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RESEARCH ARTICLE

Epidemiology of erectile dysfunction: A cross-sectional web-based survey conducted in an Indonesian national referral hospital [version 1; peer review: 2 approved with reservations]

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Abstract

Background: Many epidemiological studies have demonstrated a high prevalence of erectile dysfunction (ED) in different parts of the world. The objective of the present study was to establish the prevalence of ED in a healthy population from Indonesia and risk factors associated with ED.

Methods: We performed a cross-sectional study to estimate the prevalence of erectile dysfunction in relatively healthy males in Jakarta that aged 20 to 80 years old. This cross-sectional study utilizes a web-based survey containing a translated version of The International Index of Erectile Function (IIEF-5) in Indonesian. Sexual domain functions in the IIEF-5 include 4 domains of erectile function starting from erection confidence, erection firmness, erection maintenance and sexual satisfaction.

Results: The mean age of respondents is 38.7 ± 12.6 years old. Most of the respondents were married (77.2%), had completed or undertaking tertiary education (66.3%) and worked in privately established companies (35.7%). The prevalence of ED was 35.6% (22.3% mild, 13.7% mild to moderate, 3.1% moderate and 0.8% severe). The prevalence of ED ranges from 6.5% in the 20-29 year old group, to as high as 88.0% in respondents aged 60 years old and above. Age, hypertension, stroke, history of heart disease, diabetes, kidney disease, history of prostate operations and interpersonal stress are significantly associated with ED (p -value = <0.001, <0.001, 0.015 0.000, 0.01, 0.002, <0.001 and 0.022 respectively).

Conclusion: The prevalence of ED in Indonesia is about 35.6%. The prevalence of ED in this study ranges from 6.5% to as high as 88.0%. Age, hypertension, stroke, history of heart disease, diabetes, kidney disease, history of prostate operation and interpersonal stress are significantly associated with ED.

Keywords

erectile dysfunction, epidemiology, Indonesia, web-based, survey, IIEF-5, prevalence, risk factors

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Introduction

Erectile dysfunction (ED) is principally defined as the inability to reach and maintain an adequate erection to achieve satisfying sexual intercourse¹. Although not life-threatening, erectile dysfunction has a huge impact on the quality of life of the patient as well as their sexual partners with consequential fear, depression and loss of confidence or self-esteem.

Many epidemiological studies have demonstrated high prevalence of ED in different parts of the world. For instance, the Cologne Male Survey have found that the prevalence of erectile dysfunction could be as high as 19.2% amongst a group of male responder aging between 30 to 80 years old². In the United states, about 18.4% of the adult male population (above the age of 20) suffered from sexual dysfunction³. Nikolosi *et al.* also explored sexual dysfunction in a number of Asian countries and found that approximately 15% of the whole Asian population suffers from ED⁴.

A simplified version of International Index of Erectile Function (IIEF-5) is a widely used self-administered questionnaires that has been translated and validated in many different languages. This questionnaire has a high degree of specificity and sensitivity to diagnose and evaluate the prevalence of ED⁵. In addition, this questionnaire is also commonly used for assessing ED severity before and after appropriate therapy^{6–8}. One limitation however, is that IIEF cannot be used to distinguish the different pathophysiology's of ED⁹.

To date, the majority of studies looking at ED prevalence have focused on western countries or the Asian continent as a whole. No large population-based survey have been conducted to demonstrate the prevalence of ED in Indonesia specifically. Therefore, the objective of this present study was to establish prevalence of ED in a healthy population of males in Indonesia and risk factors for ED.

Methods

This was a cross-sectional study used to estimate the prevalence of erectile dysfunction in relatively healthy male population in Jakarta aged 20 to 80 years old. This cross-sectional study utilized a web-based survey containing a translated version of IIEF-5 in Indonesian (see extended data¹⁰).

Study setting

This study was conducted via a web-based survey in Cipto Mangunkusumo Hospital, Jakarta in March 2019. First data entry began on 1st March and last data entry was collected on 31st March 2019.

Participants

The link to the web-based survey was put on display on a banner placed in the Urology Clinic of Cipto Mangunkusumo hospital and anyone who voluntarily opened the survey through the links provided are considered as potential respondents. We did not contact potential respondents individually because it may increase the risk of selection bias. The inclusion criteria were men aged 20–80 years old who completed the questionnaire within the enrollment period. All questionnaires filled beyond the enrollment period were excluded.

Ethical considerations and consent

This cross-sectional study has been approved by Cipto Mangunkusumo Hospital Research and Ethical Committee in February 2019 with an approval number of 0316/UN2.F1/ETIK/2018 before enrolling any participant for the study. Because this study incorporates web-based survey, written informed consents could not be obtained. Consent was taken electronically prior to participants completing the survey.

Data collection and management

We used Google Form to provide online questionnaire and collect respondent's data. We subsequently downloaded the completed questionnaire after the period of enrollment. Access to the completed questionnaire was considered confidential and only accessible to the authors. The online questionnaire was available [here](#). Before being asked to fill in the questions, patients were first provided with a concise description of the study with confidentiality assurances. In order for the respondents to complete the survey, they had to provide their email address as well as their phone number to ensure that the same respondent would not take the survey more than once. We also imposed a mechanism in the survey that provided the respondents with a reminder that will pop up in their window if there are questions in the survey that have not been answered. This helps to assure that all respondents will complete all the questions provided in the survey and therefore minimizing missing data.

The translated IIEF-5 imbedded in the survey was used to determine the prevalence of. Sexual domain functions in the IIEF-5 include 4 domains of erectile function starting from erection confidence, erection firmness, erection maintenance and sexual satisfaction. These tools are useful in determining baseline erectile function as well in assess the outcome of a specific treatment modality^{11,12}. Each IIEF-5 questions were provided with five response options, which enables the calculation of scores ranging from 5 to 25 for erectile function. The scores were then categorized into : severe ED (5–7), moderate ED (8–11), mild to moderate ED (12–16), mild ED (17–21), no ED (22–25)¹³. The IIEF-5 is limited by its inability to distinguish the etiologic basis for ED especially those of organic origins⁹. In order to address this limitation, some additional examinations should be performed, e.g. RigiScan, Doppler ultrasonography⁹. Unfortunately, additional examination was not possible due to the web-based nature of this study.

Only authors were able to access the completed surveys from a separate page under restricted access. Within this page, the authors are able to convert the data of the completed survey into a Microsoft Excel 2013 file which was later used for statistical analysis. This survey was planned to be maintained within one month period of time.

Statistical analysis

Data was analyzed using IBM SPSS Statistic 20. Demographic characteristics included in this study included the age group of respondents, marital status, educational level as well the occupation of respondents. The age group of the respondents was simplified into <40 years old and ≥ 40 years old groups to define age as a dichotomous variable to enable the subsequent analysis. Normality test using Kolmogorov-smirnov were

performed for numerical data. Risk factors, including age, hypertension, stroke, history of heart disease, diabetes, kidney disease, history of prostate operation and interpersonal stress, and their association with ED in this study will be evaluated using chi-square test statistics. The result was considered significant when $p < 0.05$.

Results

Over 1 month a total of 255 respondents completed the web-based survey, the sociodemographic characteristics of the respondent are described in [Table 1](#) (see underlying data¹⁴). The mean age of respondents was 38.7 ± 12.6 years old with the majority of the respondents (31.4%) in the 30–39 years old age group. Most of the respondents were married (197/255, 77.2%) and most had completed or were undertaking tertiary education (169/225, 66.3%). The majority of respondents were employees of private companies (91/255, 35.7%).

Table 1. Sociodemographic characteristics of respondents.

Sociodemographic Characteristics of Respondents (n = 255)	
Variables	Frequency (%)
Age Group	
20–29 Years Old	76 (29.8%)
30–39 Years Old	80 (31.4%)
40–49 Years Old	39 (15.3%)
50–59 Years Old	35 (13.%)
Older Than 60 Years Old	25 (9.8%)
Mean Age : 38.7 ± 12.6	
Marital Status	
Married	197 (77.2%)
Single or Dating	50 (19.8%)
Divorced, widowed or separated	8 (3.0%)
Educational Status	
No Formal Education	4 (1.6%)
Primary Education	10 (3.9%)
Secondary Education	58 (22.7%)
Tertiary Education	169 (66.3%)
Master / Doctoral equivalent	14 (5.5%)
Occupation	
Non-Government Employees	91 (35.7%)
Businessman	60 (23.5%)
Health Workers	49 (19.2%)
Government Employees	25 (9.8%)
Labour	10 (3.9%)
Army	6 (2.3%)
Retired	3 (1.1%)
Others	11 (4.3%)

Erectile function of the respondents was been stratified into ED severity categorizations based on the established IIEF-5 definitions. The prevalence and severity of ED is described in [Table 2](#) according to age groups. The prevalence of ED in this study was 35.6% (22.3% mild, 13.7% mild to moderate, 3.1% moderate and 0.8% severe). The prevalence of ED ranged from 6.5% in the 20–29 years old age group to as high as 88.0% in respondents aged 60 years and above.

The association of ED with various potential risk factors including hypertension, stroke, history of heart disease, diabetes, kidney disease, history of prostate operation and interpersonal stress were evaluated using Chi-square analysis. The age group of the respondents was simplified into <40 years old and ≥ 40 years old groups to define age as a dichotomous variable to enable the subsequent analysis. [Table 3](#) summarizes the findings; age, hypertension, stroke, history of heart disease, Diabetes, kidney disease, history of prostate operation and interpersonal stress are significantly associated with ED (p -value = <0.001, <0.001, 0.015, <0.001, 0.01, 0.002, <0.001 and 0.022 respectively).

Discussion

The prevalence of ED has been widely evaluated in many different countries around the world, however, the comparison of prevalence between countries may prove difficult ordeal due to the various questionnaires used to assess ED in different studies. Additionally, heterogeneity of age as well as ethnic distribution of different groups of respondents further complicates matters. Two previous studies by Nikolosi *et al.* and Akkus *et al.* utilized one simple question “How would you describe yourself” to assess and classify ED severity into No ED, Mild ED, Moderate ED and Severe ED^{15,16}. Other more recent epidemiologic studies employed use of the self-reported IIEF-5 questionnaire, the most commonly used validated questionnaire that had been translated into various different languages worldwide^{5,17–19}. Routine use of IIEF-5 in the evaluation of ED prevalence helps in gathering epidemiologic data that are comparable, possibly reproducible, and standardized facilitating cross-cultural comparison.

The discussion of sexual issues, especially those of which are related to male potency may cause embarrassment and stress. This may result in reporting bias, general underestimation or even exaggeration of sexual problems, and even the unwillingness to participate in the study overall. We aimed to address this by using a web-based survey with adaptation of IIEF-5 that any potential respondents can voluntarily access and complete without any coercions, potentially limiting any reporting bias.

The prevalence of ED in this study was 35.6% (22.3% mild, 13.7% mild to moderate, 3.1% moderate and 0.8% severe). The prevalence of ED in this study is comparably smaller to the cross-sectional study conducted by Oyelade *et al.* in Nigeria¹⁹ and Quilter *et al.* in New Zealand (58.9% and 42% respectively). This discrepancy in the prevalence rate might be explained by the difference in respondent’s age recruited in this study. In the present study 29.8% (76 out of 255) of the respondents

Table 2. Prevalence of erectile dysfunction (ED) according to various in survey respondents using the International Index of Erectile Function (IIEF)-5.

	Prevalence (%) of ED by IIEF-5 scores					
	ED severity					
Age Group (y)	No ED (22–25)	Mild ED (17–21)	Mild to moderate ED (12–16)	Moderate ED (8–11)	Severe ED (<8)	ED (≤21)
20–29 (n = 76)	71(93.4%)	3(3.9%)	2 (2.6%)	0 (0.0%)	0 (0.0%)	5 (6.5%)
30–39 (n = 80)	62(77.5%)	9 (11.3%)	9 (11.3%)	0 (0.0%)	0 (0.0%)	18 (22.6%)
40–49 (n = 39)	18(46.1%)	12 (30.7%)	8 (20.5%)	0 (0.0%)	1 (2.6%)	21 (53.8%)
50–59 (n = 35)	10 (28.6%)	11 (31.5%)	8 (22.8%)	6 (17.1%)	0 (0.0%)	25 (71.4%)
≥60 (n = 25)	3 (12.0%)	11 (44.0%)	8 (32.0%)	2 (8.0%)	1 (4.0%)	22 (88.0%)
Total prevalence	164 (64.3%)	57(22.3%)	35 (13.7%)	8 (3.1%)	2 (0.8%)	91 (35.6%)

Table 3. The possible risk factors associated with erectile dysfunction (ED) in this survey.

	Status of Erectile Dysfunction		p-value
	Erectile Dysfunction	No ED	
Age			
< 40 years old	24 (15.4%)	132 (84.6%)	0.000
≥ 40 years old	68 (68.7%)	31 (31.3%)	
Hypertension			
Yes	31 (67.4%)	15 (32.6%)	0.000
No	61 (29.2%)	148 (70.8%)	
Stroke			
Yes	5(83.3%)	1 (16.7%)	0.015
No	87 (34.9%)	162 (65.1%)	
Heart Disease			
Yes	10 (90.9%)	1 (9.1%)	0.000
No	82(33.6%)	162 (66.4%)	
Diabetes			
Yes	15 (68.2%)	7 (31.8%)	0.01
No	77 (33.0%)	156(67.0%)	
Neurologic Diseases			
Yes	8 (53.3%)	7 (46.7%)	0.151
No	84 (35.0%)	156 (65.0%)	
Chronic Liver disease			
Yes	2 (28.6%)	5 (71.4%)	0.675
No	90 (36.3%)	158 (63.7%)	
Hormonal Disease			
Yes	0 (0.0%)	1 (100.0%)	0.452
No	92 (36.2%)	162 (63.8%)	
Kidney Problems			
Yes	10 (76.9%)	3 (23.1%)	0.002
No	82 (33.9%)	160 (66.1%)	

	Status of Erectile Dysfunction		p-value
	Erectile Dysfunction	No ED	
Hypercholesterolemia			
Yes	25 (41.7%)	35 (58.3%)	0.303
No	67 (34.4%)	128 (65.6%)	
Smoker			
Yes	49 (38.9%)	77 (61.1%)	0.469
No	43 (33.3%)	86 (66.7%)	
Alcoholics			
Yes	10 (50.0%)	10(50.0%)	0.177
No	82 (34.9%)	153 (65.1%)	
Narcotic Drug User			
Yes	3 (75.0%)	1 (25.0%)	0.102
No	89 (35.5%)	162 (64.5%)	
History of spinal trauma			
Yes	5 (35.7%)	9 (64.3%)	0.977
No	87 (36.1%)	154 (63.9%)	
History of pelvic trauma			
Yes	2 (66.7%)	1 (33.3%)	0.267
No	90 (35.7%)	162 (64.3%)	
History of Spinal Cord Operation			
Yes	1 (33.3%)	2 (66.7%)	0.921
No	91 (36.1%)	161 (63.9%)	
History of Prostate Operation			
Yes	12(85.7%)	2 (14.3%)	0.000
No	80 (33.2%)	161 (66.8%)	
Under Stress			
Yes	11 (61.1%)	7 (38.9%)	0.022
No	81 (34.2%)	156 (65.8%)	

were 20–29 years old; Oyelade *et al.* only recruited respondents who were 30 and above, whereas Quilter *et al.* only recruited respondents 40–70 years old. The prevalence of ED in this study ranges from 6.5% in the 20–29 age group to as high as 88.0% in respondents aged 60 years old and above (Table 2). This consistent increase of ED prevalence with age was also demonstrated in a systematic review conducted by Prins *et al.* which found ED prevalence has been reported to be as high as 7% among men aged 18 to 29 years old, 2–9% among men aged 30–39 years old, 9–11% among men aged 40–49 years old, 16–18% among men aged 50–59 years old, 34% among men aged 60 to 69 years old, and 53% among men aged 70 to 80 years old. The rising trend in prevalence of ED as the population grows older can be explained by the presence of various comorbidities commonly found in the older population such as diabetes, heart disease, hypertension, and other vascular related diseases. These comorbidities are commonly associated with the development of ED¹⁸.

In this cross-sectional study, independent variables such as age, hypertension, history of heart disease, stroke, diabetes, kidney disease, history of prostate surgery and interpersonal stress are significantly associated with ED (p -value = 0.000, 0.000, 0.015 0.000, 0.01, 0.002, 0.000 and 0.022 respectively). It is well known that the chances for developing ED increases with advancing age as mentioned by Prins *et al.* and Rhoden *et al.* and increases substantially from the age of 40^{5,20}. Diabetes mellitus in itself is already an independent and strong predictor for ED development as this particular medical condition is strongly involved with microvascular changes, peripheral neuropathy and endothelial dysfunction²¹. The significant association between history of hypertension, heart disease and interpersonal stress with ED development in this study is also consistent with the findings in a another web-based study conducted by Shaeer *et al.*, however, they did not find any significant association of renal disease with development of ED¹⁷. This contradictory result might be caused by the ambiguous definition

of renal disease used in their survey that may have confused some respondents.

Interestingly, smoking which was generally thought to be associated with risk of ED, was not significantly associated with ED in the current study. This finding is consistent with studies conducted by Oyelade *et al.* and Shaeer *et al.*^{17,19}. In contrast, an epidemiologic study conducted in Brazil by Moreira *et al.* found that heavy smoking (≥ 40 cigarettes/day) is a strong predicting risk factor for ED development²². The disparity in the results in between these studies is possibly due to the lack of information regarding the number of cigarettes smoked per day, as well as the duration of smoking that was not explored in this study.

Alcohol consumption was not found to be significantly associated with ED, consistent with Oyelade *et al.* and Shaeer *et al.*^{17,19}. Interestingly, Moreira *et al.* found that moderate alcohol consumption was inversely related with the development of ED²². Low alcohol consumption was found to improve erections and increases libido, likely due to its vasodilatory effect and suppression of anxiety. Large amounts of alcohol consumption, however, may decrease libido due to central sedation²³. To correctly evaluate the effect of alcohol consumption on development of ED, the amount and duration of alcohol consumption must also be considered, which was not explored in detail in this particular study.

In summary, incorporating IIEF-5 into a carefully designed and well-structured web-based survey assists in collecting epidemiological data on the prevalence of ED that is concise, standardized, and provides easily comparable data to the surveys conducted in other countries. Additionally, web-based survey also help to spare the potential respondents from embarrassment when addressing their sexual issues, which is hoped will provide more objective responses. Lastly, the web-based survey has proven to be cost efficient and is able to cover a large sample of the population at the country level and above.

One limitation of this web-based survey, however, is the difficulty in gathering responses from individuals of lower educational status or socioeconomic level which may have restricted access to internet connection may have resulted in sampling bias. Moreover, the web link to the survey in this study was only available to those attending the urology polyclinic in Cipto Mangunkusumo hospital. Future prevalence studies of ED in Indonesia may involve the distribution of the link to this

web-based survey to all health institutions in Indonesia to provide a more accurate estimation of ED prevalence in the Indonesian population.

Conclusion

In conclusion, the prevalence of ED in our study was 35.6% (22.3% mild, 13.7% mild to moderate, 3.1% moderate and 0.8% severe). The prevalence of ED in this study ranges from 6.5% in the 20–29 years old group to 88.0% in respondents aged 60 years old and above. This shows the consistent increase in the prevalence of ED as the population is ages. Additionally, independent variables such as age, hypertension, history of heart disease, stroke, diabetes, kidney disease, prostate operation and interpersonal stress are significantly associated with ED.

Data availability

Underlying data

Harvard Dataverse: ED Web-based Survey. <https://doi.org/10.7910/DVN/PEX2YB>¹⁴

This project contains the following underlying data:

- DE-revised.tab (Extracted web survey data)

Extended data

Link provided to participants: https://docs.google.com/forms/d/e/1FAIpQLSfYGnSIsnY3-kgGH_50Fe_DdNgTMnkiceBFMaN-LkgPnnJbRTw/viewform

Harvard Dataverse Repository: Questionnaire ED (EN). <https://doi.org/10.7910/DVN/TAFOCB>¹⁰

This project contains the following extended data:

- Questionnaire ED_ID.docx (Study questionnaire, Indonesian)
- Questionnaire ED_revised.docx (Study questionnaire, English)

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

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The authors performed a population-based survey to demonstrate the prevalence of ED in Indonesian healthy males and the risk factors for ED.

I have the following comments:

1. For your sample size - did you do a power calculation? I think that this sample size is small to address the prevalence of a disease.
2. Adding the age range up to 80 years, I think that affects the total prevalence of the disease.
3. The authors address the risk factors based only on the online questionnaires with no attached data to confirm it, which makes this more subjective and only patient-based.
4. What is the criteria or the definition they judge that the participant is healthy?
5. The authors mentioned in the risk factors "hormonal disease", I think it needs to be more specified.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Andrology and STDs

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 13 June 2019

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In the current study, the authors tried to estimate the prevalence of ED in Indonesia population through a web-based survey. I have several concerns about the methods and results parts.

Major points:

First, compared with traditional studies using face-to-face questionnaires, there are several limitations must be stressed concerning web-based survey:

1. Web-based survey cannot guarantee that all the terms are correctly understood by the participants. Usually an experienced physician is necessary for explanation of the questions in the study.
2. Physical examination cannot be performed. Some physical examination results such as testicular volume, varicocele... may be associated with ED. Additionally, detection of sexual hormones (serum testosterone, estrogen, prolactin) is also required for a cross-sectional study researching ED. Absence of these will result in potential bias.
3. According to the description in Methods part, the link to the web-based survey was put on display on a banner placed in the Urology Clinic. I doubt whether these participants can represent general population in Indonesia? These participants (I think most of them were patients in the Urology Clinic) were those who were interested about this issue. And this will result in selection bias.
4. I am wondering whether there were some participants completing the web-survey directly

through searching in the Internet?

Second, the sample size was not predetermined. I don't think the sample size (255) is large enough to estimate the prevalence of ED in Indonesia. The authors need to address the end-points of their study.

Third, concerning statistics, a multivariate analysis may be performed to get a comprehensive understanding of risk factors of ED.

Fourth, some factors were not listed in the questionnaire, which were commonly used in ED research, such as previous diagnosed of CP/CPPS, anxiety, depression...

Minor points:

In the abstract-methods: what is the definition of "relatively healthy males"?

Scientific paper is not easy to accept unclear words, such as "relatively", and "about 35.6%" in abstract-conclusion part.

References were not new and required to be up-dated.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

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Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Andrology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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