INTRODUCTION

The magnitude of population explosion, the world over, seems today more alarming than the threat of nuclear explosion. If the population keeps on growing at this rate then the world would be at the threshold of self extermination without any nuclear explosion or any other natural calamity. Population explosion and pollution are two main problems of the 21st century. These problems have been continuing for the last four decades as the world population is steadily going up and increasing population is one of the main causes of pollution. If we pick up the demographic data of the last 250 years, the population has been doubled.

The world "population" was introduced in 1930 when world population became 2 billion. Since then the population is increasing at an alarming rate. The population of India became 1 billion on 11th May 2000 when baby girl Astha was born. India's population is second in the world, the first being China with a population of 1.12 billion. It is estimated that the population of India will be double of today's population by 2050.

In the new millennium, India has crossed the one billion mark, sharing 16% of the world population on 2.4% of the global land area. More than 18 million people are added every year, which is almost the entire population of Australia. With the current trend, it is projected that India may overtake China in the year 2045 to become the most populous country in the world, the distinction which no Indian would be proud of.

Some of the reasons for India’s rapidly growing population are poverty, illiteracy, high fertility rate, rapid decline in death rate or mortality rates, and immigration from Bangladesh and Nepal.
Current data show a continued increase in population but a steady decline in the population growth rate, with the global population expected to reach between 9.5 to 10.5 billion by 2050 according to International data base (IDB) World Population CENSUS June 28, 2010. Some analysts have questioned the sustainability of further world population growth, citing the growth pressures on the environment, global food supplies and energy resources.

Population explosion or over population denotes a situation in which the number of people living in a country rapidly exceeds its carrying or sustaining capabilities. It is not just the just the quantity of people but the ratio of it in connection with the actual or artificial resources at hand. Population explosion can occur due to a number of reasons such as a step up of birth rates, down slope of mortality rates with the advent of modern medical sciences, a simultaneous increase in immigration and decrease in emigration and so on.

Many problems like hot climate, low level of basic education, poverty, shortage of food supply and accommodation, development of unhygienic conditions etc. are direct consequence of the population explosion. To accommodate increasing population, agricultural land is being utilized for human establishments, making factories, roads etc.

The world population was 1 billion in the year 1804, and it is estimated that at this rate of growth in 2083 the world population will be about 10 billion. India’s population numbered 238 millions in 1901, doubled in 60 years to 439 millions in 1961, doubled again, this time is only 30 years to reach 846 million by 1991. Now in 2014, the population of India is 1.27 billion.
Due to the increasing world population it is likely that one day either we would have major scarcity of food and shelter or if we follow the process of constantly clearing the jungles and provide food for the people in the world, we would over exhaust nature and that would lead to a grave natural disaster that might kill thousands of people. It has become a concern for the whole world now as to how to save the world from destruction and devastation that would be the consequence of over population.

For the economy of India high population rate is a serious threat. Currently there are about 51 births in India in a minute. India has the largest illiterate population in the world. The direct consequences of population explosion are the shortage of food supply, shortage of living space, unemployment, increasing population, poverty, educational problems, development of unhygienic condition etc. today the country is unable to provide the basic amenities for the survival.

Increasing population is a serious threat for the economy of our country. Alarmed by its swelling population, India started taking measures to stem the growth rate quite early. So the only possible way to achieve aim of population control that is strict implementation of family planning programme.

Although India was the first to launch national family planning programme as early as 1952 in order to curtail the population menace, 16% of currently married women in the country have an unmet need for family planning; 8% women want child spacing without contraceptive use, while the other 8% do not want any more child but without the use of contraceptive-as per the national Family Planning Survey (1998-1999), 25% of total family planning programme had an unmet need, and
the contraceptive prevalence rate in the country is only a moderate 48.2%, with female sterilization accounting for 34.2% and the currently available male methods accounting negligible.

Family planning services at present cater for a predominantly female clientele. Approximately, 8% of the married women use pills world wide. However, an increasing number of people both men and women now want men to take a more active role in contraception use. But unfortunately, despite years of research, not a single modern contraceptive drug currently exists for men, whose most effective choices are limited to two most conventional methods; condoms or sterilization.

International conference on population and development (1994) has emphasized the involvement of men in the management of birth control as earlier the focus was women. In addition to condom and vasectomy, new approaches are being developed as male contraceptive methods. Two such methods i.e. RISUG and hormone based contraceptive are putative candidates which are likely to be put for human use in near future.

Recognizing the new options as a means of increasing contraceptive utilization rates, the WHO has identified the development of reversible male methods as a priority. Emerging data indicate that male hormonal contraception (MHC) provider a reversible option with efficacy equal to that of the female oral contraceptive.

Some effective and accepted by public, contraceptives are needed to control this increasing population. Some commonly used methods of contraception are as follows.
- Natural Methods:- Use of fertile period, abstinence are some such methods.
- Barrier methods:- A physical barrier is wed to prevent contact of male and female gametes male condoms, female condoms such as the diaphragm, cervical cap and the contraceptive sponge are some such methods.
- Spermicides:- Used in vagina during coitus. There are used either alone or in combination with the barrier methods.
- Hormonal methods:- Oral contraceptives, injectables & Subdermal implants containing levonorgestrel.
- Permanent sterilization:- Vasectomy for men and tubectomy or bilateral tubal occlusion for women.
- Other:- The intrauterine devices (Currently available are a copper containing T and a progesterone releasing device), natural family planning, emergency contraception like kill are also available.

Decision making by men is a prominent feature of family planning in most cultures. In the quest for appropriate family size, it is surely axiomatic that the male partner should be able to share the benefit and risk of what ever contraceptive strategy the couple may follow.

In the developed countries male methods of contraception i.e. condoms, vasectomy and withdrawal account for 20-80% of the contraceptive strategy among couples of reproductive age.

The male reproductive physiology is different from the female reproductive physiology.

- Males produce about 50,000 spermatozoa per minute whereas females produce a single egg each month.
- Sperms survive up to 7 days whereas egg is viable up to 24 hours only.
- In males fertility is maintained to old age but in females fertility is limited to around 45 years only.

For men to have as wide a choice as women, however, there is clearly a need for a greater variety of antifertility methods, capable of reversibly suppressing sperm production or sperm function in men without interfering with their libido or any other feature of their health status.

The task force on plants for fertility regulation has continued with its programme to identify novel drug prototypes in plants alleged to have fertility regulating properties. In particular compounds are being sort out that are orally-active, non-steroids, non-estrogenic and that will safely and effectively prevent or disrupt implantation in women and which will inhibit spermatogenesis or interfere with sperm maturation in men.

The majority of this search has been carried out in a network of 7 renowned centers, located in 6 countries. To this date nearly 400 plants have been evaluated. This work has involved the preparation of at least 1000 extracts and fractions and their subsequent testing is done by using rats and hamsters. Out of these 7 renowned centers, Central Drug Research institute, Lucknow, India is one. Some such plants are Albizia procera, Malva viscus conzatti, Trigonella foenum graecum, Conscora decussata, Sapindus mukorosii, Brassica olercia.

If some new drug for the control of fertility in males is developed from plants, it will be an attractive proposition for a number of reasons plant derived compounds or the derivatives from the basis of a large
number of established drugs and the acceptability of new antifertility drugs may be greatly enhanced if there preparation are based on plants.

The herbal medicines include herbs, herbal materials, herbal preparation and finished herbal products that contain part of plant or other plant material as active ingredients. Use of medicinal plants comes from ancient especially in the Africa, Asia and Latin America where the majority of the world’s people live. It is not surprising to estimate that about 90% of people have tried medicinal plants at least once in their life.

Medicinal plants and herbs are integral parts of different treatment systems. Experimental and clinical researches are conducted in the last few decades on plants mentioned in ancient literature or used traditionally for many experiments. Some of medicinal plants have been registered for medical use in some countries and in some cases poor people are dependent on medicinal plants for management of their diseases.

In spite of the use of herbal medicinal plants for different ailments, these are also used for the control of human fertility. Fertility regulation with plants or plants preparations have been reported in the ancient literature of indigenous systems of medicine. A large number of plant species with antifertility effects have been screened in China and India about 60 years ago and subsequently fortified by national and international agencies.

Rising human population throughout the world, more particularly in developing and under-developed parts has detrimental effects on the life supporting system on earth. It is possible that through biological means effective check on human fertility may soon be realized. Fertility regulation comprising contraception and management of fertility forms an
important component of reproductive health. Though considerable progress has been made in the development of highly effective, acceptable and reversible methods of contraception among females, progress and possibilities on males are still slow and limited.

More than 100 countries have regulations for herbal medicine. Herbal medicines are the synthesis of therapeutic experiences of generations of practicing physicians of indigenous system of medicine for over hundreds of years.

Some plants are mentioned in traditional literature and are used by tribal’s and by rural communities to prevent pregnancies. Laszlo and Henshaw have listed many plants used by primitive people in different countries to control fertility. Though many indigenous plants have been shown to prevent births, only a few plants have so far been investigated for antispermatogenic activity by various researchers.

Many studies have been done regarding male contraception based on hormonal mechanism. But there are many other compounds that have some action on the male reproductive system. In this regard plants reported to decrease male fertility can be studied for a male contraceptive drug.

Because of their efficiency and safety herbal medicines are also in great demand in the developed world for primary health care and some such disorders for which no modern medicine is available.

As a part of the program of research in human reproduction, the WHO has set up a task force on plants for fertility regulation in 1976. A total of 400 plants were identified by the task force for
investigation. Out of these, 331 plants were collected from different parts of Asia.

In India, rich plant diversity of the Himalaya - over 8000 angiosperms, 44 gymnosperms, 600 pteridophytes, 737 bryophytes, 1159 lichens etc. has been a source of medicine for millions of people in the country and elsewhere in the world. In the high altitudes, tradition a health care system is the only accessible form for majority of the population, both logistically and economically. Medicinal herbs are the main ingredients of local medicines and are thus of vital importance in Traditional Health Care.

Traditional Health Care System, which used to be the lifeline of remote, high altitude areas, is on the verge to extinction. The number of traditional birth-attendants, bone-attendants, bone-setters, herbal healers, wandering monks, which used to be the common sight earlier, is decreasing gradually, The wealth of information, which is preserved as an unwritten Material Medica of the tribal folk is slowly fading, and oral tradition of passing on knowledge from generation to generation is decreasing. In most cases, the traditional medicine prescriptions usually contain a large number of ingredients, varying in their proportion according to the condition of the patients. As a ‘family secret’ these multidrug prescriptions are orally transmitted from generation to generation.

Since the project for the antifertility agent of plant origin was initiated in 1976, a total of nearly 400 plants have been evaluated in 7 collaborating laboratories, approximately 20% of these plants have been found to exhibit antifertility activity. Several pure compounds that appear to have the desired antifertility activity and none of the undesirable
properties have been identified and chemically characterized and are being further investigated.

Use of medicinal plants comes from ancient especially in the Africa, Asia and Latin America where the majority of the words people live. It is not surprising to estimate that about 90% of people have tried medicinal plants at least once in their life. Information relating to medicinal plants and traditional medicine can be found in documents and databases aimed at readers.

Many plants have been known to possess antifertility activity, but limited attempts have been made to scientifically evaluate these claims.

To date, several hundred plants have been reported to possess significant antifertility properties. In all these plants, studies were restricted only to the level of spermatogenesis through histology and fertility tests in rats and mice. The roots of *Aristolochia indica* and *Plumbago zeylanica*, the leaves of *Azadirachta indica*, *Catheranthus roseus*, *Vinca rocea* and *Ocimum sanctum*, the flower of *Hibiscus rosasinensis* and *Malvaviscus conzatti*, the seed of *Carica papaya* and *Vitex negundo*, and the fruits of *Momordica charantia*, have been identified as lead plants for male fertility regulation.

Some other such plants are *Acacia concinna*, *Albizia procera*, *A. lebbeck*, *A. odoratissima*, *Aloe borbadines*, *Azardicto indica*, *Coltha pollustries*, *Portulaca oleracea*, *carica papaya*, *Astracanthis longifolia*, *Cleistanthus collinus*, *Terminalia bellerica*, *Trigonium foenum greecum*. Some other plants investigated for the antifertility effect in male rats are *Beaumontia grandifloro*, *Cimum sanctum*, *Tripterygium wilfordii*, *Aristolochia tagola*, *Adiantum lunculatum*, *Piper beetle*, *Aegle
marmelosa, Ammania baccifera, Rumex steudelii, Dendrophthoe folcate, Colebrookia oppositifolia, Madhuca indica, Quassia amara, Hibiscus rosa sinesis, Casiarea tomentosa, Diospyras embryopteris, and Milletria auriculata and were found to be effective. Unfortunately most of the aforesaid plants have not been fully investigated. Many plants have promising results, which need to be properly investigated.

The gossypol isolated from the seed of cotton plant and the glycosides of *Tripterygium wilfordii* have been studied extensively up to the stage of clinical trials. Although, gossypol was found to be more effective with 99% efficacy assessed by semen examination in human trials, further studies were abandoned due to its major side effects such as hypokalemia, low therapeutic index and uncertain recovery upon withdrawal of the drug. The glycosides of *Tripterygium wilfordii* have shown reversible impairment of motility in human. However, preliminary toxic evaluation indicates that these compounds are immunosuppressive at high dose regimens.

Recently Prof. S.K. Guha of I.I.T Kharagpur introduced RISUG (Reversible inhibition of sperm under guidance) as a reversible contraceptive for male. RISUG is a combination of styrene maleic anhydride and dimethyl sulphoxide. The combination generates molecules, which when injected into the male reproductive tract releases charged ions that act on the sperm heads and make them incapable for fertilization.

It is clear from the above account that out of hundreds of plants possessing antifertility activity of some kind, only a few have been thoroughly evaluated. There is still scope for some potent antifertility plant preparation.
The need of the day is to identify some new drugs of plant origin which can inhibit spermatogenesis or interfere with sperm maturation in men.

From the long list of plants having antifertility activity, *Terminalia bellirica* (Roxb.) plant has been selected for the present study. *Terminalia bellirica* (Roxb.) is commonly known as Bahaeda, Bibhitaka, Behda, Beleric/Bastard Myrobalan and Bhutavasa belongs to the family combretaceae Fruits contain green fixed oils, saponin, tannins, a resinous residue and three amorphous and hygroscopic glycosidal compounds. It has many medicinal properties.

The ‘baheda’, is a moderate to large sized tree, growing up to 40 meters in height. Leaves are simple, alternate, long petioled and crowded at the tip of branches, elliptic entire and acute. Flowers are small, pale green found in axillary spikes. Fruits are ovoid drupes containing single stony hard seed.

The alcoholic extract of fruit has bile stimulant activity and cold water extract possess antibacterial activity. It prevents ageing and imports longevity, immunity, enhance body resistance against disease and improves mental ability.

In piles and diarrhea, the dried ripe fruit of *Terminalia bellirica* (Roxb) are used. It is also used in fever, applied to the eyes and is useful in sore throat and bronchitis. They are also useful in urinary calculus and eye diseases. The oil obtained from seed in trichogenous and is useful in dyspepsia, skin diseases, and dryness of hair.
So in the light of the aforesaid facts, the present project has been undertaken to evaluate the changes in testes, epididymis and sperm morphology and count by different doses of benzene fraction of T. bellirica.

The present investigation was approved by an Institutional Animal ethical committee of CPCSEA. The college is registered with CPCSEA vide Regd: No. 516/01/A/CPCSEA.