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Erectile Dysfunction and Hypertension among Adult Males in Umudike, Nigeria: A Study of Prevalence and Relationships

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ABSTRACT

This study investigated the prevalence of Erectile Dysfunction (ED) and hypertension in Umudike, Nigeria and assessed the correlations between the 5 item International Index for Erectile Function (IIEF-5) scores and measures of blood pressure in the said population. Standard protocols were followed for all measurements and determinations. The results show that 86.8% of the studied population had some form of ED, though only 10.4 and 2.4% of the population had moderate and severe ED, respectively. Hypertension and prehypertension were found in 21.3 and 47.1% of the population, respectively. Both ED and hypertension increased in prevalence with age. The prevalence of severe ED was significantly ($p < 0.01$) lower than that of normal erectile function (16.7 vs. 38.7%) among subjects with normal blood pressure. Conversely, the prevalence of severe ED was significantly ($p < 0.05$) higher than that of normal erectile function (33.3 vs. 16.7%) among subjects with hypertension. The IIEF-5 scores correlated negatively but significantly ($p < 0.01$) with both SBP and MBP. Evaluating men with hypertension for ED may be warranted in Nigeria, so as to reduce to morbidity and the poor quality of life in men, arising from ED.

Key words: Erectile dysfunction, hypertension, prevalence, relationships

INTRODUCTION

Erectile Dysfunction (ED), defined as “the consistent or recurrent inability (of a man) to achieve and/or maintain a penile erection sufficient for satisfactory sexual performance” (NIH Consensus Conference, 1993), is the major sexual dysfunction found in men. Symptoms lasting up to three months and not arising from trauma or surgery, are sufficient for establishing the presence of ED (Lewis *et al.*, 2010). The ED affects approximately half of men over 40 years of age and results in an inevitable loss of quality of life of the sufferer and his partner (Sanchez-Cruz *et al.*, 2003).

Age, followed by the presence of a spouse, is thought to be the most significant risk factor for ED (Lewis *et al.*, 2010). Studies also indicate that ED is highly prevalent in individuals with cardiovascular disease risk factors such as diabetes mellitus, dyslipidemia, hypertension and other such diseases linked with endothelial dysfunction (Solomon *et al.*, 2003). In fact, men with hypertension have a 15% likelihood of developing severe ED and if they smoked, the likelihood increased to 20% (Feldman *et al.*, 1994). It is currently thought that ED may serve as a sentinel marker for cardiovascular diseases (Gupta *et al.*, 2011).

The prevalence of hypertension is increasing globally but more so in low and middle income countries, owing to urbanization and lifestyle modifications. A recent systematic review and meta-analysis of 27 studies which met the inclusion criteria reported that the prevalence of

hypertension in Nigeria is 28.9% (30.6% in urban dwellers and 26.4% in rural dwellers) (Adeloye *et al.*, 2015). As much as 1.56 billion men and women the world over are projected to be hypertensive by 2025 (Kearney *et al.*, 2005) while 322 million men will have ED same year (Aytac *et al.*, 1999). Interestingly, for both hypertension and ED the largest projected increases will take place in low and middle income countries of the world.

There are few reports on the prevalence of ED in Nigeria and none (to the authors' knowledge) in Abia State Nigeria. Furthermore, the relationship between ED and hypertension in Nigerians, in particular and sub-Saharan Africans, in general, has not been studied. This study therefore investigated the prevalence of both ED and hypertension among apparently healthy males in Umudike, a University town in the South Eastern part of Nigeria. The study also assessed the correlations between the 5 item International Index for Erectile Function (IIEF-5) scores and measures of blood pressure in the said population. The findings will improve the understanding of the relationships between these public health challenges and help guide prevention education messages for the public.

MATERIALS AND METHODS

Subjects: Adult men in Umudike, Abia State Nigeria, who (1) Literate, (2) Married or involved in a sexual relationship with a co-habiting female, (3) Aged forty years or older, (4) Had no evident signs of morbidity and (5) Not using any aphrodisiac; were approached for recruitment in this cross-sectional population study. Subjects who filled out and returned the questionnaires were recruited for blood pressure evaluation. Only those who met the inclusion criteria above and gave an informed consent were allowed to participate in the study.

Methods: Data on ED were collected using the internationally validated 5-item International Index for Erectile Function (IIEF-5) (Rosen *et al.*, 1999), otherwise known as the Sexual Health Inventory for Men (SHIM). A total of 900 IIEF-5 questionnaires were distributed to eligible men. The respondents were requested to answer the questions conscientiously and in private before returning them to the investigator. There was a 95% response rate to the distributed IIEF-5 forms. Returned questionnaires that were duly completed and had complete blood pressure data (83% of distributed questionnaires) were included in the analyses.

The blood pressures of consenting subjects were measured between 8 am and 9 am on study days. Subjects were required to be seated in a quiet room and their blood pressures measured using an oscillometric device (Omron HEM 742) with appropriate cuff sizes, after an initial 10 min rest. For each subject, three separate readings were taken, each at 5 min intervals and the average of the last two recorded. Values for Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and Pulse Pressure (PP) read off the device's digital display were recorded for each subject, while Mean Blood Pressure (MBP) was calculated using the formula:

$$[\text{SBP} + (\text{DBP} \times 2)] / 3$$

Self-reported age was recorded for each participant. For convenience in reporting, the subjects were subsequently grouped into four age ranges viz., 40-49, 50-59, 60-69 and 70 years and older (70+years).

Definitions: Erectile dysfunction was defined (as described above) as "the consistent or recurrent inability (of a man) to achieve and/or maintain a penile erection sufficient for satisfactory sexual

performance”. The IIEF-5 scores of 22-25 and <22 were considered to represent normal erectile function and erectile dysfunction, respectively; while the severity of ED were defined using IIEF scores of 12-21, 8-11 and 5-7 which represent mild, moderate and severe ED, respectively.

Based on the blood pressure values, three blood pressure phenotypes were defined thus: Normal (SBP/DBP <120/80 mm Hg); prehypertension (SBP/DBP ≥120/80 mm Hg but <140/90 mm Hg) and hypertension (SBP/DBP ≥140/90 mm Hg).

Statistics: Descriptive statistics were carried out on the data generated and percentages calculated where necessary. Differences between means were separated by one way ANOVA (for continuous variables) and Chi square test (for categorical variables). Pearson correlation coefficients were calculated to assess the relationship between IIEF-5 scores and measures of blood pressure. For all analyses, the significant threshold was fixed at $p < 0.05$. The results are presented in tables and bar charts. All data analyses were performed using IBM-SPSS for windows version 20.0 (IBM Corp. Atlanta, GA).

RESULTS

A total of 86.8% of the studied population had some form of erectile dysfunction, though only 10.4 and 2.4% of the population had moderate and severe ED, respectively. Both the prevalence and severity of ED increased progressively with age from 38.4% (ED) and 0.9% (moderate to severe ED) at the 40-49 age range, to 98.8% (ED) and 45.4% (moderate to severe ED) at the 70+ range (Fig. 1).

Hypertension and prehypertension were found in 21.3 and 47.1% of the population, respectively. The prevalence of hypertension increased from 12% in those aged 40-49 years to 30.7% in those aged 70+ years while that for prehypertension remained within 2% points for all the age ranges (Fig. 2). Diastolic hypertension was found in 5.6% of cases while diastolic prehypertension was found in 18.7% of cases. The majority of the pre-hypertensive subjects had systolic pre-hypertension.

Subjects with normal erectile function (mean age 43.2 ± 6.6 years) were significantly ($p < 0.001$) younger than those with moderate (64.2 ± 9.0 years) or severe (67.8 ± 5.4 years) ED. The SBP was significantly ($p < 0.05$) higher in subjects with moderate (130 ± 20 mm Hg) and severe (134 ± 19 mm Hg) ED, compared to those with normal erectile function (124 ± 19 mm Hg). Similarly, MBP was significantly ($p < 0.05$) higher in subjects with moderate (96 ± 12 mm Hg) and severe

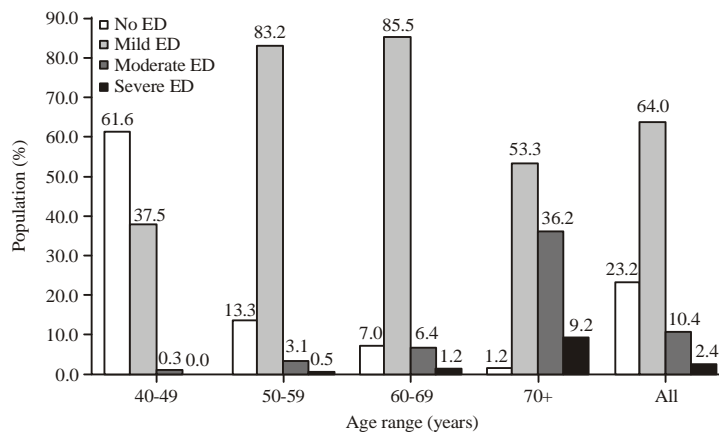


Fig. 1: Prevalence of erectile dysfunction in the studied population

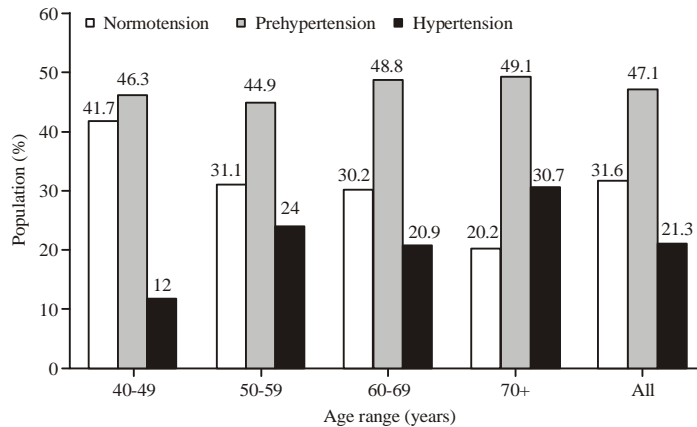


Fig. 2: Prevalence of hypertension and prehypertension in the studied population

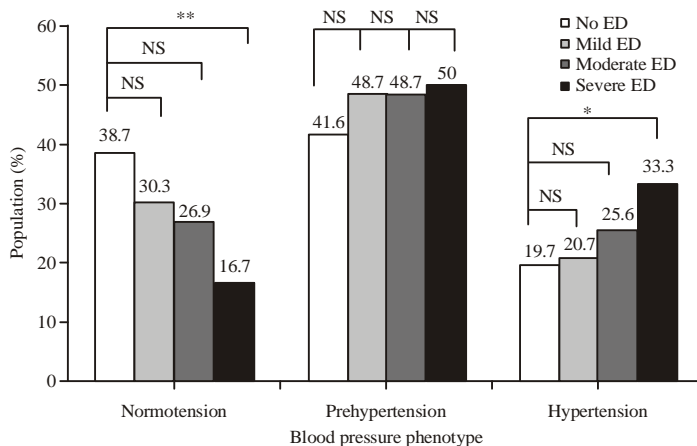


Fig. 3: Prevalence of erectile dysfunction in the studied population, within the three blood pressure phenotypes

(96±13 mm Hg) ED, compared to those with normal erectile function (92±13 mm Hg). Both DBP and PP were however similar ($p>0.05$) irrespective of ED category (Table 1).

Subjects with prehypertension and hypertension were significantly ($p<0.001$) older than their counterparts who had normal blood pressure (51.9±10.8 vs. 49.1±10.7 years and 56.8±10.9 vs. 49.1±10.7 years, respectively). The IIEF-5 scores of prehypertensive and hypertensive subjects were significantly ($p<0.001$) lower than those with normal erectile function (18.5±4.3 vs. 19.2±4.3 and 18.1±4.4 vs. 19.2±4.3, respectively) (Table 2).

The prevalence of severe ED was significantly ($p<0.01$) lower than that of normal erectile function (16.7 vs. 38.7%) among subjects with normal blood pressure. Conversely, the prevalence of severe ED was significantly ($p<0.05$) higher than that of normal erectile function (33.3 vs. 16.7%) among subjects with hypertension. The prevalence values were similar ($p>0.05$) among prehypertensives irrespective of ED status (Fig. 3).

All the measures of blood pressure were negatively correlated with IIEF-5 scores. However, only the correlations between IIEF-5 scores and both SBP and MBP were statistically significant ($p<0.01$) (Fig. 4).

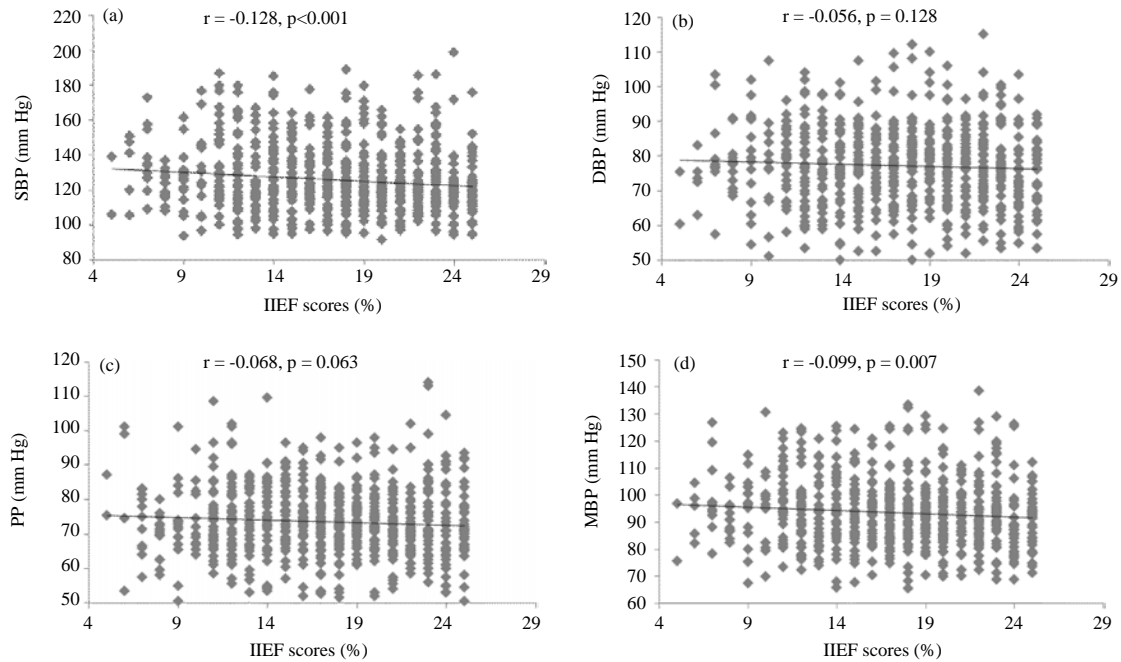


Fig. 4(a-d): Correlations between IIEF-5 scores and measures of blood pressure, (a) SBP, (b) DBP, (c) PP and (d) MBP

Table 1: Relevant characteristics of the population stratified by erectile dysfunction status

| Parameters | Age (years) | IIEF-5 score | SBP (mm Hg) | DBP (mm Hg) | PP (mm Hg) | MBP (mm Hg) |
|----------------------|-------------|--------------|-------------|-------------|------------|-------------|
| No ED (n = 173) | 43.2±6.6 | 23.4±1.1 | 124±19 | 76±12 | 73±11 | 92±13 |
| Mild ED (n = 478) | 54.7±10.0 | 16.7±2.8 | 126±18 | 78±11 | 74±10 | 94±12 |
| p-value | <0.001 | <0.001 | 0.195 | 0.229 | 0.194 | 0.173 |
| Moderate ED (n = 78) | 64.2±9.0 | 9.9±1.2 | 130±20 | 79±11 | 74±10 | 96±12 |
| p-value | <0.001 | <0.001 | 0.014 | 0.082 | 0.716 | 0.022 |
| Severe ED (n = 18) | 67.8±5.4 | 6.5±0.7 | 134±19 | 78±12 | 76±12 | 96±13 |
| p-value | <0.001 | <0.001 | 0.022 | 0.662 | 0.173 | 0.015 |

IIEF: International index for erectile function, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, PP: Pulse pressure, MBP: Mean blood pressure, ED: Erectile dysfunction

Table 2: Relevant characteristics of the population stratified by blood pressure status

| Parameters | Age (years) | IIEF-5 score | SBP (mm Hg) | DBP (mm Hg) | PP (mm Hg) | MBP (mm Hg) |
|------------------|-------------|--------------|-------------|-------------|------------|-------------|
| Normal (n = 236) | 49.1±10.7 | 19.2±4.3 | 110±7 | 68±7 | 73±8 | 82±6 |
| PreHPT (n = 352) | 51.9±10.8 | 18.5±4.3 | 124±9 | 79±8 | 73±10 | 94±5 |
| p-value | <0.001 | <0.001 | <0.001 | <0.001 | 0.378 | <0.001 |
| HPT (n = 159) | 56.8±10.9 | 18.1±4.4 | 153±17 | 88±11 | 78±12 | 110±11 |
| p-value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |

IIEF: International index for erectile function, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, PP: Pulse pressure, MBP: Mean blood pressure, HPT: Hypertensives

DISCUSSION

This is the first study to investigate the prevalence of ED in Abia State Nigeria and the first to assess its relationship with blood pressures in Nigeria. It is therefore a very important first step in the appreciation of the etiology of these disorders as lessons learned from studies such as this would inform and guide appropriate health policy and action and impact future research directions positively.

The response of 95% (and effective participation of 83%) recorded in this study is higher than the 41.9-69.9% response rates in Australia, the United States, Brazil, Germany, the Netherlands and Finland (Ansong *et al.*, 2000; Braun *et al.*, 2000; Koskimaki *et al.*, 2000; Meuleman *et al.*, 2001; Moreira *et al.*, 2002; Chew *et al.*, 2008). This may be due to the direct method of questionnaire distribution and collection employed for this study.

A total of 86.8% of the studied population had some form of erectile dysfunction, though only 10.4 and 2.4% of the population had moderate and severe ED, respectively. The proportion of the studied population with ED is higher than previous reports from Nigeria. Shaeer *et al.* (2003) for example reported a prevalence of mild, moderate, or severe ED in 57.4% of Nigerians. It is important to note however, that the prevalence of moderate and severe ED were in fact lower than those reported in previous studies. Fatusi *et al.* (2003) reported a prevalence of 8.0% severe ED and 35.8% moderate ED in Nigerians. The difference between the prevalence of ED in this study, compared to the previous studies on Nigerians may be in the higher prevalence of mild ED reported in this study.

The prevalence of ED varies globally. In Egypt and Pakistan it is reported to be 63.6% and 80.8%, respectively (Shaeer *et al.*, 2003); in the United States, 52.0% (9.6% for severe ED) (Feldman *et al.*, 1994) and in Australia, 40.3% (21.2% for severe ED) (Chew *et al.*, 2008). Nicolosi *et al.* (2003) reported an ED prevalence of 34% in Japan, 17% in Italy, 22% in Malaysia and 15% in Brazil. A recent review of ED in Asia reported a prevalence of 2 to 88% for ED (Park *et al.*, 2011). As is evident from the discussion above, there is a tremendous variation in the prevalence of ED in different populations. These differences may be actual population differences but may also be due to methodological differences or a reflection of cultural differences in the way ED and other sexual health matters are perceived across cultures and civilizations.

Both the prevalence and severity of ED increased progressively with age in this study. This finding is a consistent finding in ED studies irrespective of culture or geography (Chen *et al.*, 2004; Tan *et al.*, 2007; Hao *et al.*, 2011). Lewis (2011) reported that the prevalence of ED increases with each decade of life in all the studies he reviewed. Similar to our finding, Ahn *et al.* (2007) reported that age was significantly and negatively correlated with IIEF-5 scores. These reports are the reasons for which age is considered a risk factor for ED (Chew *et al.*, 2008). This age-dependent increase in the prevalence and severity ED may be associated with the age-dependent increase in the prevalence of most chronic diseases.

Hypertension and prehypertension were found in 21.3 and 47.1% of the population, respectively. The prevalence of hypertension increased with age and there was a preponderance of systolic pre-hypertension. The preponderance of systolic hypertension is a fairly common observation. Hypertension and prehypertension had been reported in 4 and 53.2% of a young adult male population of Nigerians (mean age 22 years). In older adults, the prevalence of hypertension has risen from 10% in 1987 to 17-20% in 1999 (Ejike and Ijeh, 2012). A very recent systematic review and meta-analysis of hypertension data published between 1980 and 2013 reported the prevalence of hypertension as 29.5% for males in Nigeria (Adeloye *et al.*, 2015). In a recent study, employing national survey data for Canada, the USA and England, all economically advanced countries, hypertension and prehypertension were found in 6.6 and 32.9%, 15 and 42.7% and 25 and 53.5% of the population, respectively in adults males aged 20 to 79 years (Joffres *et al.*, 2013). In another recent study, this time in Low and Middle Income Countries (LMICs), using data from the World Health Organization's Study on Global Ageing and Adult Health (SAGE) the

prevalence of hypertension among males aged 50 years or older was reported to be 30.3% in India, 55.2% in Mexico, 54.6% in Ghana, 58.8% in China, 65.9% in Russia and 74.7% in South Africa (Lloyd-Sherlock *et al.*, 2014).

The SBP and MBP were significantly higher in subjects with moderate and severe ED, compared to those with normal erectile function. The IIEF-5 scores of prehypertensive and hypertensive subjects were significantly lower than those with normal erectile function. Not surprisingly, the IIEF-5 scores were significantly and negatively correlated with SBP and MBP. Furthermore, the prevalence of severe ED was significantly lower than that of normal erectile function among subjects with normal blood pressure; whereas conversely, the prevalence of severe ED was significantly higher than that of normal erectile function among subjects with hypertension. These findings show the relationship between ED and elevated blood pressures and have been reported by some previous authors. The ED is essentially a vascular condition and this may explain the finding of higher prevalence of ED in men with vascular disorders such as hypertension (Selvin *et al.*, 2007). Kloner *et al.* (2003) and Solomon *et al.* (2003) had reported a high prevalence of ED (42-75%) in patients with cardiac diseases. Feldman *et al.* (1994) had reported from the Massachusetts Male Ageing Study that men with hypertension have a 15% probability of developing complete ED and that the figure increased to 20% if such men smoked. Clearly there is need to evaluate men with hypertension for ED and initiate early treatment where necessary.

In conclusion, the prevalence of ED in this population of Nigerians is higher, whereas the severity of the symptoms is lower, than previous studies from Nigeria. Hypertension was found to be prevalent in the studied population, affecting one-in-five men, a figure which compares with figures from Nigeria but which is lower than values reported for many LMICs. Both ED and hypertension increased in prevalence with age. The ED and hypertension were found to be related, such that there were more cases of ED among hypertensives and IIEF-5 scores correlated significantly and negatively with both SBP and MBP. These findings are important especially as life expectancy for men in Nigeria improves and more people grow old, relative to the past. Evaluating men with hypertension for ED may be warranted in Nigeria, so as to reduce to morbidity and negative effect on the quality of life of men arising from ED.

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