The erection conundrum: risk factors for erectile dysfunction among middle-aged and elderly men in Lamongan, East Java, Indonesia

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ABSTRACT

Background: The most common sexual problem affecting the general population of men is Erectile Dysfunction (ED) with a global estimated number of over 100 million. It affects the biological, psychological, and social aspect of life which can cause frustration, depression, and anxiety. Unfortunately, the attention towards the disease in Indonesia is often overlooked as evidenced by the lack of studies regarding the prevalence and risk factors for the disease. This study aims to evaluate possible risk factors of Erectile Dysfunction among elderly males in Lamongan, East Java.

Methods: This is a quantitative study with an analytical observational design, performed using a case-control approach. Respondents consisted of male inpatients as well as outpatients aged 40 years or more in Ngimbang General Hospital evaluated using the International Index of Erectile Function (IIEF) questionnaire. The patient's comorbid data are taken from the Medical Record to ensure proper diagnosis. The acquired data are then analysed using the ordinal logistic regression method.

Results: A total of 174 men were evaluated. There are 62 people with no ED (35.6%), 39 people with mild ED (22.4%), 35 people with mild to moderate ED (20.1%), 16 people with moderate ED (9.2%), and 22 people with severe ED (12.6%). Significant risk factors are older age (OR: 1.29; CI: 1.23-1.37), Diabetes (OR: 6.56; CI: 2.77-15.56), and hypertension (OR: 5.19; CI: 2.27-11.88) (all, $p < 0.05$); whereas dyslipidemia and smoking habit are insignificant ($p > 0.05$).

Conclusion: Age, diabetes, and hypertension are significant risk factors for Erectile Dysfunction.

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INTRODUCTION

Erectile dysfunction is one of the most common sexual dysfunctions affecting the general population of men.[1] It is estimated that currently around 150 million men have some degree of ED The concerning number will continue to increase and predicted to reach 322 million cases by the year 2025.[2] Even though the disease has no direct impact to a person's mortality or morbidity, to some men, a penis is more than a sexual and urinary organ. It is considered to be a symbol of masculinity and male prowess.[3] Sexual desire followed by the inability to fulfil that desire could affect the quality of life of patients causing frustration, depression, and anxiety.[4]

Only a few of the available treatments currently offer a complete, satisfying response for each specific individual. Moreover the cost of the treatment modalities is often burdening especially for people in developing countries. The strategy to tackle this problem has to be balanced between the intention of improving the quality of life of patients and overall health with the cost of therapy and evaluation.[5] Based on these considerations, prevention is the most effective approach to alleviate the

consequences. Previous studies suggested several risk factors associated with the disease are age, diabetes, hypertension, dyslipidemia, and smoking habit.[6-8]

Even though previous studies have suggested several possible risk factors to the disorders, albeit some results are contradictory, different demographics may provide different results. In Indonesia, there is a disturbing lack of studies focusing on epidemiology and risk factors of ED. As of the publication of this study, there is only one published study of the prevalence of ED in Indonesia reported by Nicolosi et al.[9] To contribute additional information regarding the epidemiology of ED and its associated risk factors in Indonesia, this study aims to evaluate the possible risk factors of ED consisting of age, diabetes, hypertension, dyslipidemia, and smoking habit among middle-aged and elderly male.

METHODS

We performed a quantitative study with an analytical observational design, performed using a case-control approach. Consecutive sampling was

chosen as the sampling method. The respondents consisted of male inpatients as well as outpatients aged 40 years or more in Ngimbang General Hospital from February to May 2019. The patient's comorbid data consisting of age, history of diabetes, hypertension, dyslipidemia, and smoking habit were taken from the Medical Record to ensure proper diagnosis. The diagnosis and staging of ED are measured using the standard International Index of Erectile Function (IIEF) questionnaire. The comorbid data were taken and analysed as the independent variables acting as numerical data for age and nominal for the rest of the risk factors. The ED stages were analyzed as the dependent variable. The acquired data are then analysed using the ordinal logistic regression method with IBM SPSS 23.0.

RESULTS

Out of more than 200 respondents that we have managed to gather to evaluate, a total of 174 male respondents consented and were eligible to be evaluated. Based on table 1, most samples have no ED (n = 62, 35.6%). Instead of merely diagnosing the presence of ED among the samples, the stages of the disease are also evaluated. They are mostly around 70-79 years of age (n = 49, 28.2%). A staggering amount of samples were suffering from diabetes (n = 85, 48.9%), hypertension (n = 79, 45.4%), and dyslipidemia (n = 91, 52.3%). More than half of them have also developed a smoking habit (n = 91, 52.3%) (Table 1).

Unsurprisingly, only a few samples are more than 80 years of age and they suffered from at least a moderate type of ED as shown in table 2. Most of them were not bothered and consider that a decrease in sexual function is normal to have at a certain age. Samples with no history of diabetes at most only suffer from a mild to moderate form of ED (n = 13). Most of them did not even have any complaint related to the disease (n = 44) as shown in table 3.

A few samples with no hypertension suffer from moderate ED (n=3). However similar to diabetes, most that did not have the comorbid history only suffered from a mild form (n = 32) or did not suffer from the disease at all (n = 47) as shown in table 4. A few samples with no hypertension suffer from moderate ED (n=3). However similar to diabetes, most that did not have the comorbid history only suffered from a mild form (n = 32) or did not suffer from the disease at all (n = 47) as shown in table 4. Samples with or without dyslipidemia seem to have ED at certain degrees as shown in table 5. Surprisingly, there are more samples with dyslipidemia with ED (n = 38) compared to those without dyslipidemia (n = 24). A similar result can be seen in the crosstabulation between smoking habit and ED in table 6. Samples with no ED mostly smoking (n = 40).

The risk factors are assigned as independent variables whereas the severity of ED is assigned as the dependent variable. To avoid any significance bias, a multivariate type analysis has to be performed. Ordinal logistic regression analysis is chosen since the dependent variable is an ordinal data. Based on the results in table 7, the significantly associated (p < 0.05) variables are age (OR: 1.298; CI: 1.229-1.370), diabetes (OR: 6.561; CI: 2.766-15.564), and hypertension (OR: 5.186; CI:

Table 1 Subject Characteristics

Characteristics	n	%
Erectile Dysfunction		
No ED	62	35.6
Mild ED	39	22.4
Mild to Moderate ED	35	20.1
Moderate ED	16	9.2
Severe ED	22	12.6
Age		
40-49 years old	24	13.8
50-59 years old	46	26.4
60-69 years old	38	21.8
70-79 years old	49	28.2
> 80 years old	17	9.8
History of Diabetes		
Yes	85	48.9
No	89	51.1
History of Hypertension		
Yes	79	45.4
No	95	54.6
History of Dyslipidemia		
Yes	91	52.3
No	83	47.7
Smoking Habit		
Yes	91	52.3
No	83	6.6

Table 2 Age and ED

Stages	40-49	50-59	60-69	70-79	> 80
No ED	22	31	8	1	0
Mild ED	2	12	18	7	0
Mild to Moderate ED	0	3	7	25	0
Moderate ED	0	0	5	11	0
Severe ED	0	0	0	5	17
Total	24	46	38	49	17

Table 3 Diabetes and ED

Stages	Diabetes	No Diabetes
No ED	18	44
Mild ED	7	32
Mild to Moderate ED	22	13
Moderate ED	16	0
Severe ED	22	0
Total	85	89

Table 4 Hypertension and ED

Stages	Hypertension	No Hypertension
No ED	15	47
Mild ED	7	32
Mild to Moderate ED	22	13
Moderate ED	13	3
Severe ED	22	0
Total	79	95

Table 5 Dyslipidemia and ED

Stages	Dyslipidemia	No Dyslipidemia
No ED	38	24
Mild ED	22	17
Mild to Moderate ED	15	20
Moderate ED	5	11
Severe ED	11	11
Total	91	83

Table 6 Smoking Habit and ED

Stages	Smoking	No Smoking
No ED	40	22
Mild ED	18	21
Mild to Moderate ED	14	21
Moderate ED	9	7
Severe ED	10	12
Total	91	83

Table 7 Ordinal Logistic Regression Analysis

Independent Variables	Odds Ratio (OR)	p-value	CI 95%
Age	1.298	0.015	(1.229-1.370)
Diabetes	6.561	0.014	(2.766-15.564)
Hypertension	5.186	0.023	(2.263-11.884)
Dyslipidaemia	0.955	0.896	(0.481-1.896)
Smoking Habit	0.971	0.933	(0.491-1.919)

2.263-11.884). Dyslipidemia and smoking habit are not significantly associated (p>0.05).

DISCUSSION

The findings in this study, which indicate that there are significant previously suggested risk factors associated with ED among the respondents, show that they are indeed in line with most previous studies. However, there are interesting results which may be contradictory with several previous studies.

Erectile Dysfunction and Age
The prevalence of the disease in men among men between the age of 40 to 49 years old is around 2% to 9%. The percentage increases for 60 to 69 years old becoming 20% to 40%. The highest rate, 50% to 100%, occurs in those older than 70 years old.[10] In this study, as age progresses so does the risk of suffering from a severe form of ED (OR: 1.298; CI: 1.229-1.370) (p = 0.015). In an ageing male, the risk of ED increases due to hormonal and morphological alterations. Decrease of testicular function resulting in testosterone deficiency is quite commonly seen in elderly men.[11] Testosterone is necessary to maintain erectile functions. However, it was only correlated with libido and nocturnal erections but not with ED specifically. Thus, testosterone replacement as a treatment is effective only in cases of testosterone deficiency but not in patients with normal testosterone levels. Androgens in general have a role in maintaining the penile nerve network and structural integrity of the corpus cavernosum.[12] In relation to the physiological mechanism of erection, testosterone aids in the vasodilation of the penis by contributing to the production of nitric oxide by the vascular endothelium.[13,14] It also has a role in mediating alpha-adrenergic activity in the vascular smooth muscle cells to maintain the relaxation of corporal veins. Even though other previous studies believe that ageing and ED are also associated with the presence of high metabolic syndrome occurrences in the elderly, the results of this study show that the significance of older age is independent factor apart from the presence of diabetes, hypertension, or dyslipidemia for ED.

Erectile Dysfunction and Diabetes
In diabetic patients the risk of ED increases 3 to 4 folds.[15] The presence of metabolic syndrome and diabetes in animal model cause a central hypogonadism affecting the hormone production in the pituitary and hypothalamus gland.

The hypothalamus-pituitary axis might also be disrupted. The disturbance causes a decrease in gonadotropin hormone production which results in a testosterone deficiency. Patients with diabetes tend to develop ED in much earlier and severe symptoms.[16] In an uncontrolled diabetic patient the damage also occurs in the endothelium hindering the corporeal smooth muscle relaxation and decreasing nitrous oxide bioavailability.[17,18] Peripheral sensory afferentation can also be impaired.[19] The impact of diabetes on the severity of ED can be seen in our study as they are significantly (p = 0.014) associated (OR: 6.561; CI: 2.766-15.564). Out of the other significant risk factors, diabetes has the most active association among the others variables.

Erectile Dysfunction and Hypertension
The prevalence of hypertension in ED patients in the USA is considerably high, reaching 41% of all patients with ED.[20] In line with this data, hypertension is significantly (p=0.023) associated with ED (OR: 5.186; CI: 2.263-11.884) in this study. The direct impact of chronic high blood pressure is due to systemic increase of oxidative stress. Erectile tissue is the front line of endothelial dysfunction and an early end-organ target before there are manifestations of systemic vascular alterations.[21] This implies that before there may be clinical signs of ED before there are damages in other organs, which supports the role of hypertension as an independent risk factor to ED regardless of the presence of other cardiovascular diseases. Uncontrolled chronic hypertension could eventually lead to collagen accumulation and fibrosis.[22] On the contrary, several anti-hypertensive medications such as diuretics and first generation of beta-blockers have slightly detrimental but reversible in short term effects on erection.[23]

Erectile Dysfunction and Dyslipidemia
Several previous studies have concluded that there is an association between dyslipidemia, specifically hyperlipidemia, and ED based on the significance of a high concentration of low-density lipoprotein.[24] In theory, dyslipidemia causes a systemic inflammation which in turn increases overall oxidative stress and endothelial dysfunction.[23] However, a survey conducted by Hall et al. on 1899 men aged 30-79 years showed no association between untreated dyslipidemia and ED.[25] An experiment performed on rabbits showed that chronic untreated hypercholesterolemia reduces endothelium-dependent relaxations, but not the ones in corpus cavernosum.[26] Both studies tie well to the result of this study which shows that the association between dyslipidemia and ED (OR: 0.955, CI: 0.481-1.896) is not significant (p = 0.896).

Erectile Dysfunction and Smoking Habit
The assumption that smoking could lead to ED has been common knowledge for a long time. This study shows an impressive result, in which the association of smoking and ED is not significant (p = 0.933) (OR: 0.971, CI: 0.491-1.919). Past studies examining the association of smoking habit and ED resulted in multiple contradicting conclusions. Several studies claimed that smokers, both active and passive, have a higher risk for ED compared to non-smokers.[27,28] However, causative effect of smoking and ED has yet to be proven. A study conducted on rats showed that exposure to smoking reduces penile nitrous oxide bioavailability, but erectile responses were not reduced.[29]

For future studies, a cohort multi-centre study should be performed in Indonesia. A cohort study focusing on a more detailed analysis of each exclusive risk factors could prevent possible biases compared to a case-control approach in this study. Diabetes, hypertension, and dyslipidemia should be evaluated based on the stages of each disease to examine further the difference that could be present. Smoking habit should also be elaborated into duration, frequency, and quantity of smoking. A nation-wide multicenter study could provide valuable data for the epidemiology of ED and its risk factors in Indonesia.

CONCLUSION

Older age, diabetes, and hypertension are significant risk factors for Erectile Dysfunction among middle-aged and elderly men in Lamongan, East Java.

ETHICAL CLEARANCE

This study has been approved by the Research Ethical Committee of Ngimbang General Hospital.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest.

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AUTHOR CONTRIBUTIONS

YPK contributes for main idea, data collecting, primary writer. BH data gathering, secondary writer. DRT data collecting, secondary write. All were contribute for review of the manuscript and proofreading.

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