

## Current Consequence and Research of Human Infertility in Bangladesh

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### Abstract

Infertility means not being able to become pregnant after a year of unprotected sexual intercourse. The actual rate of infertility in Bangladesh (BD) is still unknown but World Infertility Survey revealed that in South Asian Country stated 4% in Bangladesh and 15% of woman in the age of 45-49 years. In BD, infertility remains a neglected issue due to problem of overpopulation and rural childless women experienced social isolation, strong stigma, feelings of guilt, role failure, loss of self-esteem, abandonment by the family rather than urban childless woman. Poverty, tuberculosis, malnutrition and anemia and reproductive tract infection are the main risk factors of infertility here. Sexual transmitted diseases (STD), late marriage, improper medication and general hygienic condition, random use of oral contraceptives for long time are the causes of human infertility in BD. The treatment of infertility is not available in local hospitals, except Dhaka, due to lack of specialist and treatment unit. Assisted Reproduction Technology (ART) is one of the treatment options in Dhaka, Bangladesh, besides *In Vitro* Fertilization (IVF), Embryo Transfer, Intra Uterine Insemination (IUI), Surgical Sperm Retrieval; Blastocyst Transfer etc. are accessible here. In reproductive health research and treatment findings of hormonal imbalance, chromosomal abnormality and genetics is a common thing but this type of research works is not available in BD, may be, due to the lack of high facility research laboratory, politics, socioeconomic condition and not interest on research of our doctors. Even infertility has become a matter of trade and business in the last decade among practitioners.

**Keywords:** Bangladesh (BD); Assisted Reproduction Technology (ART); *In Vitro* Fertilization (IVF); Chromosomal abnormality and genetics

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### Introduction

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse or is the inability of a sexually active, non-contracepting couple to achieve pregnancy in one year. It is a common and severe health problem which not only affects one's ability to have children, but also has emotional, economical, psychological, family and societal effects [1]. Infertility affects both men and women. Yet women, particularly in developing country, may bear the sole blame for barren marriages. In many areas infertility is a socially acceptable basis for divorce by the husband [2-4]. In an average 15% and/or 8% to 12% of couples worldwide are infertile and in some areas that figure reaches one-third or more of couples [5,6]. According to WHO data more than 180 million couples in developing countries suffer from primary or secondary infertility, another study revealed that more than 186 million people are infertile worldwide [7]. According to Center for Diseases Control (CDC) 1.5 million women in the US (6%) are infertile and 25% of infertile couples have more than one factor that contributes to

their infertility [8]. Due to different infertility care, socio-cultural value and childlessness the differences between developed and developing world are emerging [9].

The actual rate of infertility in Bangladesh is still unknown but World Infertility Survey revealed that in South Asian Country stated 4% in Bangladesh and 15% on the basis of woman at the end of their reproductive lives in the age of 45-49 years [10,11]. In the past, infertility is mainly considered to be a female problem but it is recognized that couples undergo infertility testing about 40 percent are in the case of male factors and 40 percent are female. Despite the prevalence and significance of this health problem, resources and attention have not been sufficiently focused on this important issue in many countries in the world. In addition nearly half of the knowledge still back yet on the cause of infertility [12]. Therefore, scientists feel research interest in this area due to technological advancement and diagnostic work up and/or collaboration of various specialties (sequencing, bioinformatics, statisticians, classical genetics and others). Our country is developing one; we are still unable to treat all the patients nationally and take part of important research area for

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this type of disease that will help us for prediction of new findings and recommend prediction of policies in health sectors and/or service provider in Bangladesh. This article focused on the current consequence and research of human infertility in Bangladesh.

### Rate of infertility

According to world health organization infertility has been described as the diminished or absent ability to conceive or produce an offspring [13] and one in every four couples in developing countries had been found to be affected by infertility. In Bangladesh, infertility remains a neglected issue due to problem of overpopulation; instead the emphasis has always been related to controlling of fertility [14] moreover implementation of family planning program has become a success story for the country [15,16]. The statistics of infertility vary country to country but researchers [17] suggest that, worldwide, it is approximately 13-14%. Therefore, no epidemiological study has been conducted in the national level yet to know the prevalence rate of infertility in Bangladesh. According to WHO survey report (WHO, 1976) it was found to be 6 per cent. Later, in a study at 1996 revealed 3.9% primary and 3.2% secondary infertility in Bangladesh [18]. World fertility survey and others estimated infertility rate in South Asian Country stated 4% in Bangladesh and 15% on the basis of woman at the end of their reproductive lives in the age of 45-49 years [11] which is the highest among all South Asian Countries.

### Socioeconomic and mental health status

Woman those who are childless will suffer from an array of social, economic and emotional difficulties around the world. The cause of their suffering is primarily related their gender position in society and their gender identity. In a study it was seen that illiterate rural poor childless women and educated urban middle-class childless women in Bangladesh experience strong stigma, feelings of guilt, role failure, loss of self-esteem, abandonment by the family, social isolation and impoverishment. In contrast urban

childless woman practice good life than rural childless woman but both group of woman lead frustrated lives [19]. Another study discovered that the rural poor childless women are badly affected economically than the urban middle class [20]. Mental health complications of childless couples have been documented [21-30] and infertile woman have lower mental health score than fertile woman in Bangladesh [31].

### Risk factor of infertility

Risk factor is something that raises the risk of developing a conditions, diseases or symptoms. There are many risk factors involves in human infertility. For example age, smoking, alcohol consumption, obese and overweight, sexual transmitted infection (STI), exposure to chemicals, mental stress etc. Research suggests that environmental level of endocrine disruptors (EDs) may affect the development and functioning of reproductive system in both sexes [32-57]. In Bangladesh the potential risk factors are worth mentioning that is poverty, malnutrition, anemia [20] and tuberculosis [57,58]. Maternal nutritional status, e.g., weight and mid-arm circumference are the factor of sterility [33,34]. Polycystic ovary syndrome, pelvic surgery, caesarian delivery and increased body mass index (BMI) are associated risk factors of secondary infertility [35]. Up to date, incidence of genital tuberculosis have been diagnosed in Bangladesh [59] but appearance of pelvic tuberculosis and the relationship between BMI and infertility is not well characterized in Bangladesh yet. Reproductive tract infection is another type of risk factor of human infertility in Bangladesh [36].

### Mechanism of infertility

There is no particular cellular and molecular mechanism involves in both male and female infertility from which elucidate and/or establish appropriate treatment strategies. Many situation and factors are involved in both case infertility mechanism. Some of the condition and factor affecting fertility are given in **Tables 1 and 2**.

**Table 1.** Factor and condition affects the fertility of human.

Condition/Factors	Function	References
Anticore (opposed to sperm antigen)	▪Setting down in immune system with microorganisms opposite reaction or medicine to form immunologic infertility.	[37]
	▪Cause genital trauma and trend to infection and infertility	
Trophoblast antigens	▪Decreasing hormone require for the proliferation and production of T-cell occurring during pregnancy may cause infertility	[38,39]
Sperm immobilization factor	▪Sperm immobilization by pathogen (e.g. <i>E. coli</i> ) cause various structural damage of sperm	[40]
Thyrotoxicosis, Hypothyroidism	▪Induces abnormalities in sperm motility ▪ Associated with abnormalities of sperm morphologies	[41]
Protamine (nuclear sperm proteins)	▪Mutation and change expression pattern of protamine gene associated with infertility	[42]
Capacitation, Acrosome reaction, Oxidative stress	▪A state which maintain all of the condition for hyper activation of sperm function	[43]
	▪Induce damage of spermatozoa to loss of mortality and/or failures of sperm-oocyte fusion	
Apoptosis	▪Apoptosis occurs in spermatogonea, spermatocytes and spermatids in the testis	www.clevelandclinic.org
Autoimmune polyendocrine syndrome type 1 (APS1)	▪Increases the risk of developing autoimmune disease against the ovaries.	[44]

**Table 2.** Represents the test report of affected individuals focusing also by block rectangle and cycle symbol in pedigree analysis above. Here, NA= Not Available, ♂M=Male, ♀F=Female.

Family No	Gender of the infertile individuals	Report	
		Male	Female
		Semen examination	Menstrual cycle
1	♂(M)	NA	
	♂(M)	•Volume of fluid 2 ml •Number of sperm (not specified in report)	
	♂(M)	NA	
	♀(F)		Irregular
2	♂(M)	NA	
	♂(M)	•Volume of fluid 2 ml •Number of sperm 50 million/ml	
		•Active motility 35-40%	
3	♂(M)	•Volume of fluid 2 ml •Number of sperm 80million/ml	
		•Active motility 65- 75%	
	♂(M)	NA	
4	♂(M)	•Volume of fluid 2 ml•Number of sperm 10 million/ml	
		•Active motility 10%	
	♂(M)	NA	
5	♀(F)		Irregular
	♀(F)		Irregular
6	♀(F)		Irregular
	♀(F)		Irregular
7	♂(M)	•Volume of fluid 2 ml •Number of sperm 40 million/ml	
		•Active motility 70%	
	♀(F)		No menstrual cycle
8	♂(M)	NA	
	♂(M)	NA	
9	♂(M)	NA	
	♀(F)		
10	♀(F)		Irregular
	♀(F)		Irregular
11	♂(M)	NA	
	♂(M)	•Volume of fluid 2 ml •Number of sperm 35 million/ml	
		•Active motility 50%	
12	♂(M)	NA	
	♂(M)	Azoospermia	
13	♀(F)		Irregular
	♂(M)	NA	
14	♀(F)		Irregular
	♂(M)	NA	
15	♂(M)	NA	
	♂(M)	•Volume of fluid 2 ml •No Spermatozoa Seen	
	♂(M)	NA	
16	♂(M)	•Volume of fluid 2 ml •No Spermatozoa Seen	
	♀(F)		Irregular
	♀(F)		Irregular
	♀(F)		Irregular

## Hormonal influence of infertility

Hormones are key chemical substances that travel in the bloodstream to regulate specific organs and tissues as well as many bodily systems, including our reproductive systems. Improper levels of reproductive hormone affect the fertility of both man and woman. It can negatively affects a person's desire to have sex, quality of a man's sperm, quality of a woman's eggs, the process of ovulation (ovarian eggs maturing and the chance of a successful pregnancy). The following hormone imbalance may affect the female fertility as Follicle-stimulating hormone (FSH), luteinizing hormone (LH), human chorionic gonadotropin (HCG), estrogen and progesterone. Male reproductive hormones are produce and regulated by the hypothalamus-pituitary-endocrine system, which is responsible for stimulating the testicles to produce and release health sperm. In a small percentage of cases, only 1 to 2 percent, male infertility is due to problems in the hypothalamus and pituitary gland (parts of the brain that makes and regulates luteinizing hormone (LH) and follicle-stimulating hormone (FSH) cause the testes to produce testosterone and sperm). Thus, problems with the hypothalamus and pituitary glands can affect sperm production and sexual function. There is no work available on hormonal imbalance of infertile patients in Bangladesh.

## Cause of infertility

There is no particular casual factor involves to infertility in Bangladesh. According to Bangladesh Fertility Society (BFS) drug addiction, environmental pollution, menstrual regulation and delayed marriage are the cause of infertility here. Harvest Infertility Care Ltd. revealed that the use of detergent powder, chemical fertilizer, pesticides, use of preservatives in food, excessive use of plastic materials is another cause of infertility. But, researcher publicized that there are some potential casual factor involves for both male and female individuals and it is varying from person to person. In South Asian region reproductive health problem, for example sexually transmitted diseases (STD), urinary tract infection (UTI), reproductive tract infection (RTI), unhygienic delivery, postpartum infection and unsafe obstetric and abortion procedure are linked to sepsis and pelvic infection which can cause of infertility [45-47]. Prevalence of STD in BD is still unknown but a previous study reported that Bangladesh has high prevalence of STD [48]. Other study reported that the number of people with STDs in the country is around 2.3 million [49]. Begum [50] studied on 100 couples and mentioned that the frequency of primary and secondary infertility was 56% and 44% respectively. The same study focusing that 57% had female factors (tubal factor 33%, ovarian factor 12% and endometriosis 11%), 25% had both male and female factors and 3% had male factors where in 15% of couples the cause of infertility were unknown. Later a study revealed that problems in the fallopian tubes and the uterus, disorders of menstruation, sexual disorders, age and ovarian failure is the cause of infertility in Bangladesh [51]. Oligospermia, asthenospermia, oligoasthenospermia and teratospermia are common in the male individuals. A study found that male factor in 36.4%, bilateral tubal block in 20.2%, PCOS and anovulation in 31.7%, endometriosis in 19.6%, unexplained in 10.95%, combined in 3.5%, ovarian failure in 1.4%, testicular failure in 0.33%, congenital anomaly in 0.3% among the patients

those who are taking treatment in hospitals [52]. According to (The Dailystar, January 11, 2015) the daily news report late marriage, improper medication and general hygienic condition, random use of oral contraceptives for long time is the cause of human infertility in Bangladesh (<http://www.thedailystar.net/dealing-with-infertility-59295>).

## Chromosomal abnormalities

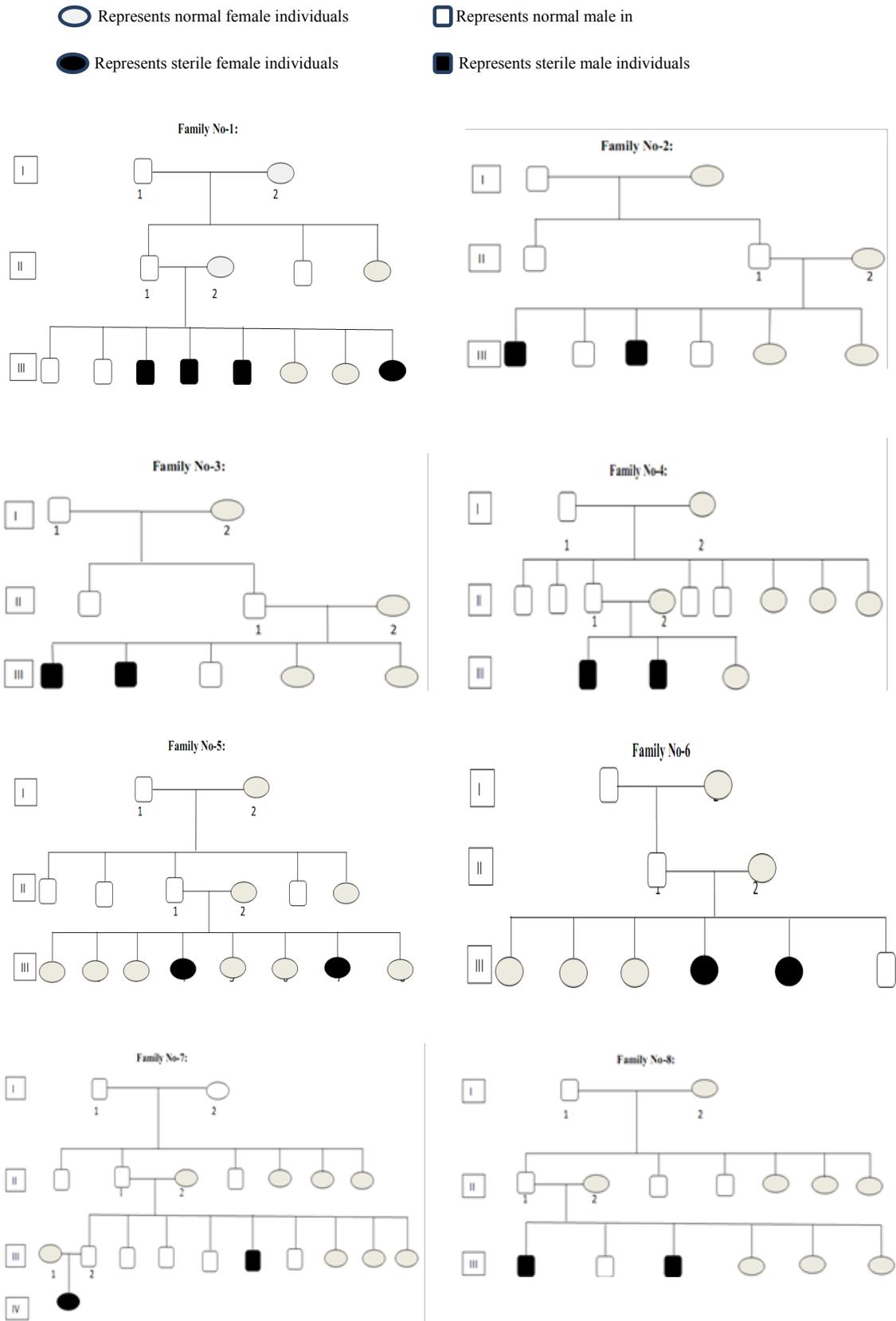
Chromosome play crucial role in fertility of humans. Chromosomally abnormal embryos have low rate of implantation in the mother's uterus often leading to miscarriages. According to Dr. Jennifer and A. Kalich (Carolinas Health Care System) a patient age 40 or older has up to a 50% risk of miscarriage. If abnormal embryos does implant, the birth of the baby may physical problem, developmental delay, mental retardation. There are several kinds of chromosomal abnormalities for example, deletion, inversion, mutation, aneuploidy (also called numerical abnormality), and translocation. There is no work and research available on patients in Bangladesh focusing chromosomal abnormality.

## Genetic cause

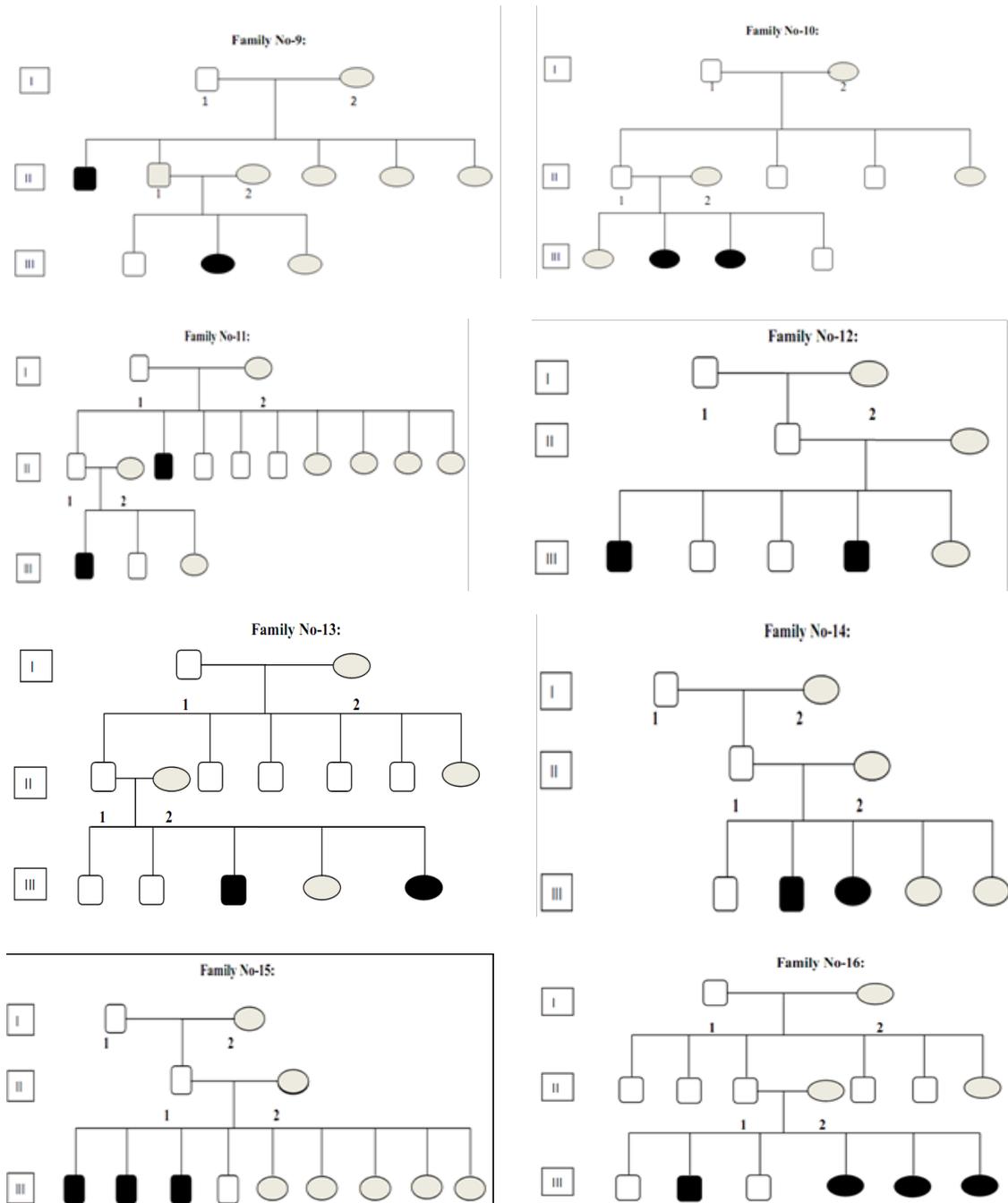
A genetic abnormality is one of the causes of infertility. The genetic cause of infertility in Bangladesh is still unknown. Much information is still back in this area of Bangladesh. In previous study it is revealed that about 10% of the genes in the human genome may be related to spermatogenesis and fertility [54,55] and nearly 50% of infertility cases are due to genetic defects [56]. According to Kavita [53] in most cases, but not all, it is difficult to assess accurately the overall magnitude of the contribution of genetics to infertility. But the great promise is that of Human Genome Projects (HGP) which help us to identification and evaluation of candidate gene in patients. Therefore, we have collected some families in the District Chuadanga, Bangladesh, for study on the topic "genetic basis underlying human infertility in Bangladesh". The pedigree analysis of these families and clinical report available of the patients are given bellow. It represents the patient's grandfather and mother to their normal sibling. The symbols of pedigree analysis are followed in **Figures 1 and 2**.

## Treatment of infertility in Bangladesh

In Bangladesh the treatment of infertility is not available in local hospitals, except Dhaka, where there is not available treatment department and doctors. If investigation is done it will seen that some doctors in local hospitals giving service to patients without any advance pathological identification. Even infertility has become a matter of trade and business in the last decade. (<http://ubinig.org/index.php/home/showAerticle/14/Farida-Akhter/#sthash.TqcCLnFw.dpuf>). In Dhaka some hospitals, clinics and medical college giving this type of service, for example Apollo hospital, Bangladesh Institute of Medical Service (BIMS), Care Specialized Hospital, Chennai Fertility Center (CFC) etc. For this type of treatment require available and sopesticated diagnostic tools and research laboratory which is a problem in our under develop country. Assisted Reproduction Technology (ART) is one of the treatment options in Dhaka Bangladesh, besides *In Vitro* Fertilization (IVF), Imbryo Transfer, Intra Uterine Insemination (IUI), Surgical Sperm Retrieval, Blastocyte Transfer and others treatment are available here. But this type of treatment require



**Figure 1** The pedigree analysis and clinical report of family 1 to 8.



**Figure 2** The pedigree analysis and clinical report of family 9 to 16.

high service charge which is not possible for the patients living in urban area due to their socioeconomic condition. The two most 'famous' technologies seen as successful so far are the IVF or commonly known as Test Tube and the other is Frozen Embryo. The Country's first Test Tube babies were born in 2001 and first frozen embryo baby was born in 2008.

## Conclusion

In Bangladesh, information about infertility is limited by which a good figure can be made and answer of many questions is still back yet, such as, what is the commonest cause of genetic

disease related to sub fertility?, percentage cause of unexplained infertility?, prevalence of IUI and IVF?, incidence of PCOS, increased BMI?, the commonest cause of mental stress? depression? schizophrenia in Bangladesh?, respectively. Therefore, beside research, epidemiological study and demographic or census surveys, clinical infertility studies may be the prime sources for determining the etiology and/or present consequences of infertility here. It is also important to comparison of data collected at different times and places have been done with particular care because of the different standards and technique used in data collection and their presentation.

## Conflict of Interests

The authors proclaim no conflict of interests.

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