

Surprising Rise of Male Infertility

Md. Nurul Amin¹

Living in a small country like Bangladesh with a population size of about 160 million,¹ it is quite usual that we will frequently hear about birth control, contraception and family planning as most important health and population issues. On the other end of the spectrum, there are thousands of couples who desire a child but remain childless years after years; yet the issue is rarely talked about in national forums. Yes, we are talking about infertility. At a time when the world is trying hard to achieve a decline in the rates of population growth and all developmental efforts are directly or indirectly focusing on small family norm, an attempt to talk about infertility may sound illogical. Nevertheless, those who have ever seen a couple running from door to door from "Fakir Baba" to "Traditional Healer" to top-most "Gynaecologist" of the country to have a cure for infertility can well understand the pain and pangs of the deprived couple.

Infertility (defined as the inability of a couple to achieve pregnancy after one year of regular and unprotected sexual intercourse)² is a recognized reproductive health problem worldwide with a profound impact on the psychology of the affected couples. It affects an estimated 15% of couples globally, amounting to 48.5 million couples.³ It is a problem of public health importance in many developed and developing nations because of its high prevalence and its serious social implications on affected couples and families. The prevalence rate varies between and within countries. For instance, in the United Kingdom and the United States of America it is

estimated to be 6% and 10% respectively.⁴ In Denmark, it is estimated to be 15.7%,⁵ In Nigeria and some parts of sub-Saharan Africa including the Republic of Sudan and Cameroon, infertility rate could exceed 30%.⁶⁻⁸ Some studies in South-eastern Nigeria have demonstrated a 65% and 35% prevalence rate for primary and secondary infertility respectively.⁹ Similarly, some countries, most notably Kenya, Gabon, Botswana, Zimbabwe and many other African countries, have shown a trend towards declining fertility.^{10,11}

The public health implications are even greater¹² when efforts to have children by infertile couples are unsuccessful. Feelings of helplessness frustration and despair are common. They go through enormous emotional crisis and psychological distress, as their friends and peers begin to have children. Since it is the woman who becomes pregnant and gives birth, blame goes to female partner only. Society puts pressure on her to become "mother". This phenomenon compels a woman to seek help alone, even though the male partner may be the one who is infertile. However, social attitude towards infertility has recently been changed and it is now generally accepted that male factor infertility is as important as the female factor. Available evidence suggests that infertility in the male partner contributes to approximately half of all cases. Even, in many studies infertility due to male factors is found to be the commonest single diagnostic category.¹²⁻¹⁴

Authors' Information:

¹**Dr. Md. Nurul Amin**, Asst. Professor (Community Medicine), Rajshahi Medical College, Rajshahi & Executive Editor, Ibrahim Cardiac Medical Journal, Ibrahim Cardiac Hospital & Research Institute, Shahbag, Dhaka.

Correspondence: Dr. Md. Nurul Amin, Mobile: 01753178452, e-mail: mdamin01@yahoo.com

According to WHO guideline, if an adult male has a sperm count below 20 million per ejaculate, sperm motility below 50% and abnormal morphology > 40%, the individual is considered as infertile.¹⁵ According to this guideline, a 62% prevalence of male partner infertility (combined prevalence of azoospermia, asthezoospermia, oligospermia and teratzoospermia) was evident in a recent study conducted in BIRDEM (Unpublished Document, 2016). The staggeringly high prevalence of male infertility data may seem unbelievable to many of our gynaecologists or epidemiologists. But when one considers that the study was done in BIRDEM and that a recent study done in the Infertility Treatment & Research Centre, Dhaka by Bashed et al¹⁶ on 9000 couples demonstrated a similar report (60% prevalence of male partner infertility among infertile couples), it may not be surprising. Besides, the most comprehensive WHO study¹⁷ of 5,800 infertile couples seeking help at 33 medical centers in 22 developed and developing countries demonstrated that female causes accounted for between 25 to 37% of infertility worldwide (with larger proportions in sub-Saharan Africa and Southeast Asia), male causes accounted for between 8 to 22%, and both male and female causes accounted for between 21 to 38%. Contrasting to the results reported in the WHO study,¹⁷ a positive male factor alone was found in 42.4% of the couples in the Nigerian cohort, in 25.8%, the female alone and in 20.7% both male and female factors appeared to be responsible. To further judge the plausibility of the findings of these studies, let us look at the findings of studies that observed changes in fertility pattern around the world in the last few decades.

Historic data showed that the bulk of young men in the 1940s had sperm counts far above 40 million per ml with averages higher than 100 million per ml.¹⁸ Considered in this context, only a small proportion of males will have sperm values that satisfy these ideal figures in today's

Western industrialized countries. Not only are sperm counts decreasing, the proportion of sperm with abnormal morphology and reduced motility is also increasing. For example, the proportion of sperm with abnormal morphology increased (from 26 to 45%) and sperm motility decreased¹⁹ in a Danish study while in Oslo, Norway, the proportion of abnormal sperm rose from 40 to 59% between 1966 and 1986.²⁰ A Belgian study also found that the proportion of sperm with normal morphology decreased from 39.2% in the period 1977-1980 to 26.6% in 1990-1995 and their mean percentage motility decreased from 52.7 to 31.7%.²¹ Some studies have suggested that the semen quality of sperm of young men in Northern Europe is declining.²² Other reports have confirmed the presence of extraordinarily poor semen quality among otherwise healthy young men in the general population.²³ Carlsen and colleagues first reported (in 1992) that sperm concentration in healthy men have substantially dropped from 113 million/ml in 1940 to 66 million/ml in 1990.²⁴ They showed that sperm count declined to 71.2 million/ml in Ibadan, Nigeria,²⁵ 54.6 million/ml in Lagos, Nigeria,²⁶ 65.0 million/ml in Salem, Libya,²⁷ 66.9 million/ml in Dar Es salaam, Tanzania²⁸ and 57.4 million/ml in Copenhagen, Denmark.²⁹ Subsequent studies have confirmed and strengthened Carlsen's findings.²⁴

A survey of 1,350 sperm donors in Paris found a decline in sperm counts by around 2% each year over the past 23 years with total decline of 32% and with younger men having the poorest-quality semen.³⁰ In another study at the University Hospital in Ghent, Belgium, researchers found that sperm counts among sperm donors had declined to about 10 million per ml between 1977 and 1994.²¹ In a more extensive re-analysis of the Carlsen data, Swan et al³¹ confirmed a significant mean sperm count decline of 1.5% per year in USA between 1938 and 1988, and of 3.1% per year in Europe between 1971 and 1990.

Although little is known about what is responsible for the decline in male fertility (in terms sperm count and quality) worldwide, significant associations have been reported between poor semen quality (in terms of sperm count, motility as well as morphology) and reproductive tract infections, particularly sexually transmitted diseases, exposures to heavy metals such as cadmium and lead, cigarette smoking, mycotoxins such as aflatoxins, pesticides, industrial chemicals and endocrinopathies.³² All these risk factors for declining fertility are rampantly prevailing in our country. Although community prevalence of sexually transmitted diseases is difficult to investigate, a study among adult patients (aged 18-50 years) attending at Out-patient Department of Skin and Venereal diseases of Dhaka Medical College Hospital, Dhaka and Shahid Sohrawardy Hospital, Dhaka revealed a staggeringly high prevalence of STD pathogens (86.5%). A number of epidemiological studies provided equivocal results concerning the effects of lead and cadmium on hormone concentration, male infertility and sperm parameters.³³ Cigarette smoking is an important variable when considering the effect of both lead and cadmium exposure on human health. A single cigarette has been reported to contain 1.5 µg of cadmium. Moreover, one tenth of the metal content of a cigarette is inhaled.³⁴ According to Global Adult Tobacco Survey (GATS) Bangladesh 2009, a nationally representative household survey of men and women aged 15 years or above, 43.3% people currently use both smoke and smokeless tobacco³⁵ indicating that a sizable proportion of adult males is at constant risk of lead and cadmium exposure and hence at risk of infertility. Besides, exposure to pesticides, industrial pollutants and chemicals used as preservatives are common now-a-days, although little is known about the toxicity of these chemicals to human beings exposed to their day-to-day lives.³⁶ Many of these chemicals persist in the environment,^{37,38} accumulate in body fat and

may remain in body tissue for decades³⁹ Even, majority of these chemicals have had little or no testing for their effects on human health.⁴⁰ Additionally, it is important to note that we are not being exposed to just one discrete chemical at a time, but to a mixture of chemicals, and the synergistic effect of these chemicals is unknown as toxicological studies typically look at one chemical at a time.

However, there is a 'sliver lining in the cloud' that most of the infertility in developing countries are preventable¹⁶ and many cases of male infertility do not require sophisticated and expensive treatment. Therefore any efforts to reduce the prevalence of male infertility in Bangladesh must largely focus on the prevention and prompt treatment of sexually transmitted infections, control of cigarette smoking, occupational exposure to environmental pollutants, chemicals and radiation, while legislative measures to control environmental pollution should be geared up.

But unfortunately infertility appears to be an unimportant question to policy-makers in Bangladesh, for as yet, none of the programmes of the national reproductive health policy has focused on implementing preventive and curative services for infertility, when there are 3 million infertile couples in the country and the number is rapidly increasing.¹⁶ The main message of this write-up is to remind the health and population policy-makers that as the panorama of nature is meaningless to a blind man, so a childless couple does not care whether the population of his country has in fact crossed the level above which it can be called explosive. A child is a heavenly blessing. It has no substitute. Even in the developed countries where life is busy and all means of entertainments and merry-making are available, efforts have been continuing for providing for the childless couples 'a baby' in order to give a meaning to their lives. The 'test-tube babies', 'the sperm banks' and all

other expensive 'high-techs' only indicates that the longing for real motherhood or fatherhood cannot be satisfied by substitute methods, such as, adoption or the like.

REFERENCES

1. Health Bulletin, DGHS, Dhaka, Bangladesh, 2015.
2. Idrisa A. Infertility. In: Kwawukume EY, Emuveyan EE editors . Comprehensive Gynaecology in the tropics. Accra Graphic packaging, 2005. P. 333-43.
3. Sharlip ID, Jarow JP, Belker AM, Lipshultz LI, Sigman M, Thomas AJ, et al. Best practice policies for male infertility. *Fertil Steril* 2002;77:873-82.
4. Ugwuja E, Ugwu NC, Ejikeme BN. Prevalence of Low Sperm Count and Abnormal Semen Parameters in Male Partners of Women Consulting at Infertility Clinic in Abakaliki, Nigeria. *Afr Reprod Health* 2008;12:67-73.
5. Schmidt L, Minister K, Helm P. Infertility and the seeking of infertility treatment in a representative population. *Br J Obstet Gynaecol* 1995;102:978-84.
6. Larsen U. Primary and secondary infertility in sub-Saharan Africa. *Int J Epidemiol* 2000;29:285-91.
7. Okonofua EF, Harris D, Odebiyi A, Kaned T, Snowb RC. The social meaning of infertility in Southwest Nigeria. *Health Trans Rev* 1997;7:205-20.
8. Adetoro OO, Ebomoyi EW. The prevalence of infertility in a rural Nigerian community. *Afr J Med Med Sci* 1991;20:23-27.
9. Ikechebelu JI, Adinma JI, Orié EF, Ikegwonu SO. High prevalence of male infertility in South-eastern Nigeria. *J Obstet Gynaecol* 2003;23:657-59.
10. Okonofua FE. Infertility in Sub-Saharan Africa. In: Okonofua F, and L Odunsi editors. Contemporary Obstetrics and Gynaecology for Developing Countries. Women's Health and Action Research Centre. 2003. p.128-56.
11. Araoye MO. Epidemiology of infertility: social problems of the infertile couples. *WAJM* 2003;22:190-6.
12. Randall JM , Templeton AA. Infertility: the experience of a tertiary referral centre. *Health Bull* 1991;49:48-53.
13. Thonneau P, Marchand S, Tallec A, Ferial ML, Ducot B, Lansac J, Lopes P, Tabaste JM, Spira A. Incidence and main causes of infertility in a resident population (1 850 000) of three French regions (1988- 1989). *Human Reproduction* 1991;6(Issue 6):811-16.
14. Schmidt L, Minister K and Helm P. Infertility and the seeking of infertility treatment in a representative population. *Br J Obstet Gynaecol* 1995;102:978-84.
15. WHO. Laboratory Manual for the Examination of Human Semen and Sperm-Cervical Mucus Interaction. 4th ed, Geneva, World Health Organization 1999.
16. Bashed MA, Gazi MA, Kabir MA, Al- Amin AQ. Male infertility in Bangladesh: What Better- Pharmacological Help or Awareness Programme? *Int J Pharm* 2012;8(8): 687-94.
17. Cates W, Farley TMM, Rowe PJ. Worldwide patterns of infertility: Is Africa Different? *Lancet* 1985; 596-8.
18. Guzick DS, Overstreet JW, Factor-Litvak P, Brazil CK, Nakajima ST, Coutifaris C et al. Sperm morphology, motility, and concentration in fertile and infertile men. *New England J Med* 2001;34:1388-93.
19. Bostoffe E, Serup J, Reba H. Has the fertility of Danish men declined through the years in terms of semen quality? A comparison of semen qualities between 1952 and 1972. *Int J Fert* 1983;28:91-95.
20. Bendvold E. Semen quality in Norwegian men over a 20-year period. *Intl J Fert* 1989;34:401-04.
21. Van Waelegheem K, De Clercq N, Vermeulen L. Deterioration of sperm quality in young Belgian men during recent decades. *Hum Reprod* 1994;9:73.
22. Jørgensen N, Carlsen E, Vierula M, Asklund C, Holm M, Petersen JH et al. Recent increase in testis cancer incidence among young Finnish men in associated with a decreasing trend in semen quality. *Int J Androl* 2011;34:37-48.
23. Jørgensen N, Asklund C, Carlsen E, kakkebæk NE. Coordinated European investigations of semen quality: result from studies of Scandinavian young men is a matter of concern. *Int J Androl* 2006;29:54-61.
24. Carlsen E, Giwercman A, Keiding N, Skakkebaek NE. Evidence for decreasing quality of semen during past 50 years. *Brit Med J* 1992;305:609-13.
25. Ladipo OA. Seminal analysis in fertile and infertile Nigerian men. *J Nat Med Assoc* 1980;72:785-89.
26. Osegbe DN, Amaku EO, Nnatu SN. Are changing semen parameters a universal phenomenon?. *Eur Urol* 1986;12:164-68.
27. Sheriff DS. Setting standards of male fertility. I. Semen analyses in 1500 patients-a report. *Andrologia* 1983;15:687-92.
28. Kirei BR. Semen characteristics in 120 fertile Tanzanian men. *East Afr Med J* 1987;64:453-57.
29. Andersen AG, Jensen, TK, Carlsen E, Jørgensen N, Andersson AM, Krarup T, Keiding N, Skakkebaek NE. High frequency of sub-optimal semen quality in an unselected population of young men. *Hum Reprod* 2000;15(2):366-72.
30. Sharpe RM, Fisher JS, Millar MM, Jobling S, Sumpter JP. Gestational and lactational exposure of rats to xenoestrogens results in reduced testicular size and sperm production. *Environ health perspect* 1995; 103(12):1136-43.

31. Swan SH, Elkin EP, Fenster L. Have sperm densities declined? A reanalysis of global trend data. *Environ Health Perspect* 1997;105:1228-32.
32. Abarikwu SO. Causes and Risk Factors for Male-Factor Infertility in Nigeria: A Review. *Afr J Reprod Health* 2013;17(4):150-66.
33. Benoff S, Jacob A, Hurley IR. Male infertility and environmental exposure to lead and cadmium. *Hum Reprod* 2000;6:107-21.
34. Srám RJ, Benes I, Binková B, Dejmeš J, Horstman D, Kotsovec F et al. Teplice program-the impact of air pollution in human health. *Environ Health Persp* 1996; 104:699-714.
35. Ministry of Health and Family Welfare, 2009. CDC, JHSPH: Global Adult Tobacco Survey 2009, Bangladesh. World Health Organization, Country office for Bangladesh.
36. U.S. Environmental Protection Agency (EPA). Overview: Office of Pollution Prevention and Toxics (OPPT) Programs. 2008. EPA Web site.
<http://www.epa.gov/oppt/pubs/opptabt.htm>
37. Rudel RA, Camann DE, Spengler JD, Korn LR, Brody JG. Phthalates, alkylphenols, pesticides, polybrominated diphenyl ethers, and other endocrine-disrupting compounds in air and dust. *Environmental Science & Technology* 2003;37:4543-53.
38. Siddiqui MK, Anand M, Mehrotra PK, Sarangi R, Mathur N. Biomonitoring of organochlorines in women with benign and malignant breast disease. *Environmental Research* 2004;98:250-57.
39. Nickerson K. Environmental contaminants in breast milk. *Journal of Midwifery and Women's Health* 2006;51:26-34.
40. Bennett M, Davis BJ. The identification of mammary carcinogens in rodent bioassays. *Environ Mol Mutagen* 2002;39(2-3):150-57.