Sci Parasitol 12(3):123-129, September 2011
ISSN 1582-1366

ORIGINAL RESEARCH ARTICLE

Sudanese male fertility and infections

Nazar M. Abdalla

King Khalid University, College of Medicine, Microbiology Department, Abha, Saudi Arabia.
Correspondence: Tel. 00966072291041, Fax 00966072264908, E-mail uofgnazar@gmail.com

Abstract. The main objective of this study is to identify the aetiology of infertility among Sudanese males. This study was done under the umbrella of UNFPA (The United Nation) in collaboration with University of Gezira in Sudan. It was a prolong cohort study and it was held in Wad Medani city, Gezira state (central of Sudan), from June 2008 to June 2010. Four primary health care centers out of 19 health care centers in the city were selected – they are: Police, Banat, Eldibagha, Gezira health centers. The study samples were randomly selected, sample size was 200 infertile males. Demographic and epidemiological data were collected in special questionnaire, as well as medical history, examination and investigations. All steps were conducted by the investigator and the health centre doctor, midwife and nurse. Investigations performed include: blood haemogram, urine analysis, seminal analysis and testicular biopsy. Outcome results were: infertility due to husbands alone was 20% and infertility due to both couple, 31%. The end result of seminal analysis revealed that 44% out of the total number of the study group had abnormal seminal results. Those with abnormal physical findings were 12%, this include testicular abnormality, hypertension and diabetes. The impact of sexually transmitted diseases (STD) on male fertility is strongly dependent on the local prevalence of the STDs, but in this study there was no single case of STDs that mainly due to religious background. There were few cases of urethrities but Acute urethritis could not be associated with male infertility.

In Western countries STD-infections are of minor relevance. In other regions, i.e. Africa or South East Asia, the situation appears to be different. Chronic infections (gonorrhoea) can cause urethral strictures and epididymo-orchitis. *Chlamydia trachomatis* and *Neisseria gonorrhoea* can be transmitted to the female partner and cause pelvic inflammatory disease with tubal obstruction. *Ureaplasma urealyticum* may impair spermatozoa (motility, DNA condensation). *Trichomonas vaginalis* has, if any, only minor influence on male fertility. The relevance of viral infections (HPV, HSV) for male infertility is not resolved. Any STD increases the chances of transmission of the human immunodeficiency virus (HIV). The HIV infection is associated with infectious semen and the risk of virus transmission. Semen quality deteriorates with the progression of immunodeficiency. Special counselling of serodiscordant couples is needed. STDs should be treated early and adequately to prevent late sequelae for both men and women.

Keywords: *Male infertility; Sexual transmitted diseases (STDs); Seminal analysis; Azospermia; Oligospermia*.

Received 23/06/2011. Accepted 08/08/2011.

Introduction

Infertility is a medical problem that affects more than 80 million people worldwide (Ochsendorf, 2006). Infertility is one of the indicators of lacking of reproductive health. It affects a vast proportion of the world's young population (10–15%) (Sakar et al., 2008). The inability to bear children seriously impacts the psychosocial and emotional lives of couples affected by this condition (Zegers et al., 2008). It is a threat to humans continued survival on earth (Cates et al., 1984). Infertility is defined as inability to conceive after one year of unprotected adequately time intercourse (Berek et al., 1996). It has two types: primary infertility, which is the term used for a couple who have never achieved a pregnancy. Secondary infertility refer to a couple who have previously succeeded in achieving at least one pregnancy even if this ended in abortion. The prevalence and aetiology of infertility vary from place to others all over the universe, it may depend on the influence of religion and region (Jejeebhoy and Sathar, 2001) and also it depends on the type of the studies and the place where they were conducted, for example a study showed that two million American women of reproductive age were infertile in USA in 2002 and aetiology of infertility was also common among men. In Africa these studies related the main cause of infertility to tribal problem; in Western world ovulation disorder and male factors were the common causes (Gorkemli et al., 2006). In general aetiology of male infertility includes: congenital genital abnormality and spermatogenesis disorders, infections (bacteria, virus, fungi and protozoa) the important ones are known as sexual transmitted diseases (STDs) (Ochsendorf, 2008). From the organisms listed in table 1, the following appear to be able to impair male fertility: gonococci and HIV, while the roles of *Chlamydia trachomatis, Ureaplasma urealyticum,* HSV, HPV and *Trichomonas vaginalis* are discussed controversely. Epidemiological data showed that men with a history of penile discharge, painful micturition and genital ulcers, who did not seek adequate treatment for these symptoms, were more likely to be infertile than men without these symptoms or men who were adequately treated (Okonofua et al., 2005).

In a recent study, the DNA from STD pathogens was detected in semen of 45 of 241 asymptomatic men seeking an infertility investigation [18.7%; cytomegalovirus (CMV) 8.7%, human papillomavirus (HPM): 4.5%, herpes simplex virus (HSV) 4.5%, human herpes virus type 6 (HHV6) 3.7%, Epstein–Barr virus 0.4%, hepatitis B virus 0% and *C. trachomatis* 2.5%]. There was no difference in prevalence between samples with or without leukocytospermia. The DNA of sexually transmitted infection pathogens in semen was associated with a decrease in sperm concentration, motile sperm concentration, total sperm count and neutral alpha-glucosidase concentration (Bezold et al., 2007). So on the whole STD pathogens could be associated with male infertility. Other aetiology of male infertility were: immunological causes (Bandivdekar et al., 2003) and idiopathic (Trantham, 1996). Infertility is often a multifactorial condition with more than one factor contribute to have the disease. Psychological, emotional disorders, alcoholic and drugs addicts can play a role in male infertility in form of loss of libido, rapid ejaculation and erectile dysfunction. Lack of sexual education is a major causative factor in developing countries ref. Organic diseases such as smoking, obesity, diabetes, hypertension, cardiovascular and neurological disorders can lead to male infertility that could manifest in form of oligospermia and/or azospermia (Corona et al., 2010). Couples whose fertility evaluation identifies no abnormalities but who are unable to conceive are said to have idiopathic, or unexplained infertility. Investigations and treatment of infertility are always time consuming, expensive and in developing countries raise moral problem to the male side. Sudan is the largest country in Africa, most of its population live in rural areas. The developing country facing many problems including low socioeconomic status, transportation, education and lack of health services will have negative impact on the infertility problem. In Sudan, males are usually not accused as a cause of infertile couple, in fact an x-wife will be the solution for this

problem. As they used to deny their infertility. Therefore doctors should encourage male to undergone clinical examinations and simple investigations in form of seminal analysis which will bring out most of treatable cause of infertility and hence to avoid expensive, time consuming and usually inconclusive procedures, to make live easy for all infertility couples in Sudan. Objectives of this study was to identify the aetiology of Sudanese male infertility in Sudan.

Table 1. Sexually transmitted diseases: pathogenic agents and relevance for male fertility

Disease	Pathogenic agent	Relevance for infertility	
Bacteria			
Gonorrhoea	*Neisseria* gonorrhoea	Male Female	+ +
Chlamydia infection	*Chlamydia trachomatis* (D-K)	Male Female	? +
Urethritis (due to)	*Ureaplasma urealyticum*	May impair motility, sperm chromatin	?
Syphilis	*Treponema pallidum*	Co-factor for transmission of HIV Gummatous testicular lesions: Female	+ +
Chancroid	*Haemophilus ducrey*	–	
Lymphogranuloma venereum	*Chlamydia trachomatis* (L1-L3)	–	
Granuloma inguinale	*Calymmatobacterium granulomatis*	–	
Viruses			
AIDS	HIV	Male	+
Mononucleosis	CMV	–	
Asymptomatic infection	HSV	Impaired semen quality	?
Asymptomatic infection	HPV	Impaired semen quality Asthenozoospermia	??
Asymptomatic infection	Adenovirus	Infertility	?
Mumps	Mumps virus	Testicular atrophy	+
Protozoa			
Urethritis (prostatitis, epididymitis) due to	*Trichomonas vaginalis*	? Controversial	
Yeasts			
Balanitis, urethritis (due to)	*Candida albicans*	–	

+ clinical relevance demonstrated; – not relevant; ? relevance possible but not yet proven.

Material and methods

This study was performed in Gezira state, Wad Medani city (central Sudan) from June 2008 to June 2010. It took place in four primary health care centers selected randomly from 19 health care centers to represent the whole city. They are: Police, Banat, Eldibagha and Al Gezira primary health centers. Depending on the international prevalence of infertility in sub-Saharan area which is 10% (Yao and Schust, 2002) sample size was calculated as 10% from the total number of married males visited health center for any complain during one month. The total number was 200 infertile couples.

Couples consent was secured. Data were collected by special questionnaire which includes: full history of both wife and husband, history of sexual intercourse (the frequency and timing), medical examination and

investigations. Some investigations were done in the laboratories of the health centers – hemogram, urine analysis and seminal analysis for macroscopic and microscopic examination. Sudanese men usually refuse to do seminal analysis due to the complicated procedure of the test when they do it in any private laboratory, but by doing the test near their home they did not need to do it at the laboratory, but they can do at home and bring it to the health center laboratory; by this we solve the problem of males refusal of doing the test. Other tests were performed in: Surgical Department in Wad Medani Teaching Hospital for testicular biopsy.

Seminal analysis

Final results of seminal analysis depend on WHO classification, which is: the volume will be more than 2 ml.

The sperm count is as following:

- Normal sperm count >20 million per H.P.F.;
- Moderately oligospermia >5 million but <20 million;
- Sever oligospermia <5 million;
- Azoospermia is no spermatozoa seen.

The sperm motility, more than 60% of the sperms will be actively motile after production (within half an hour).

The shape, more than 60% of spermatozoa should be normal in shape.

Any husband with a sperm count less than 20 million asked to repeat the test after 2-3 weeks with avoidance of intercourse for 3-7 days prior to the test.

Results

The age of the study group rang from 19 to 60 years old, for the majority 78.5% (157 males) their age were predominant in the age group 30-49 years old (table 2). Their occupation vary from hard work like builders, drivers and farmers; other categories were employees and businessmen. The detail of clinical findings revealed that 176 male were normal, 8 of them had testicular abnormality, 10 had hypertension, only 3 of them on treatment, 6 were diabetic, 25% had family history of infertility and only 5% had past history of consulting doctors for their problem (table 3). After full examination and investigation of 200 infertile males the responsibility of infertility due to husbands was found in 20.5%, those of unknown etiology were 11% (table 4).

The seminal analysis showed more than half infertile men (54%) presented with normal seminal components, this will encourage doctors to treat them and giving these men a hope to be fertile (table 5). Abnormal seminal analysis was encountered in 42.5% of infertile men (Azospermia 11%, Oligospermia 10.5% and 21% have abnormal sperms motility).

Table 2. Male age distribution

Age group	Frequency	Percent
20 – 29	8	4
30 – 39	77	38.5
40 – 49	80	40
50 – 59	26	13
60 and above	9	4.5

Table 3. Male occupation

Occupation	Frequency	Percent
No job	2	1
Employee	62	31
Worker	50	25
Driver	14	7
Technician	1	0.5
Builder	2	1
Farmer	2	1
Practitioner	5	2.5
Businessman	49	24.5
Abroad	9	4.5
Other	1	0.5

Table 4. Male clinical findings

Results of physical examination	Frequency	Percent
Normal	174	87
Testicular abnormality	8	4
Hypertension	10	5
Diabetic	6	3
Not available	2	1
Total	**200**	**100**

Table 5. Results of seminal analysis

Result of seminal analysis	Frequency	Percent
Normal analysis	108	54
Oligospermia	21	10.5
Azoospermia	22	11
Low motility	42	21
Husband not available	5	2.5
Refuse to do the test	2	1
Total	**200**	**100**

Discussion

The age distribution of the study population was based on the international scale, the majority of males under study lies between age group 30 and 49 years, that showed they are in their middle age active and have jobs and income. Hence the age played no significant role in male aetiology of infertility. Around 11% of men understudy were illiterate, this will not assist to manage the problem of infertility by means of treatment and health education. The majority of male occupation was heavy work and car drivers which might have a great influence on their fertility. Only 5% of the males did previous investigation, that because Sudanese men usally related the problem of infertility to females.

The main aetiology of male infertility was due to seminal abnormalities in 44% which due to past history of trauma, infection mainly due to mumps congenital abnormalities (undescended tests and hypopedia) and idiopathic. Seven cases have testicular biopsy which showed testicular atrophy but no tumors were detected. In this study no single case of STD was found. This might be explained by the cultural and religious background in central part of Sudan (Muslim religious); other diseases such as diabetes in 6 cases and hypertension in 10 cases. Few cases had urithritis was identified by urine analysis. Data on the relevance of STD infections for male fertility are conflicting and have been reviewed elsewhere (Weidner et al., 1999; Ochsendorf, 2008). This may be explained by large differences in the prevalence of STDs in different regions of the world. Excluding human immunodeficiency virus (HIV) infections, the prevalence ranges from 4 per million in Western Europe to 32 in Sub-Saharan Africa and 48 in South East Asia with annual incidences of 17, 69 and 151 per million respectively (Lunenfeld et al., 2004). Therefore, the practical relevance of these agents in the aetiology of male infertility will differ. The other major problem is that the demonstration of an organism may be sign of an infection with pathological sequelae or mere contamination without relevance.

Gonorrhoea, however, may impair male fertility. Gonorrhoeic urethritis was associated with urethral strictures (Dohle, 2003). Men with gonococcal urethritis, who developed unilateral epididymo-orchitis, showed a strong impairment of testicular functions 2 years later (Osegbe, 1991). Epidemiological data propose an association of a past *C. trachomatis* infection and subfertility both in men and women (Karinen et al., 2004; Eley et al., 2005). It is accepted that *C. trachomatis* impairs female fertility by causing tubal obstruction (Eggert-Kruse et al., 1990). The exact role of Mycoplasmae, i.e. *M. hominis, U. urealyticum* and *M. genitalium* has still to be elucidated. It was shown that *M. genitalium* can attach to spermatozoa and thus can be transported to the female genital tract (Svenstrup et al., 2003). *Ureaplasma urealyticum* may cause infertility via deleterious effects on sperm chromatin and DNA, leading to impairment of embryo development (Reichart et al., 2000). In the group of infertile patients with PCR positive for *U. urealyticum,* the volume, count and morphology of semen samples were lower than in the infertile patients with PCR negative results. *Trichomonas vaginalis* was more often found in infertile men than in fertile controls, however, no effect on motility or sperm-mucus interaction could be demonstrated. Although CMV and HHV6 could be demonstrated in semen, this was not associated with impaired semen parameters. The demonstration of HSV was associated with impaired semen quality and functions of the prostate and epididymis (Bezold et al., 2007). HPV was demonstrated in semen, but the associations with sperm parameters are conflicting. One main impact of STDs is their potential to increase the rate of HIV transmission. So the treatment of STDs is not only relevant for the prevention of long-term negative consequences for fertility, but also for the prevention of HIV spreading. The most relevant source of HIV in the male reproductive tract are infected leukocytes

(lymphocytes, monocytes, macrophages) (Dulioust et al., 1998). It is controversially discussed whether the virus also infects spermatozoa (Bandivdekar et al., 2003). In AIDS patients, orchitis, hypogonadism, oligozoospermia or azoospermia have been reported; pronounced loss of germ cells (Shevchuk et al., 1999). While semen parameters were in the normal range in symptomless HIV-positive men, especially normal sperm morphology was impaired with progress of the disease. In AIDS patients, grossly abnormal sperm and leukocytospermia have been reported. There were no differences in any parameter in those taking antiretroviral medication. A disturbed function of seminal vesicles and prostate gland could explain the decreased volume as well as the more viscous semen found in HIV-infected subjects (Van Leeuwen et al., 2004). Sperm alterations found today are attributed to effects of antiretroviral therapy (Barboza et al., 2004).

Conclusion

As more past than present infections appear to impair male fertility, it is important to treat any acute infection adequately and appropriately. In HIV infections testicular functions deteriorate with progression of the immunodeficiency. Reproduction in this situation needs special counselling and experience.

References

Bandivdekar A.H., Velhal S.M., Raghavan V.P. 2003. Identification of CD4-independent HIV receptors on spermatozoa. Am. J. Reprod. Immunol. 50:322-327.

Barboza J.M., Medina H., Doria M., Rivero L., Hernandez L., Joshi N.V. 2004. Use of atomic force microscopy to reveal sperm ultrastructure in HIV-patients on highly active antiretroviral therapy. Arch. Andrology 50:121-129.

Berek J.S., Adashi E.Y., Hillard P.A., eds. 1996. Novak's gynecology. 12th ed. Baltimore: Williams & Wilkins.

Bezold G., Politch J.A., Kiviat N.B., Kuypers J.M., Wolff H., Anderson D.J. 2007. Prevalence of sexually transmissible pathogens in semen from asymptomatic male infertility patients with and without leukocytospermia. Fertil. Steril. 87:1087-1097.

Cates W., Farley T.M., Rowe P.J. 1984. Patterns of infertility in the developing world. WHO Special Programmed of Research Development and Research Training in Human Reproduction. February, p. 11.

Corona G., Bandini E., Fisher A., Elisa M., Boddi V., Balercia G., Sforza A., Forti G., Mannucci E., Maggi M. 2010. Psychobiological Correlates of Women's Sexual Interest as Perceived by Patients with Erectile Dysfunction. J. Sex. Med. 7(6):2174-2183.

Dohle G.R. 2003. Inflammatory-associated obstructions of the male genital tract. Andrologia 35:321-324.

Dulioust E., Tachet A., De Almeida M., Finkielsztejn L., Rivalland S., Salmon D., Sicard D., Rouzioux C., Jouannet P. 1998. Detection of HIV-1 in seminal plasma and seminal cells of HIV-1 seropositive men. J. Reprod. Immunol. 41:27-40.

Eggert-Kruse W., Gerhard I., Naher H., Tilgen W., Runnebaum B. 1990. Chlamydial infection – a female and/or male infertility factor? Fertil. Steril. 53:1037-1043.

Eley A., Pacey A.A., Galdiero M., Galdiero M., Galdiero F. 2005. Can *Chlamydia trachomatis* directly damage your sperm? Lancet Infect. Dis. 5:53-57.

Gorkemli H., Cicek M.N., Akyurek C., Celik C. 2006. Approach to infertile patient. *In:* Cicek M.N., Akyurek C., Celik C. (Eds.), Gynecology and obstetrics. Chapter 29. Ankara, Turkey: Gunes Kitabevi, pp. 1081.

Jejeebhoy S.J., Sathar Z.A. 2001. Women's Autonomy in India and Pakistan. The Influence of Religion and Region. Popul. Dev. Rev. 27:687-712.

Karinen L., Pouta A., Hartikainen A.L., Bloigu A., Paldanius M., Leinonen M., Saikku P., Jarvelin M.R. 2004. Association between *Chlamydia trachomatis* antibodies and subfertility in the Northern Finland Birth Cohort 1966 (NFBC 1966), at the age of 31 years. Epidemiol. Infect. 132:977-984.

Lunenfeld B., Van Steirteghem A., Foundation Bertarelli. 2004. Infertility in the third millennium: implications for the individual, family and society: condensed meeting report from the Bertarelli Foundation's second global conference. Hum. Reprod. Update. 10(4):317-326.

Ochsendorf F.R. 2006. Urethritis, sexually transmitted diseases (STD), acquired immunodeficiency syndrome (AIDS). *In:* Schill W.B., Comhaire F.H., Hargreave T.B. (Eds.), Andrology for the clinician. Springer, Berlin – Heidelberg – New York, pp. 125-130.

Ochsendorf F.R. 2008. Sexually transmitted infections: impact on male fertility. Andrologia 40(2):72-75.

Okonofua F., Menakaya U., Onemu S.O., Omo-Aghoja L.O., Bergstrom S. 2005. A case-control study of risk factors for male infertility in Nigeria. Asian J. Androl. 7:351-361.

Osegbe D.N. 1991. Testicular function after unilateral bacterial epididymo-orchitis. Eur. Urol. 19:204-208.

Reichart M., Kahane I., Bartoov B. 2000. *In vivo* and *in vitro* impairment of human and ram sperm nuclear chromatin integrity by sexually transmitted *Ureaplasma urealyticum* infection. Biol. Reprod. 63:1041-1048.

Sakar M.N., Gul T., Atay A.E., Celik Y. 2008. Comparison of hysterosalpingography and laparoscopy in the evaluation of infertile women. Saudi Med. J. 29(9):1315-1318.

Shevchuk M.M., Pigato J.B., Khalife G., Armenakas N.A., Fracchia J.A. 1999. Changing testicular histology in AIDS: its implication for sexual transmission of HIV. Urology 53:203-208.

Svenstrup H.F., Fedder J., Abraham-Peskir J., Birkelund S., Christiansen G. 2003. *Mycoplasma genitalium* attaches to human spermatozoa. Hum. Reprod. 18:2103-2109.

Trantham P. 1996. The infertile couple. Am. Fam. Physician 54(3):1001-1010.

Van Leeuwen E., Cornelissen M., De Vries J.W., Lowe S.H., Jurriaans S., Repping S., Van der Veen F. 2004. Semen parameters of a semen donor before and after infection with human immunodeficiency virus. A case report. Hum. Reprod. 19:2845-2848.

Weidner W., Krause W., Ludwig M. 1999. Relevance of male accessory gland infection for subsequent fertility with special focus on prostatitis. Hum. Reprod. Update 5:431-432.

Yao M.W.M., Schust D.J. 2002. Infertility. *In:* Berek J.S. (Ed.), Novak's Gynecology. Lippincott Company, Philadelphia.

Zegers F., Hochschild J.E., Schwarze V., Alam F. 2008. Infertility international encyclopedia of public health. Academic Press, USA, pp. 576-587.