	2.21—2.32	0.0001
≥ senior high *(SMA)*	171.683	18.3	81.7			
Occupation						
Housewife	127.782	34.3	65.7	1.99	1.92—2.07	0.0001
Employee	62.156	19.9	80.1	0.95	0.90—0.99	
Entrepreneur	85.103	30.3	69.7	1.66	1.59—1.72	
Farmer/fisherman/laborer	210.866	37.3	62.7	2.27	2.19—2.35	
Other	15.621	26.4	73.6	1.37	1.29—1.46	
No occupation and no education	53.769	13.6	86.4			
Type of residence						
Rural	378.712	32.3	67.7	1.38	1.34—1.42	0.0001
Urban	230.385	25.7	74.3			
Per capita expenditure						
Quintile 1-3	344.551	30.4	69.6	1.13	1.11—1.16	0.0001
Quintile 4-5	262.178	27.9	72.1			

*OR = Odds Ratio; **95%CI = 95% Confidence Interval

Table 2. Relationship of BMI and smoking with rheumatic disease

Variable	N	Rheumatic disease (%)		OR*	95%CI**	p
		Yes	No			
BMI						
Underweight	73.985	24.8	75.2	0.85	0.82—0.87	0.0001
Overweight	52.568	34.4	65.6	1.34	1.31—1.38	
Obese	58.307	38.6	61.4	1.61	1.57—1.65	
Normal	406.206	28.1	71.9			
Smoking						
Daily	167.543	33.0	67.0	1.29	1.27—1.32	0.0001
Occasionally	37.282	27.1	72.9	0.98	0.94—1.01	
Ex-smoker	16.985	38.3	61.7	1.63	1.56—1.71	
Non-smoker	384.506	27.6	72.4			

*OR = Odds Ratio; **95%CI = 95% Confidence Interval

obese 10.5% and underweight 12.8%. The respondents who smoked daily accounted for 27.6%, those who smoked occasionally 6.3%, ex-smokers 3%, and those who never smoked (non-smokers) 63.2%. The proportion of respondents in the age range of 15-64 years with rheumatic disease was 29.3% and those without rheumatic disease 70.7%.

The results of the bivariate analysis on the relationship between individual characteristics and type of occupation on the one hand and rheumatic disease on the other hand are shown in Table 1, while the bivariate analysis results on BMI and smoking behavior versus rheumatic disease are shown in Table 2.

From the bivariate relationship in Table 1 it is apparent that the proportion of rheumatic diseases increases significantly with advancing age, lower educational level, rural residence and lower per capita household expenditure. In comparison with the group without occupation, the proportion of rheumatic disease was higher in farmers/fishermen/ laborers and housewives.

Table 2 shows the bivariate relationship between BMI and smoking behavior on the one hand and rheumatic disease on the other. From Table 2 it can be seen that in comparison to the proportion of rheumatic disease in respondents with normal BMI, the proportion

of rheumatic disease was higher in overweight and obese respondents and lower in underweight respondents. The proportion of rheumatic disease in respondents who smoked daily and in ex-smokers was higher when compared with the non-smokers.

The multivariate relationship between several factors and rheumatic disease is shown in Table 3. The variables fulfilling the criteria for multivariate analysis were age, gender, education, type of residence, occupation, monthly per capita household expenditure, BMI, and smoking behavior.

From the multivariate relationship shown in Table 3, it appears that all eight factors included in the analysis were significantly associated with rheumatic disease. In comparison to the respondents in the age group of 15-44 years, the proportion of rheumatic disease was 3.2-fold higher in the age group of 45-64 years. Compared with the respondents who never smoked, the proportion of rheumatic disease in the respondents who smoked daily was 1.6-fold, in ex-smokers 1.8-fold, and in non-smokers 1.4-fold higher. The proportion of rheumatic disease in respondents with an educational level of SMP and below was 1.6-fold higher than in those who had an SMA certificate or higher. In comparison with the group without occupation, the proportion of

Table 3. Multivariate relationship between several factors and rheumatic disease

Variable	Rheumatic disease(%)		OR*	95%CI**	p
	Yes	No			
Age (years)					
45-64	50.7	49.3	3.22	3.15—3.28	0.0001
15-44	21.0	79.0	Reference		
Gender					
Female	31.0	69.0	1.60	1.56—1.64	0.0001
Male	27.4	72.6	Reference		
Education					
< junior high *(SMP)*	33.7	66.3	1.62	1.58—1.66	0.0001
≥ senior high *(SMA)*	18.3	81.7	Reference		
Occupation					
Housewife	34.3	65.7	2.36	2.28—2.45	0.0001
Employee	19.9	80.1	1.69	1.62—1.77	
Entrepreneur	30.3	69.7	2.17	2.09—2.25	
Farmer/fisherman/laborer	37.3	62.7	2.43	2.35—2.51	
Other	26.4	73.6	1.86	1.74—1.99	
No occupation and no education	13.6	86.4	Reference		
Type of residence					
Rural	32.3	67.7	1.12	1.09—1.16	0.0001
Urban	25.7	74.3	Reference		
Per capita expenditure					
Quintile 1-3	30.4	69.6	1.07	1.05—1.10	0.0001
Quintile 4-5	27.9	72.1	Reference		
BMI					
Underweight	24.8	75.2	0.91	0.88—0.93	
Overweight	34.4	65.6	1.25	1.21—1.29	0.0001
Obese	38.6	61.4	1.52	1.47—1.56	
Normal	28.1	71.9	Reference		
Smoking					
Daily	33.0	67.0	1.65	1.60—1.70	
Occasionally	27.1	72.9	1.41	1.35—1.47	
Ex-smoker	38.3	61.7	1.85	1.76—1.95	0.0001
Non-smoker	27.6	72.4	Reference		

*OR = Odds Ratio; **95%CI = 95% Confidence Interval

rheumatic disease was higher in farmers/ fishermen/laborers and housewives. In comparison with the respondents with normal BMI, the proportion of rheumatic disease in the overweight and obese were 1.2- and 1.5-fold, respectively.

DISCUSSION

In the present study the proportion of rheumatic disease was 21.0% in Indonesians of productive age between 15-44 years and 50.7% in the age group of 45-64 years. The results of the 1997 US National Health Interview Study (NHIS) showed a prevalence of arthritis of 30% in the age range of 55-64 years and of 45-46% in the age range of 65-84 years, thus differing from the present study results.[15]

The results of the present study indicate that the prevalence of rheumatic disease is higher females than in males and increases with age. This is consistent with the results of the US National Health Interview Survey (NHIS) for 2003–2005, showing a higher prevalence of rheumatic disease for females (25.4%) as

compared to males (17.6%). In this survey the prevalence of rheumatic was also higher in the older age groups, namely 29.3% in the age range of 45-64 years and 50% in the 65+ group, as compared to 7.9% in the age group of 18-44 years.[16] Similarly, the present study results showed that the risk of rheumatic disease in the age group of 45-64 years is 3 times that in the age group of 15-44 years. One of the rheumatic diseases frequently encountered is OA, which is a degenerative disorder. Age is the principal determinant of OA, as the incidence and prevalence of OA is proportional to age, and OA is the main cause of rheumatic disease in the 65+ population group.[17]

In respect to occupation, the risk of rheumatic disease was higher in the group of farmers/fishermen/laborers and in housewives. In the occupations of farmer/fisherman/laborer, the persons involved commonly must perform muscular work, such as lifting of loads and working in non-ergonomical positions, which in the long run may lead to complaints of pain in the involved joints. Similarly, the occupation of housewife is connected with lifting and stooping movements or working in non-ergonomical positions. In addition, as the occupation of housewife is predominantly a female occupation and the female gender is one of the risk factors of rheumatic disease, this combination of factors is presumably associated with the high prevalence of rheumatic disease detected in the present study. Similar results were obtained in male Japanese workers aged ≥ 45 years, comprising factory laborers, construction workers, farmers or fishermen, who had a significantly higher risk of OA of the joints (OR = 2,54;95% CI 1.3-4.82).[18] However, the study found no association of activities such as standing, climbing stairs, kneeling, driving, and sitting with a higher risk of OA in male Japanese workers. Similar results were found in female Japanese workers.[19]

Compared with the respondents with normal BMI, the risk of rheumatic disease was respectively 1.2 and 1.5 times higher in overweight and obese respondents. With respect to BMI, it was found that overweight and obesity were at higher risk for the occurrence of rheumatic disease, in comparison to normal body weight. The results obtained in the present study are consistent with those in the literature, in that one of the risk factors of rheumatic disease is overweight. A person with OA of the knee joint has in general a higher body weight as compared to persons without OA of the knee joint. A number of studies similarly showed that obesity increases the risk of OA. These studies also showed a positive correlation between BMI and severity of OA of the knee.[20-22] OA is due to the aging process, resulting in damage to joint cartilage. The involved joints are the frequently moved and weight-bearing joints, such as the carpal, elbow, lumbar, knee and tarsal joints.

There were several limitations in this study, such as lack of specific data on the type of rheumatic disease and on the location, number and size of the involved joints. Therefore the present study was unable to project the prevalence of specific joint disorders. As arthritis may cause functional impairment, disability, and impaired quality of life, this may lead to future socio-economic problems. Attention should be focussed on prevention of OA in order to reduce the problems associated with this disease. Obesity is a remediable risk factor for several types of joint disorder, thus epidemics of obesity should be contained by weight control, changes in dietary patterns and increased physical activity, in order to impact on the prevalence of arthritis. Every patient with rheumatic disease should receive counseling regarding this disorder. Changes in lifestyle are necessary to ensure that these patients remain physically fit and be capable of controlling their disease. In the case of severe disease the patient should be referred to a physiotherapist.

CONCLUSION

In Indonesians of productive age, BMI, smoking, and occupation are the most influential among the various factors affecting rheumatic disease, indicating the importance of obesity prevention and the urgent need of a behavioral approach to weight control.

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