CHAPTER ONE

1.0 INTRODUCTION

Infertility is a problem that affects men and women everywhere in the world including Ghana. It is defined as lack of conception after at least 12 months of unprotected regular intercourse (Rowe, *et al*, 1993.). Infertility prevalence varies from region to region and about 8% of couples in the US experience some form of infertile problem. When extrapolated to global population this means that about 50-80 million people probably have a problem with infertility, a condition that causes personal suffering and disturbance to family life (Rowe, *et al*, 1993.). Infertility prevalence in Ghana is estimated to be 7.4% (i.e. 1.5million out of 20.76million) according to the statistics used for prevalence of infertility typically based on US, UK, Canadian or Australian prevalence statistics which are then extrapolated using only the population of Ghana (US census Bureau, 2004). Globally, the incidence of infertility is estimated to be about 13-18% (Hull *et al* 1985; Thonneau *et al* 1991; Jones and Toner 1993; Irvine 1998; Mueller and Daling 1989) in the human population, regardless of race, and ethnic group.

Normal fertility depends on the production of a sufficient number of healthy, motile sperm cells by the male, delivery of those cells through open pathways into the vagina, successful passage of the sperm through the uterus and into the fallopian tubes, and penetration of a normal ovum (egg) by one of the sperm. A successful pregnancy also requires that the fertilized ovum subsequently become implanted in the lining of the female uterus. A defect at any one of these stages can result in a couple's infertility (Glover, *et al*., 1999).

Early efforts in the field of fertility management were aimed at preventing unwanted conception, and technological advances in the second half of the 20th century have made this a usually achievable goal (Isidro, *et al*, 2006). The reverse situation, inability to conceive when desired, has been a problem throughout recorded history. Many kinds of infertility have responded to new medical management methods in the late 20th century.

Out of every 100 cases of infertility, about 30 to 40 involve sperm inadequacies or gonadal deficiencies in the male partner; 20 to 30 are caused by ovulatory or hormonal deficiencies in the female; 15 to 30 involve disorders or defects in the female's fallopian tubes; 10 involve a vaginal or cervical environment that is chemically hostile to sperm; and 10 are caused by unknown factors (Encyclopedia Britannica, 2005, fertility and infertility). Traditionally, the female is held responsible for the failure to conceive. However, the male reproductive capacity is found to be deficient in not less than 50% of infertile couples (O'Donovan, *et al*, 1993). Evaluation of the male therefore should be added to the couple coming to consultation for infertility and must be performed at the beginning of couple investigation.

Testosterone, an organic compound belonging to the steroid family and occurring as the androgenic, or masculinizing, hormone is produced by the testis. Testosterone is responsible for development of the male sex organs and such masculine characteristics as facial hair and deepening of the voice. The hormone was isolated from testicular extracts in 1935, after it had been shown that they contain an androgen more potent than androsterone, which had been obtained from urine in 1931. Androsterone was later shown to be a biochemical product (a metabolite) of testosterone. Testosterone can be manufactured by chemical and microbiological modification of inexpensive steroids, such as diosgenin. It is used clinically for treatment of testicular insufficiency, the suppression of lactation, the therapy of certain types of breast cancer, and the treatment of frigidity in women. ("*Testosterone*", Encyclopaedia Britannica, 2005). The sex hormones of the male follow a much simpler pattern than do those of the female, although the same principle of interaction exists between the pituitary gland and the gonads. The latter organs, the testes, secrete steroids called androgens, which are responsible for the maintenance of male characteristics and behaviour. Follicle-stimulating hormone (FSH) from the pituitary gland stimulates the growth of the seminiferous tubules that constitute much of the structure of the testes and promotes within them the cell divisions that result in the production of mature sperm. LH (luteinizing hormone) from the pituitary gland promotes the development within the testes of endocrine tissue, which is composed of groups of cells (interstitial tissue) between the seminiferous tubules (Walmsley, *et al*. 1999). Under the influence of LH (often called ICSH, or interstitial-cell-stimulating hormone, in males), the interstitial tissue secretes the steroid hormone

testosterone, which is the most important vertebrate androgen. The fact that it is an intermediate compound in the metabolic pathway of estrogen synthesis accounts for the origin of some forms of abnormal sexual organization in man; for example, the testes may secrete predominantly estrogen instead of androgen, resulting in markedly female appearance and behaviour in a male. Although testosterone may be secreted by the adrenal cortex, occasionally producing sexual disturbances, the amount of secretion is not normally significant. Testosterone, which is bound to a protein as it circulates in human blood, can be converted to the compound androstenedione, from which it is formed, especially in the liver and in muscle; both compounds are metabolized, mainly in the liver, to substances that are excreted in urine. Very small quantities of testosterone can also be excreted in urine, and the quantities of testosterone and compounds derived from it frequently are measured to provide an index of testicular condition. ("Hormone", Encyclopaedia Britannica, 2005).

Nevertheless, the understanding and the treatment of male infertility have been disappointing. A specific treatment can be offered in rare cases in which the pathological background has been recognized and for which treatment is available. The majority of patients suffering from male infertility are given gonadotrophins, anti-estrogens, androgens or even antibiotics without any pathophysiological rationale (Sigman, *et al* 1991). Techniques of assisted reproduction such as intra-uterine insemination and in-vitro fertilization and embryo transfer (IVF-ET) have become more popular in the treatment of male infertility. Intracytoplasmic sperm injection (ICSI) a technique which needs only one spermatozoon in order to fertilize an oocyte is the most dramatic improvement in the treatment of male infertility (Palermo, *et al*, 1992).

1.1 STATEMENT OF THE PROBLEM

- In Ghana the female is more often than not held responsible for the cause of infertility in marriage. This creates a problem when the cause of infertility may have been due to the man's reproductive capacity.

- The underlying cause leading to insufficient sperm production is not well understood, knowledge of the quality and quantity of the sperm cells will greatly enhance male-factor infertility treatment.
- The male gonadal hormone, testosterone, contributes to the cause of male infertility, a knowledge of its levels in suspected males with gonadal dysfunction will greatly enhance the clinical management of this problem.

1.2 AIMS AND OBJECTIVES OF THE PROJECT

1. To measure and establish the threshold levels of testosterone in suspected subjects with male-infertility
2. To evaluate and ascertain the contribution of testosterone as a cause of male infertility among a cross-section of the Ghanaian male population
3. To elucidate the clinical significance or otherwise of testosterone levels and seminal fluid analysis as a diagnostic screening of male infertility
4. To determine the prevalence of primary male infertility in the Kumasi metropolis.

1.3 JUSTIFICATION

The outcome of such a study will bring to light the probable causes of infertility among couples and males in particular. This to a large extent will address prospective couple and the society on issues of infertility, reduce stigmatization and help couples to receive early medical help and intervention.