

Prevalence and characteristics of erectile dysfunction in black and mixed race primary care populations of the Cape Flats and Helderberg Basin area of the Western Cape, South Africa

De Klerk, H, MBChB, MFamMed, DCH, MBA.

De Villiers, PJT, MBChB, MFamMed, DOM, Hons BScMedSci(Epid), PhD.

Department of Family Medicine & Primary Care, University of Stellenbosch

Isaacs, S, MBCS, PhD

Department of Medical Informatics, University of Cape Town and Groote Schuur Hospital

Correspondence: Prof PJT de Villiers, Department of Family Medicine and Primary Care,

University of Stellenbosch, PO Box 1906, Tygerberg, 7505

Tel: 021-9389449, Fax: 021-9389153, Email: pjtdv@sun.ac.za

Keywords: erectile dysfunction, impotence, prevalence, blacks

Abstract

- Objective:** To estimate the prevalence of erectile dysfunction (ED) among users of primary care in a Black and Mixed Race urban population in the Western Cape, and to describe any associated health and psychosocial factors.
- Design:** Cross-sectional survey by interviewer administered questionnaire.
- Setting:** Two primary care medical centres, 40km apart, in Cape Town metropolitan area. Serve different ethnic groups, with no cross-contamination between them. Study period: March-June 1999
- Patients:** 833 Males (35-70 years old) attending these health centres for primary care. Systematic selection of all attendees.
- Main outcome measures:** Prevalence of ED and presence of associated health and psychosocial factors. Describe patient demographics, physical attributes, sexual relationships.
- Results:** Results of 730 males with current sexual partners: Mean ages 48 years (SD:7 years) all; 46 years (SD:9 years) Black group; 51 years (SD: 9 years) Mixed Race group. All degrees of ED prevalence: All 77.1% (95% CI: 74.0-80.2), Black 76.4% (95% CI: 71.8-80.4) and Mixed Race 77.7% (95% CI: 72.8-82.0). Significantly associated diseases: hypertension, diabetes, gastrointestinal and heart disease. Alcohol consumption (younger patients), smoking (older patients) significantly related to ED. Males with ED: more sexual partners than males without ED. More than 90% choose primary care physician/ generalist as primary ED care-giver.
- Conclusions:** ED is very common in both study groups. Primary care workers must be prepared to manage associated risk factors and health implications. ED sufferers in this population may also be at higher risk for sexually transmitted diseases due to multiple sexual partners.

INTRODUCTION

There is a growing awareness amongst primary care workers that male erectile dysfunction (ED) may be important in Black and Mixed Race South African populations. Both groups have a high incidence of hypertension, heart disease, diabetes mellitus and mental diseases and many of these diseases are associated with ED either directly or as a consequence of their treatment.¹ The effect of ED on the patient is frequently

not only embarrassing but also debilitating as far as mental health is concerned.²

The development of treatment guidelines^{3,4} and new modes of treatment, e.g. safe and effective drugs such as sildenafil^{2,5,6} intra-cavernous and intra-urethral alprostadil and other methods of treatment have become commonplace in the management of ED, offering new hope to a large percentage of affected men.

Many studies have been done to

determine the prevalence of ED, and the associated socio-demographic and health factors in men. The results of the most important published studies are summarised in **Table I**. The studies were ranked according to their relative strength to predict prevalence in the general community and the reliability to measure prevalence. The prevalence in the general population studies ranged from 13% to 52%, depending on the age group studied and the method of measurement.

Table I: Summary of published prevalence studies on Erectile Dysfunction

Study	Population	Methodology	Country	Age Range	Degree of ED	Prevalence % (Age group)	Strength*
Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. ¹²	General population	Interview	USA	40-70	Min/Mod/Severe	52% (40-70)	A
Prevalence and independent risk factors for erectile dysfunction in Spain: results of the Epidemiologia de la Disfuncion Erectil Masculina Study. ¹⁴	General population	Self administered questionnaire	Spain	25-70	Min/Mod/Severe	18.9%	B
Age-related prevalence of erectile dysfunction in Japan: assessment by the International Index of Erectile Function. ²⁴	General population	Self administered questionnaire	Japan	25-70	Mod/Severe	8,6% (40-49) 20% (50-59) 58% (60-69) 64,3 (70-79)	B
Erectile dysfunction: prevalence and effect on the quality of life; Boxmeer study. ²⁵	General population	Postal survey	Netherlands	40-79	Min/Mod/Severe	13%	B
Prevalence and correlates of erectile dysfunction in Japan. ²⁶	General population	Postal survey	Japan	30-79	Mod/Severe	16% (40-45) 20% (46-50) 36% (51-55) 47% (56-60) 57% (61-65) 70% (66-70)	B
Erectile dysfunction in the community: a prevalence study. ²⁷	General population, subset	Postal survey	Australia	40+	Min/Mod/Severe	3% (40-49) 64% (70-79)	B
Epidemiology of erectile dysfunction: a community-based study in rural New York State. ²⁸	General population	Postal survey	USA – Rural NY state	50-76	Min/Mod/Severe	46.3%	B
Epidemiology of erectile dysfunction: results of the 'Cologne Male Survey'. ²⁹	General population	Postal survey	Germany	30-80	Min/Mod/Severe	19.2%	B
Prevalence and correlates of erectile dysfunction: results of the Brazilian study of sexual behavior. ⁷	Males attending a health fair	Self administered questionnaire	Brazil	40+	Min/Mod/Severe	46,2%	B
Frequency and determinants of erectile dysfunction in Italy. ⁸	Attendees of GP practices	Interview	Italy	18+	Min/Mod/Severe	12.8% (>18) 2% (18-39) 48% (>70)	C
Erectile dysfunction in general medicine practice: prevalence and clinical correlates. ⁹	Attendees at GP practices	Self administered questionnaire	Australia	18-91	Min/Mod/Severe	33.9% (40-69) 39.4% (18-91)	C
Erectile and ejaculatory dysfunction in a community-based sample of men 50 to 78 years old: prevalence, concern, and relation to sexual activity. ³⁰	Attendees of health clinic and urology OPD	Self administered questionnaire	Netherlands	50-78	Severe	3% (40-69) 26%(70-78)	D
An investigation of erectile dysfunction in Gwent, Wales. ³¹	Attendees of community clinics for the screening of prostate disease	Self administered questionnaire	Wales	55-70	Severe	13.2%	D
Strength*	Criteria						
A	General population prevalence study, conducted by personal interviews						
B	Prevalence study conducted on selected groups and/or through postal surveys						
C	Conducted on attendees of primary care clinics and conducted by personal interviews						
D	Conducted on attendees of special care clinics or primary care clinics and/or using self-administered questionnaires						
* Score in order of strongest to weakest study design.							

With the exception of the study by Moreira et al, all these studies were done in developing countries.⁷ Two studies in this table determined the prevalence amongst attendees seeking primary care (GP practices in this case), providing a range of 12,8% and 39,4% in males older than 18 years.^{8,9}

The value of an epidemiological survey amongst South African Black and Mixed Race male attendees of primary care facilities will be to give an indication of the prevalence of ED to primary care workers, especially those who work in disadvantaged communities. It is also important to investigate the relationship between common health problems, socio-demographic and other relevant factors and ED in the populations studied.

The purpose of the study was to determine the prevalence of ED and its associated health and socio-demographic risk factors, in a South African Black and Mixed Race population, amongst men seeking primary medical care.

METHODS

Selection of subjects

A cross sectional survey was conducted amongst black and Mixed Race men, between the ages of 35 and 70, attending two selected primary health care facilities for routine medical care. The study was conducted between March 1999 and June 1999 in the primary health care facilities of Rusthof (Strand) and Michael Mapongwana (Khayelitsha) situated in the greater Cape Town metropolitan area, South Africa.

The Rusthof facility is situated in the Somerset-West/ Strand area, and serves a predominantly Mixed Race population. The Michael Mapongwana facility serves a mainly black population and is about 40 km further west, closer to the Cape Town city centre. Both of these facilities are publicly funded and provide a full spectrum of primary care, which includes primary contact with patients with acute diseases, follow-up of common chronic diseases, as well as primary and follow-up care for trauma and other emergencies. Any person may attend these facilities for primary health care, but because of their location people living close by predominantly

use them. The scope of practice of both facilities are comparable to that which doctors will encounter in most publicly funded primary care settings in South Africa.

The men were chosen by means of systematic non-stratified sampling, to minimise the impact on the normal functioning of the centres.

Exclusion criteria were:

1. Follow-up attendees of chronic disease clinics;
2. persons with mental disorders that would make it difficult for them to comply with protocol requirements; and
3. refusal of the patient to give consent.

Data collection

An internationally standardized and validated questionnaire, developed for the Pfizer Cross-national Study of the Prevalence and Correlates of ED was used.¹⁰ It was culturally adapted to be more specific for South African conditions, and translated into Xhosa and Afrikaans and back-translated to validate the translations. The following details were recorded: socio-demographic and occupational information, present and past illnesses and surgery, health-related behaviours such as use of alcohol, caffeine and tobacco, physical activity and mental status. There were also questions about the subject's sexual relationships and specific standardized questions about erectile function, relating to degrees of ED, and sexual behaviour. The subject's preferences with regard to health providers were also recorded.

ED was defined as the ability to get and keep an erection good enough for sexual intercourse: Always = None; Usually = Minimal; Sometimes = Moderate; and Never = Complete.

Registered male nurses, fluent in the local language and who belonged to the same ethnic group as the patients attending each facility, were used to conduct the interviews. They were trained beforehand in the administration of the questionnaire in order to achieve optimal reliability. Patients were referred to a provider of their choice when abnormalities were detected during the interview.

Informed consent was obtained from all subjects. The Ethics Committee of the University of Stellenbosch, South Africa, approved the study protocol and questionnaire.

Statistical methods and data analysis

Sample size was calculated assuming an 18% prevalence of ED with a 2% variability taking the general population involved in the sample as 184 000 men for the Mixed Race group and 70 000 men for the Black group. The calculated sample sizes at a 95% confidence level were 354 and 353 subjects per group, respectively. It was decided to enrol 400 males from each group.

Completed questionnaires were double-checked by independent monitors for completeness and adherence to the study protocol. Data was double entered into a computerized data-base for checking of correct transcription before statistical analysis. *Analysis Plan*® was used to form the framework for the analysis. Statistics were calculated for the group as a whole and for both groups separately. P-values were calculated for continuous variables using the t-test or when corrected for age the analysis of covariance was used. Chi-square values were obtained for discrete variables. Odds Ratios (OR's) were calculated where applicable. A value of alpha = 0.05 was used as cut-off for significance. Possible confounding results were assessed by comparing weighted OR's with crude OR's. The Mantel-Haentzel OR was used as weighted OR. Interaction of stratified data was used by comparing OR's between the strata. The significance of the interaction of strata was tested by using the Mantel-Haentzel Chi-squared statistical technique for interaction.

RESULTS:

A total number of 834 interviews were conducted. Fourteen (14) were excluded because they were older than 70 years and 3 who were younger than 35 years. The 104 subjects who reported that they did not have a current sexual partner were also excluded from the final data analysis. As a result 730 were analysed, 402 Black and 328 Mixed Race.

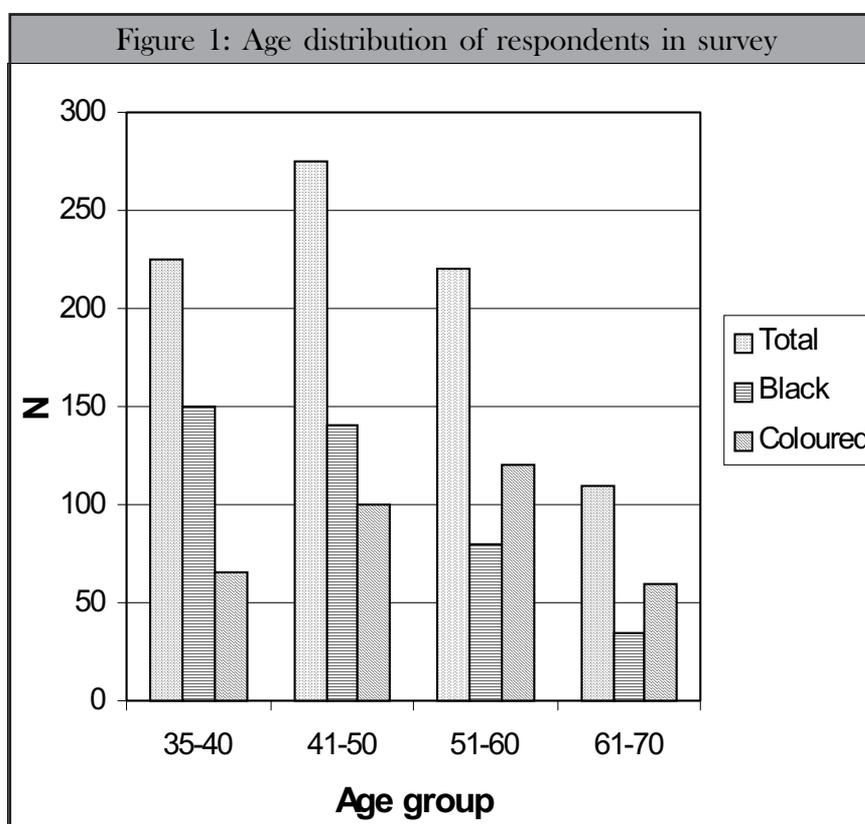
Table II: Socio-demographic characteristics of the study population

		Black	Mixed Race	All
Age (year)	N	402	328	730
	Mean	46.5	51.2	48.9
	SD	9.03	9.03	7.46
Height (m)	N	399	328	727
	Mean	1.73	1.68	1.71
	SD	0.07	0.064	0.071
Weight (kg)	N	401	328	729
	Mean	68.3	67.7	68.0
	SD	13.04	16.22	14.55
BMI (kg/m ²)	N	399	328	727
	Mean	22.9	23.9	23.3
	SD	4.16	5.25	4.71
Marital Status	Single	49 (12.2%)	35 (10.7%)	84 (11.5%)
	Married / living with partner	310 (77.1%)	263 (80.2%)	573 (78.5%)
	Separated/divorce/widowed	43 (10.7%)	30 (9.1%)	73 (10%)
Education	Below sub standards	66 (18.4%)	40 (13.9%)	106 (16.4%)
	Completed primary	169 (47.2%)	152 (53.0%)	321 (49.8%)
	Started/completed post primary	123 (34.3%)	95 (33.1%)	218 (33.8%)
Income (in Rand)	0-2,999	58 (14.6%)	60 (18.3%)	118 (16.3%)
	3,000-6,999	96 (24.3%)	119 (36.3%)	215 (29.7%)
	7,000-29,999	180 (44.5%)	141 (43.0%)	321 (44.3%)
	>30,000	68 (17.0%)	9 (2.4%)	70 (9.7%)
Employment	Employed	179 (44.8%)	93 (29.0%)	272 (37.7%)
	Retired, aged, disabled	66 (16.5%)	136(42.4%)	202 (28.0%)
	Looking for work	155 (38.8%)	92(28.7%)	247 (34.2%)

1. Socio-demographic data of the study population:

The socio-demographic characteristics of the study population are tabulated in **Table II**. The total population (730 subjects) had a mean age of 48 years (95% CI:48;49) while the black group (402 subjects) had a mean age of 46 years (95% CI:45;47) and the Mixed Race group (328 subjects) 51 years (95% CI:50;52). The Mixed Race group had a higher percentage retired, receiving a pension and/or disabled than the Black group. The age distribution (**Figure 1**) of Mixed Race males showed a lower percentage of 35 to 40 year olds, comparable 41 to 50 year olds, but a higher percentage of subjects in the 51 to 60 (33.1% vs. 20.1%) and the 61 to 75 year olds (17.6% vs. 8.5%). These age differences were significant ($p = 0.000001$). There was also a significant difference for height ($p = 0.00001$), but not for weight. If this is calculated as BMI, the difference is also significant (Black = 22.9 and Mixed race = 23.9

Figure 1: Age distribution of respondents in survey



[kg/m²]; p = 0.006). The median income of the Black group was R 8,500 and the Mixed Race group R 6,000 (p=0.008).

2. Prevalence of ED:

The prevalence of ED in the study population is depicted in **Figure 2**. If ED is defined as the inability to “always” get and keep an erection good enough for sexual intercourse (summation of “minimal”, “moderate” and “complete” ED), then the prevalence of ED in the total sample of males between the ages of 35 and 70 years of age is 77.1% (95% CI: 74.0-80.2), 76.4% (95% CI: 71.8-80.4) for Blacks and 77.7% (95% CI: 72.8-82.0) for Mixed Races. The prevalence of moderate and complete ED combined is 44.9% (95% CI: 41.3-48.5) in the total population, 44.9% (95% CI: 40.0-49.8) for Blacks and 45.7% (95% CI: 40.3-51.3) for Mixed Race.

These differences between the Black and Mixed Race groups are not statistically significant (OR = 1.07; 95% CI: 0.79 – 1.46), even after stratification for age (OR=1.15; 95% CI: 0.8-1.64).

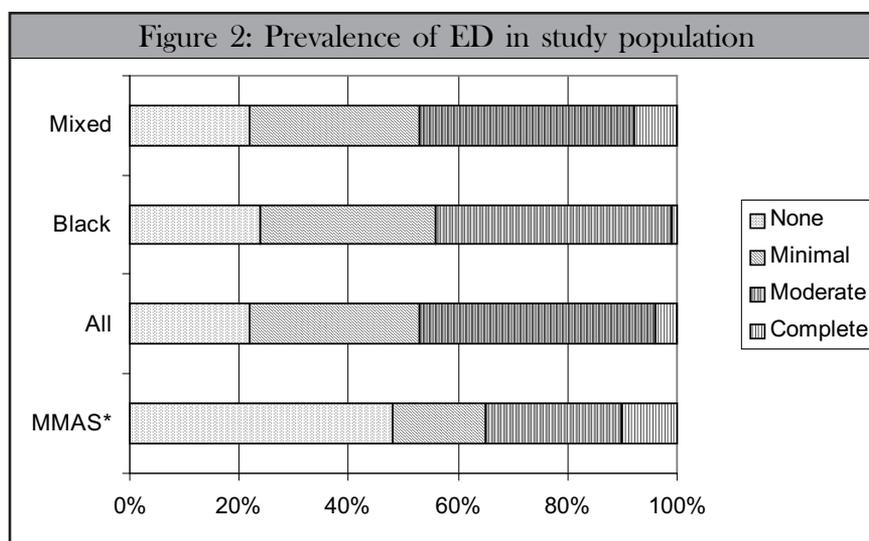
Sexual functioning was measured as “erections per month”, “intercourse per month” and “awake with erections per month”. As expected these factors were significantly associated with ED in all the groups, when were compared to moderate and severe erectile dysfunction (p <0.001 in all cases).

3. Association with age.

The strong association of ED with increasing age in these populations is clearly illustrated in **Figure 3** (p < 0.000001). In the age group 61 to 70 years almost 80% of subjects reported moderate to severe ED, compared to only 24% in the age group 35–40 years.

4. Association with health risk factors and lifestyle:

Smoking and alcohol: Less tobacco and about half the amount of caffeine is consumed by the Black group, when compared to the Mixed Race group. Alcohol is consumed at about the same amounts: Black consumed an average of 4.56 units per subject per week (SD=8.30, 95% CI: 3.87-5.24) vs. Mixed Race 4.51 units (SD=6.13, 95%



* Massachusetts Male Aging Study:

CI:4.00-5.06). In the older patients, alcohol becomes significantly associated with ED, whilst smoking seems to be associated with ED in younger age groups (Odds ratio for old = 0.46, for younger persons 2.0). This result might be coincidental and need to be investigated further.

Physical activity: Strenuous activity or strenuous labour indexes for the two groups are comparable and does show that a low level of self-reported physical activity was significantly related (p=0.002) with ED. The OR for ED (“usually”) with no activity = 1.96 (95% CI:1.44-2.68).

5. Associated medical conditions

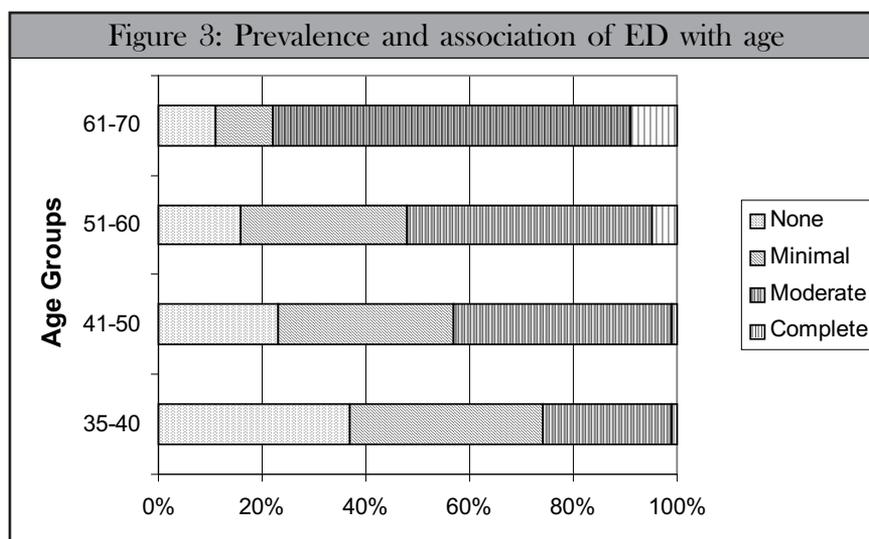
There were no significant differences between the ethnic groups for the self-reported prevalence of diabetes, hyper-

tension, heart disease, gastrointestinal disease, depression or prostate disease.

ED was significantly associated with diabetes (p = 0.001, crude OR = 3.35 [95% CI:1.80-6.30], wOR (age) = 2.63 [95% CI:1.39-4.95]) and hyper-tension in both ethnic groups (p = 0.00002, OR = 2.36 [95% CI:1.62-3.46], wOR (age) = 1.46 [95%CI:0.99-2.15]), and also with prostatism (p = 0.005) in the two groups combined. The significance of the association increased with age is expected in all of these diseases but only diabetes shows a significant chi square value for interaction (p=0.04).

6. Sexual relations and satisfaction with sex life:

Dissatisfaction with sex-life and moderate to severe ED showed a highly significant correlation. The measures of



association were: $f = 0.51$ (Black) and 0.91 (Mixed Race) and 0.72 overall. This was also true for the dissatisfaction with sexual relations and its correlation to moderate and severe ED: $f = 0.99$ (Black), 0.51 (Mixed Race) and 0.78 overall. Correlation of ED of moderate and severe grades and partner satisfaction is lower, but still strong ($f = 0.71$). The values for the ethnic groups were: black: 0.71 , Mixed Race: 0.41 . A strong correlation was found between an increasing number of partners and ED ($p=0.03$) if those with no partners are included.

7. Socio-economic factors:

There were significant differences between the black and the Mixed Race groups, regarding educational status and income. Unemployment rate in the Mixed Race group is $28,7\%$ and in the black group $44,5\%$. Employment or educational status apparently had no relation to ED, but income was related to ED. For the group with moderate ED the median income was = R6,000 (QD=39500), whilst for the group with no ED the median income was = R8,500 (QD=59500), with $p=0.0002$.

8. General mental status:

“Not happy” was defined as a person who gave a “yes” response to the questions about “felt lonely”, “felt sad”, “felt people dislike me” or “could not get going”, for 3-4 days or 5-7 days per week. A general mental status score was also obtained by giving a score of 1 to 4 to each response, and this subtracted happy from 5 to get all scores in the same direction. The total group had a mental status score of 7.69 (SD=2.67), the Black group 9.1 (SD=2.56) and the Mixed Race group 5.94 (SD=1.52). There was a significant relationship found between negative general mental status and ED ($p<0.0004$).

9. Comfort with seeking help from categories of health personnel:

$90,8\%$ of respondents would consult a primary care physician first if they had a problem with ED. The concomitant percentages in the two subgroups were Black ($87,2\%$) and Mixed Race ($95,7\%$) respectively. Figures for Public Health

Nurses varied between 0.2 and 2.0% and for Urologists between 0 and 1.1% .

DISCUSSION:

Methodological aspects:

Being a study amongst males seeking primary medical care, no direct extrapolation can be made to the general population. The prevalence of ED found in the study population will probably be somewhat higher than in the general population. The fact that the questionnaires were done through interviews with health workers and not by anonymous self-administration might however have resulted in some underreporting of ED. This method was, however, necessitated by the fact that a large part of the patient population is illiterate or had very little schooling.

The necessity to look at two different ethnic groups, was prompted by previous studies where ethnic differences were reported^{1,11} as well as by the socio-economic differences between the two groups.

Prevalence of ED:

ED is a common condition amongst males (35 to 70 years old) seeking primary medical care in the Black and Mixed Race communities investigated by this study, and moderate to severe ED was found in about $44,9\%$ of the populations studied. However, the prevalence is not unexpectedly high or low, when compared to other studies such as the community-based Massachusetts Male Aging Study (MMAS), which reported a prevalence of $34,8\%$ in males aged between 40 and 70 years.¹² The study results serve to highlight the fact that South African health workers should realise that ED is a very common problem in primary care settings.

Association with age:

Findings in this study supports other studies.¹²⁻¹⁵ that there is a very strong association of ED with increasing age in both study populations.

Association with other diseases:

Findings about the association between ED and diabetes mellitus, hypertension and heart disease, are in line with other

studies^{12,16,17} and most probably indicate a relation to the vascular pathology that is associated with these diseases. These diseases are very common in the South African population.^{18,19}

Association with lifestyle:

The relationship of ED with alcohol misuse at a younger age, and with smoking at a later age, most probably relate to the vascular changes associated with smoking and the neurological effects of alcohol and alcohol misuse.²⁰

Effect of sexual relationships:

As can be expected from other similar studies²¹, this study has shown that sexual relationships between the person with ED and his partner, are negatively affected by ED. An interesting finding in this study was the association between ED and multiple sexual partners. This may indicate that the person with ED interprets his problem as a relationship problem with his partner. The resultant seeking of alternative sexual partners may have negative implications for the spread of sexually transmitted diseases.

General mental status:

The significant relationship found between negative general mental status and ED is in keeping with other studies,^{12,22,23} where general feeling of well-being and sexual dysfunction were significantly related, although it is clearly not known which precedes the other.

Health seeking behaviour:

This study emphasizes the importance of the primary care physician in the management of ED, indicated as the provider of choice. Health care providers should ask their male patients about their ability to attain and maintain a satisfactory erection. The implications for health professionals are that they will have to ascertain that they are up to date with the initial management of these patients and that they will have to nurture a sensitivity to detect and discuss the problem in a primary care setting. It is important to note that the specific groups of patients that were investigated are frequently in contact with clinical nurse practitioners in the health facilities where they were investigated. Important negative findings are that

employment status and physical activity did not have any real influence on the prevalence of ED.

ED is a very common condition in primary care seeking Black and Mixed Race persons in the study settings. Health seeking behaviour in the study groups was overwhelmingly positive regarding consulting primary care generalist practitioners. These practitioners will thus have to possess the knowledge and skills to manage this problem effectively and suitably in a primary care setting. Several conditions are associated with ED and should serve as indicating sensitising factors to health workers that the condition may be present. Special attention needs to be given to patients of higher age, patients with hypertension, heart disease or diabetes mellitus as well as to the evident possible association of ED with drugs taken for these conditions as well as for certain psychiatric conditions. ED may also be associated with high-risk sexual behaviour (multiple partners) because of the mistaken belief that the problem is because of the partner, which may contribute to the spread of sexually transmitted diseases in sub-Saharan Africa. □

ACKNOWLEDGEMENTS:

Pfizer (Pty) Ltd, South Africa funded this study. The valuable contributions of Nathaniel Ramuthaga and Shana Bhana as study coordinators, and Dale Glasser for her critical comments on this paper is acknowledged.

References

- Melman A, Gingell JC. The epidemiology and pathophysiology of erectile dysfunction. *J Urol* 1999; **161**(1):5-11.
- Goldstein I, Lue T, Padma-nathan H, Rosen R, Steers W, Wicker P. Oral sildenafil in the treatment of male erectile dysfunction. *N Eng J Med* 1998; **338**:1397-1404.
- Baum N, Rhodes D. A practical approach to the evaluation and treatment of erectile dysfunction: a private practitioner's viewpoint. *Impotence* 1995; **22**:865-877.
- Montague DK, Barada M, Levine LA. Clinical guidelines panel on erectile dysfunction: summary report on the treatment of organic erectile dysfunction. *J Urol* 1996; **156**:2007-2100.
- Boolell M, Gepi-attee S, Ginell J, Allen M. Sildenafil, a novel effective oral therapy for male erectile dysfunction. *Br J Urol* 1996; **78**(257):261.
- Boolell M, Allen M, Ballard S. Sildenafil: an orally active type 5 cyclic GMP-specific phosphodiesterase inhibitor for the treatment of penile erectile dysfunction. *Int J Impot Res* 1996; **8**:47-52.
- Moreira ED, Jr., Abdo CH, Torres EB, Lobo CF, Fittipaldi JA. Prevalence and correlates of erectile dysfunction: results of the Brazilian study of sexual behavior. *Urology* 2001; **58**(4):583-588.
- Parazzini F, Menchini FF, Bortolotti A, Calabro A, Chatenoud L, Colli E et al. Frequency and determinants of erectile dysfunction in Italy. *Eur Urol* 2000; **37**(1):43-49.
- Chew KK, Earle CM, Stuckey BG, Jamrozik K, Keogh EJ. Erectile dysfunction in general medicine practice: prevalence and clinical correlates. *Int J Impot Res* 2000; **12**(1):41-45.
- Glasser D, Sweeney M, McKinlay J, Digrutolo L, Shirai M. The prevalence of erectile dysfunction in four countries: Italy, Brazil, Malaysia, Japan. Presented at: 8th World Meeting on Impotence Research; August 25-28, 1998; Amsterdam, the Netherlands. 1998.
- Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA* 1999; **281**(6):537-544.
- Feldman HA, Goldstein I, Hatzichristou DG, Krane RJ, McKinlay JB. Impotence and its medical and psychosocial correlates: results of the Massachusetts Male Aging Study. *J Urol* 1994; **151**(1):54-61.
- McKinlay JB. The worldwide prevalence and epidemiology of erectile dysfunction. *Int J Impot Res* 2000; **12 Suppl 4**:S6-S11.:S6-S11.
- Martin-Morales A, Sanchez-Cruz JJ, Saenz dT, I, Rodriguez-Vela L, Jimenez-Cruz JF, Burgos-Rodriguez R. Prevalence and independent risk factors for erectile dysfunction in Spain: results of the Epidemiologia de la Disfuncion Erectil Masculina Study. *J Urol* 2001; **166**(2):569-574.
- Jonler M, Moon T, Brannan W, Stone NN, Heisey D, Bruskevitz RC. The effect of age, ethnicity and geographical location on impotence and quality of life. *Br J Urol* 1995; **75**(5):651-655.
- Feldman HA, Johannes CB, Derby CA, Kleinman KP, Mohr BA, Araujo AB et al. Erectile dysfunction and coronary risk factors: prospective results from the Massachusetts male aging study. *Prev Med* 2000; **30**(4):328-338.
- Klein R, Klein B, Lee K, Moss S, Cruickshanks K. Prevalence of self-reported erectile dysfunction in people with long-term IDDM. *Diabetes Care* 1996; **19**:135-141.
- Seedat Y. Ethnicity, hypertension, coronary heart disease and renal diseases in South Africa. *Ethnic Health* 1996; **4**:349-357.
- Steyn K, Jooste P, Fourie J, Parry C, Rossouw J. Hypertension in the Mixed Race population of the Cape Peninsula. *S Afr Med J* 1986; **69**:165-169.
- Mannino D, Klevens R, Flanders W. Cigarette smoking: an independent risk factor for impotence? *Am J Epidemiol* 1994; **140**:1003-1008.
- Koskimaki J, Hakama M, Huhtala H, Tammela TL. Effect of erectile dysfunction on frequency of intercourse: a population based prevalence study in Finland. *J Urol* 2000; **164**(2):367-370.
- Araujo AB, Johannes CB, Feldman HA, Derby CA, McKinlay JB. Relation between psychosocial risk factors and incident erectile dysfunction: prospective results from the Massachusetts Male Aging Study. *Am J Epidemiol* 2000; **152**(6):533-541.
- Araujo AB, Durante R, Feldman HA, Goldstein I, McKinlay JB. The relationship between depressive symptoms and male erectile dysfunction: cross-sectional results from the Massachusetts Male Aging Study. *Psychosom Med* 1998; **60**(4):458-465.
- Marumo K, Nakashima J, Murai M. Age-related prevalence of erectile dysfunction in Japan: assessment by the International Index of Erectile Function. *Int J Urol* 2001; **8**(2):53-59.
- Meuleman E, Donkers L, Robertson C, Keech M, Boyle P, Kiemeny L. [Erectile dysfunction: prevalence and effect on the quality of life; Boxmeer study]. *Nederlands Tijdschrift voor Geneeskunde* 20010; **145**(12):576-81.
- Shirai M, Marui E, Hayashi K, Ishii N, Abe T. Prevalence and correlates of erectile dysfunction in Japan. *Int J Clin Pract* 1999; **Supplement**(102):36.
- Pinnock CB, Stapleton AM, Marshall VR. Erectile dysfunction in the community: a prevalence study. *Med J Aust* 1999; **171**(7):353-357.
- Ansong KS, Lewis C, Jenkins P, Bell J. Epidemiology of erectile dysfunction: a community-based study in rural New York State. *Ann Epidemiol* 2000; **10**(5):293-296.
- Braun M, Wassmer G, Klotz T, Reifemath B, Mathers M, Engelmann U. Epidemiology of erectile dysfunction: results of the 'Cologne Male Survey'. *Int J Impot Res* 2000; **12**(6):305-311.
- Blanker MH, Bosch JL, Groeneveld FP, Bohnen AM, Prins A, Thomas S et al. Erectile and ejaculatory dysfunction in a community-based sample of men 50 to 78 years old: prevalence, concern, and relation to sexual activity. *Urology* 2001; **57**(4):763-768.
- Green JS, Holden ST, Ingram P, Bose P, St George DP, Bowsher WG. An investigation of erectile dysfunction in Gwent, Wales. *BJU Int* 2001; **88**(6):551-553.