

Biopsychosocial Factors of Infertility among Men in Surakarta, Central Java

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ABSTRACT

Background: Impaired fertility affects 7–17% of all couples. Isolated male factor infertility may occur in 20% of all infertile couples. One recent study demonstrated a high rate of erectile dysfunction, depressive symptoms, and dysfunctional sexual relationships among male partners of infertile couples. This study aimed to examine the biopsychosocial factors on infertility among men in Surakarta, Central Java.

Subjects and Method: This was a cross-sectional study conducted at Sekar Clinic (Infertility Clinic), Dr. Moewardi Hospital, Surakarta, Central Java, from January to May 2018. A sample of 120 men was selected by fixed disease sampling. The dependent variable was infertility. The independent variables were age, body mass index (BMI), smoking, occupational radiation exposure, stress, and physical activity. Data on infertility were obtained from medical record. The other variables were measured by questionnaire. The data were analyzed by path analysis run on Stata 13.

Results: Male infertility was directly and positively associated with age ≥ 40 years ($b=1.45$; 95% CI= 0.34 to 2.49; $p=0.010$), BMI ≥ 25 ($b=0.98$; 95% CI= -0.95 to 2.05; $p=0.074$), smoking ($b=0.98$; 95% CI= 0.57 to 1.91; $p=0.037$), occupational radiation exposure ($b=1.63$; 95% CI= 0.52 to 2.75; $p=0.004$), and lack of physical activity ($b=1.11$; 95% CI= 0.13 to 2.09; $p=0.027$). Male infertility was indirectly associated with stress.

Conclusion: Male infertility is directly and positively associated with age ≥ 40 years, BMI ≥ 25 , smoking, occupational radiation exposure, and lack of physical activity. Male infertility is indirectly associated with stress.

Keywords: infertility, male, smoking, body mass index, occupational radiation exposure, path analysis

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BACKGROUND

Couples or spouses always want the presence of a child who is expected to continue his lineage. There are some couples who are not easily to have children because of several problems. Infertility is a condition where couples are not able to have children despite having sexual intercourse 2-3 times a week, within a period of 1 year without using any kind of contraceptive instrument. Infertility is still one of the most important, serious and worrying

issues, since infertility issues are not only a medical problem but also an economic and psychological problem. In the case of female infertility, it has always been the source of the problem, whereas the possibility of infertility not only comes from women alone, but men also participate and have an important role in it (Copen and Stephen, 2013; Polis et al., 2017; WHO, 2016).

Infertility occurs worldwide, 48.5 million couples from all over the world at

the highest fertility rates in Africa and Europe, 8-12% was infertile, while in the United States 10% are infertile due to factors from women and men. According to WHO (2017), the prevalence of infertility still reaches 60-80 million couples worldwide. According to World Population Data Sheet (2013), Indonesia is the fifth country in the world with the largest population with the estimation of 249 millions. Among ASEAN countries, Indonesia with the largest region remains the country with the largest population, far above 9 other countries. Indonesia Fertility rate is 2.6 or still above the ASEAN TFR average of 2.4. Not all couples are fertile, but some couples have infertility. In Indonesia the number of infertility couples of productive age is 12-15%. Infertility is 40% influenced by men, 40% is influenced by women and 20% is influenced by both of them (HIFERI, 2013; Ministry of health, 2014; Kumar et al, 2015; WHO, 2017).

Important biospicosocial models are studied in order to know the importance of forces from outside or from within. Infertility is also influenced by biological, psychological and social factors. As for some of the factors affecting infertility itself because women who are <30 years old and men who are <35 years old have the highest levels of fertility (Sharma et al., 2013), Body Mass Index was associated with obesity in men. Out of 2384 study subjects, 620 (26 %) were overweight and 298 (12.5%) of them were obese and had sperm concentrations that tend to be lower than men with normal BMI (Wang et al., 2017), smoking habits in a study that Sansone et al (2018) had conducted a significant decrease in smokers' sperm concentrations compared with non-smokers, physical exercise, studies conducted by (Durairajanayagam, 2018) shows that 27% of stress factors are significantly affected by decreased testos-

terone levels, occupations involving exposure to harmful substances to fertility, nutritional status affecting the system reproduction, excessive alcohol consumption can cause interference with hypothalamus and pituitary function, polluting or near-industrial environment affecting sperm quality, and educational level (Agarwal et al., 2015; Kazemijaliseh et al., 2015; Peyromusavi et al., 2015).

The purpose of this study was to analyze the relationship of age, BMI, smoking, occupational type, stress, and physical activity.

SUBJECTS AND METHOD

1. Study Design

This was analytic observational study with a cross sectional design. The study was conducted at Sekar Clinic, Dr. Moewardi hospital, Surakarta, Central Java, from January to May 2018.

2. Population and Sample

The population in this study was all men who visit the Sekar Clinic and analyzed sperms at Dr. Moewardi hospital. A sample of 120 men was selected by fixed disease sampling, comprising 55 infertile men and 65 fertile men.

3. Study Variables

The dependent variable is infertility in men. The independent variables include: age, BMI, smoking habits, occupation, stress level, and physical exercise.

4. Operational Definition of Variables

Infertility was defined as a condition in a male within >1 year, although having sexual activity 2-3 times in a week without any kind of contraception, they do not have children, and the number, concentration, pH, volume, morphology, and mortality male sperm is less than normal. The data were obtained from medical record. The measurement scale was categorical, coded 0 for fertile and 1 for intertile.

Age was defined as the age of men when coming to the Sekar Clinic. The data were collected by questionnaire. The measurement scale was continuous, but for the purpose of data analysis, it was transformed into dichotomous, coded 0 for <40 years and 1 for ≥40 years.

Body mass index (BMI) was defined as a weight classification calculated on the basis of height and weight measurement. The measurement scale was continuous, but for the purpose of data analysis, it was transformed into dichotomous, coded 0 for <25 and 1 for ≥25.

Smoking was defined as a person consuming cigarettes. The data were collected by questionnaire. The measurement scale was categorical, coded 0 for no and 1 for yes.

Occupational type was defined as a form of activity undertaken by research subjects to earn income exposed to chemicals, toxic gases, and radiation. The data were collected by questionnaire. The measurement scale was categorical, coded 0 for no and 1 for yes.

Stress was defined as a condition in which a person experiences psychological distress. The measurement scale was continuous, but for the purpose of data analysis, it was transformed into dichotomous, coded 0 for low and 1 for high.

Physical activity was defined as an exercise perform to maintain physical fitness. It was measured by intensity, volume, and frequency. The measurement scale was continuous, but for data analysis, it was transformed into dichotomous, coded 0 for low and 1 for high.

5. Data Analysis

The data were analyzed by path analysis run on Stata 13 to estimate the relationships of the independent variables to the dependent variables.

6. Research Ethics

The research ethics included informed consent, anonymity, confidentiality and ethical clearance. The ethical clearance in this study was obtained from Research Ethics Committee, Dr. Moewardi hospital, Surakarta, Central Java, Indonesia, and was declared as worthy of ethics based on decision letter number: 386 / IV / HREC / 2018.

RESULTS

1. Univariate Analysis

Table 1 shows that most of the study subjects aged <40 years (85, 70.8%) and BMI ≥25 (82, 68.3%).

Men who smoke were 58 (48.3%) and those who do not smoke were 62 (51.7%). Subjects with exposed occupation were 29 (24.2%) and those who were not exposed were 91 (75.8). Men with stress level ≥14 were 65 (54.2%) and those with no stress <14 were 55 (45.8%). Men with physical exercise <150 minutes/week were 49 (40.8%) and ≥150 minutes/ week and never did physical exercise were 71 (59.2%).

Table 1. Univariate Analysis

Variable	n	(%)
Infertility		
Infertile	55	45.8
Fertile	65	54.2
Age		
<40 years old	85	70.8
≥40 years old	35	29.2
Body Mass Index		
>18.5-25	38	31.7
≥25	82	68.3
Smoking habit		
Smoking	58	48.3
Not smoking	62	51.7
Occupation		
Exposed	29	24.2
Did not expose	91	75.8
Stress Level		
Stressed ≥14	65	54.2
Not Stressed <14	55	45.8
Physical Exercise		
<150 minutes/ week	49	40.8
≥150 minutes/week	71	59.2

2. Bivariate Analysis

Bivariate analysis was used to observe the association of independent variables (age, BMI, smoking habit, occupation type, stress

level, and physical exercise) with the dependent variable (male infertility). The result of bivariate analysis can be seen in Table 2.

Table 2. Bivariate analysis on the factors affected to men infertility

Dependent Variables	Fertile		Infertile		OR	95% CI	p
	n=65	%	n=55	%			
Age							
<40 years old	58	68.2	27	31.8	8.59	3.34 to 22.12	<0.001
≥40 years old	7	20.0	28	80.0			
BMI							
>18.5-25	30	78.9	8	21.1	5.04	2.06 to 12.32	<0.001
≥25	35	42.7	47	57.3			
Smoking							
Not Smoking	44	71.0	18	29.0	4.31	2.00 to 9.27	<0.001
Smoking	21	36.2	37	63.8			
Type of Employment							
Not Exposed	59	64.8	32	35.2	2.72	1.29 to 5.73	<0.001
Exposed	6	20.7	23	79.3			
Stress Level							
Low <14	37	67.3	18	32.7	2.72	1.29 to 5.73	<0.001
High ≥14	28	43.1	37	56.9			
Physical Exercise							
<150 minutes/week	36	73.5	13	26.5	4.01	1.81 to 8.85	<0.001
≥150 minutes/week	29	40.8	42	59.2			

3. Path analysis

Figure 1 depicted structural model of path analysis with parameter estimates. Men's infertility was directly affected by age, BMI,

physical activity, smoking, and employment status. Men's infertility was indirectly affected by stress, smoking, and employment status.

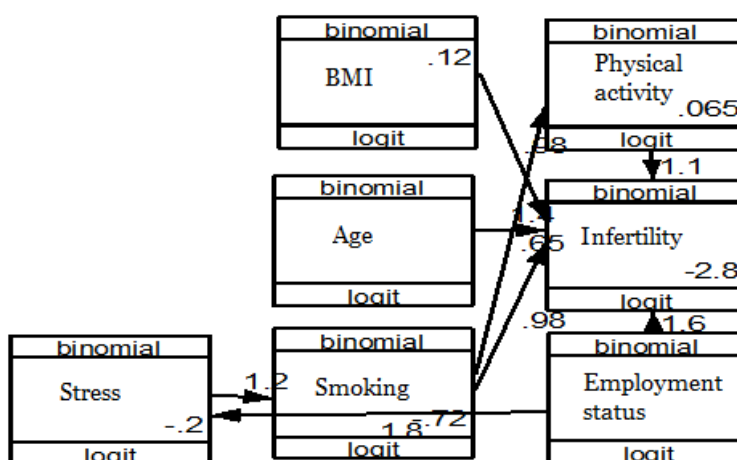


Figure 1. Structural model with parameter estimates

Table 3 showed that there was a significant relationship between age, BMI, smoking habit, type of employment, and physical exercise on men infertility.

Infertility has a positive association with age (b= 1.42; 95% CI= 0.34 to 2.49; p= 0.010), BMI (b= 0.98; 95% CI= -0.09 to 2.05; p= 0.074), smoking habit (b= 0.98; 95% CI= 0.06 to 1.91; p= 0.037), type of

employment (b= 1.63; 95% CI= 0.52 to 2.75; p= 0.004), physical exercise (b= 1.11; 95% CI= 0.13 to 2.09; p= 0.027).

Physical exercise was positively affected by smoking (b= 0.65; 95% CI= -0.86 to

1.39; p= 0.083). Stress was positively affected by type of employment (b= 1.77; 95% CI= 0.72 to 2.81; p=0.001). Smoking was positively affected by high stress (b= 1.19; 95% CI= 0.44 to 1.94; p=0.002).

Table 3. The result of path analysis on the factors affecting men's infertility

Dependent variables	Independent variables	b	95% CI		p
			Lower Limit	Upper Limit	
Direct Effect					
Infertility	← Age	1.42	0.34	2.49	0.010
Infertility	← BMI	0.98	-0.09	2.05	0.074
Infertility	← Smoking	0.98	0.06	1.91	0.037
Infertility	← Type of Employment	1.63	0.52	2.75	0.004
Infertility	← Physical Exercise	1.11	0.13	2.09	0.027
Indirect Effect					
Physical Exercise	← Smoking	0.65	-0.09	1.39	0.083
Stress	← Type of Employment	1.77	0.72	2.81	0.001
Smoking Habit	← High stress	1.19	0.44	1.94	0.002

DISCUSSION

1. The relationship between age and infertility among men

The result of analysis showed that age affected the infertility among men, and it was statistically significant. Men who were ≥ 40 years old have risk by 1.42 times to have infertility.

The result of this study was in accordance with a study by Eisenberg et al. (2014), which stated that sperm quality was decreased at the age of 40-49 years old. The incidence of infertility was increased at the age of more than 35 years old (Somigliana et al., 2016)

2. The relationship between BMI and infertility among men

The result of analysis showed that there was an effect between BMI and infertility among men. Men with BMI ≥25 increased the risk of infertility.

The result of this study was in line with a study by Wang et al. (2017), which stated that someone who was overweight or obese has sperm concentrations and low sperm motility compared to men who have

normal weight. In addition, a person with a BMI of ≥25 may inhibit the synthesis of testosterone which can lead to poor sperm quality. Overweight increased the likelihood of asthenozoospermia and oligozoospermia. BMI and sperm parameters showed that there was a significant relationship between obesity and sperm production (volume, concentration, and amount).

3. The relationship between smoking habit and infertility among men

The result of analysis showed that there was an effect between smoking and infertility among men. Smoking increased the risk of infertility.

The result of this study was in accordance with a study by Durairajanayagam (2018), which stated that there was a relationship between smoking habit and infertility among men. Men with smoking habits could disrupt spermatogenesis that affected the sperm quality and DNA damage.

4. The relationship between type of employment and infertility among men

The result of analysis showed that there was an effect between type of employment and infertility among men.

The result of this study was in accordance with a study by Uygungül et al. (2014), which stated that there was a relationship between type of employment and infertility among men. Employment with radiation exposure, a hot environment, exposure to chemicals, and toxic gases could affect the quality of sperm that caused oligozoospermia by 1.8 times and increase the risk by 5.23 times to have teratozoospermia.

The type of employment has a role in the occurrence of the disease through several ways. One of them was the relationship between the work and the disease either directly or indirectly such as exposure to chemicals, toxic, gas, radiation, and no body movement in a job that can lead to diseases, one of them was it can affect the quality of sperm that lead to infertility (Indarwati et al., 2017)

5. The relationship between physical exercise and infertility among men

The result of analysis showed that there was an effect between physical exercise and infertility among men. Men with excessive physical exercise and never do physical exercise have risk by 1.11 times to experienced infertility.

Physical exercise was done to improve physical fitness, improve health, and quality of life with the intensity and appropriate volume (Vaamonde et al., 2017). Excessive physical exercise with higher intensity can affected sperm concentration, the amount of sperm, and sperm morphology (Jozkow et al., 2017).

6. The relationship between smoking habit and infertility among men through physical exercise

The result of analysis showed that there was an effect between smoking and infertility among men through physical exercise.

A study by Lee and Yi (2016) stated that there was a relationship between smoking habit and physical exercise. A smoker was significantly less likely to consume fruits, vegetables, and milk, they also tend to prefer fast food, therefore, it affected his physical exercise.

7. The relationship between type of employment and infertility among men through stress level

The result of analysis showed that there was an effect between type of employment and infertility among men through stress.

The result of this study was in line with a study by Lee and Yi (2016), which stated that tasks, workload, time, environment, and work management affected stress, the higher the workload of a person, the higher the level of stress.

8. The relationship between stress level and infertility among men through smoking habit

The result of analysis showed that there was an effect between stress level and infertility among men through smoking.

The result of this study was in accordance with a study by Lawless et al. (2015), which stated that a person who experienced stress would affect the smoking habit. Many people believe that smoking can heal the stress (Altunay et al., 2013).

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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