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Infertility Problem In Egypt: A Hidden Suffering

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I. Introduction

This article aimed at studying the problem of infertility in Egypt. Mainly we aim at estimating its level of prevalence, its regional, demographic, social/behavioral, and health differentials, and highlighting its consequences. The study is motivated to analyze this problem for several reasons. The first is infertility is an area of women suffering, reflecting the insurmountable pressures and inadequate actions of the society, culture and traditions towards them. Only the woman is blamed although infertility can be equally caused by the man or the woman. As noted by Inhorn, the Egyptian society considers the woman "who thwarts her husband's procreativity as, at best, "useless" and at worst, "a threat" to the social reproduction of the patria-lineage at large". Infertile women must "subject their bodies to invasive and agonizing methods of surveillance and control" (Inhorn, 1994, pp:4-6). Women must comply with their husbands' right to divorce them or marry others. In contrast, if infertility is caused by males, culture denies – though Islam allows – the woman's right to divorce. Moreover, barren Egyptian women who try to fulfill their wish to motherhood through adoption do face legislative problems. The result is a boring, lonely and psycho-socially stressed life.

The second reason is that the problem of infertility is ignored by the Egyptian family planning strategy; the national policy is mainly driven by a need to control the population growth. Infertile couples have to wait for some years to get governmental services, and only affluent couples can afford the required complicated and expensive clinic and laboratory examinations and treatment. Serour et al. (1991) show that slightly more than 50% of the patients can afford the treatment available in the private sector. Abu Zeid and Dann noted that "infertile patients far exceed other categories of patients in terms of average health-care expenditures" (Abu Zeid and Dann, 1985, cited in Inhorn, 1994: 24). As indicated by Serour et al., "the treatment of infertility is rather uncertain, expensive, necessitates the use of advanced technology and in many instances it has to be repeated several times before pregnancy is taken place" (Serour et al., 1991, p:42).

Consequently, and the third, the problem of infertility suffers from the negligence of the researchers. Little is known on its level of prevalence and trend (whether it is declining or increasing), on its differentials, and its risk factors (including health-related risk factors) on the national level. The bulk of researches on infertility in Egypt and in most countries are hospital/clinic based performed by medical professionals to study the degree of infertility and its curative means. This may partly explain the lack of data on the magnitude of infertility and its social/behavioral determinants. It should be noted that infertility is an area which does not lend itself easily to a national level of measurement.

Finally, most of the available models of infertility are formulated largely on a medical/clinical basis, focusing on the proximate medical causes. A concern with

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formulating public policies to alleviate the burden of infertility invites a better understanding of the contextual, social and behavioral underpinnings of the problem.

This paper is divided into 5 sections: following the introduction, the second section is an attempt to develop a theoretical framework for the forces which govern involuntary infertility cases (primary and secondary). Due to paucity of data, this model is not thoroughly tested, but its introduction can be a step towards identifying major gaps in the available data. The third section provides information on data sources. Section four estimates the level of prevalence of primary and secondary infertility in Egypt and its differentials; there is evidence that it is relatively low compared with other African countries. The last section summarizes the implications of infertility on women's marital stability.

Definition of Primary and Secondary Infertility

Two related aspects of human reproduction are addressed in the demographic literature, namely; fecundity and fertility. Fecundity refers to the capacity for procreation and the opposite is infecundity or sterility. The criterion is the ability to conceive. The term fertility refers to the actu is evidence that it is relatively low compared with other African countries. The last section summarizes the implications of infertility on women's marital stability.

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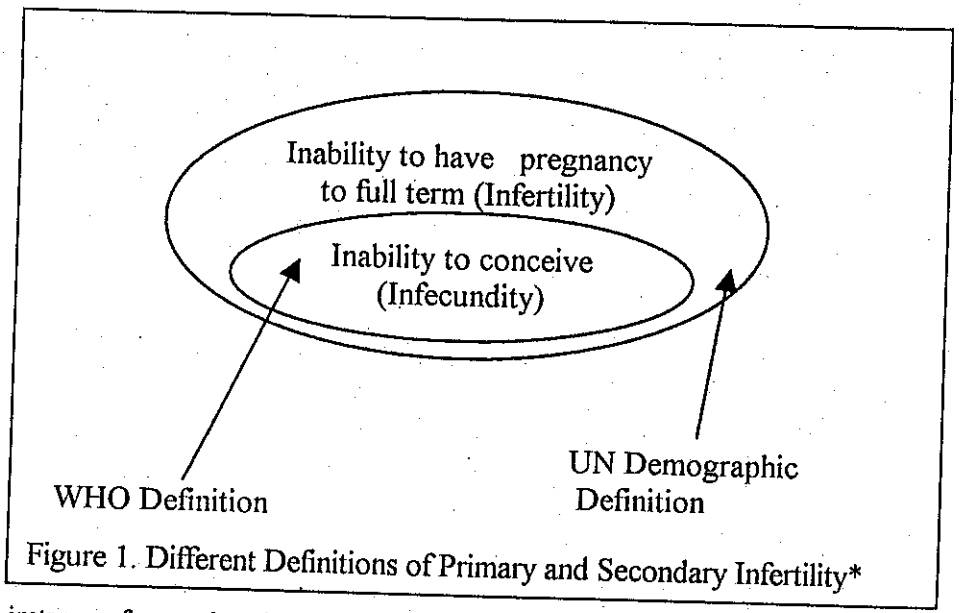


Figure 1. Different Definitions of Primary and Secondary Infertility*

* In the instance of secondary infertility, the inability to conceive and the inability to carry a pregnancy to full term criteria are considered after the last birth.

II. Theoretical Framework of the Determinants of Primary and Secondary Infertility

The proposed framework suggests dealing with infertility, primary and secondary of the couple to avoid underestimating the role of males' infertility or overestimate that of the females'. The female, the male or both may cause a couple's infertility. This framework is based on the premise that the etiologic factors can be classified into direct or "proximate" determinants and indirect ones. The indirect determinants include social, economic, cultural and health factors. They are supposed to exert an impact on infertility only through several behavioral and health links. Although both primary and secondary infertility share some of the etiologic factors, we assume that those factors influence the two instances of infertility in different weights and through different pathways.

The research aims at clearing a possible confusion aroused by two hardly separated roles played by health services; a clear distinction is made between the role of health services as an intervention and as a cause of a problem. Only the later is addressed.

Proximate determinants

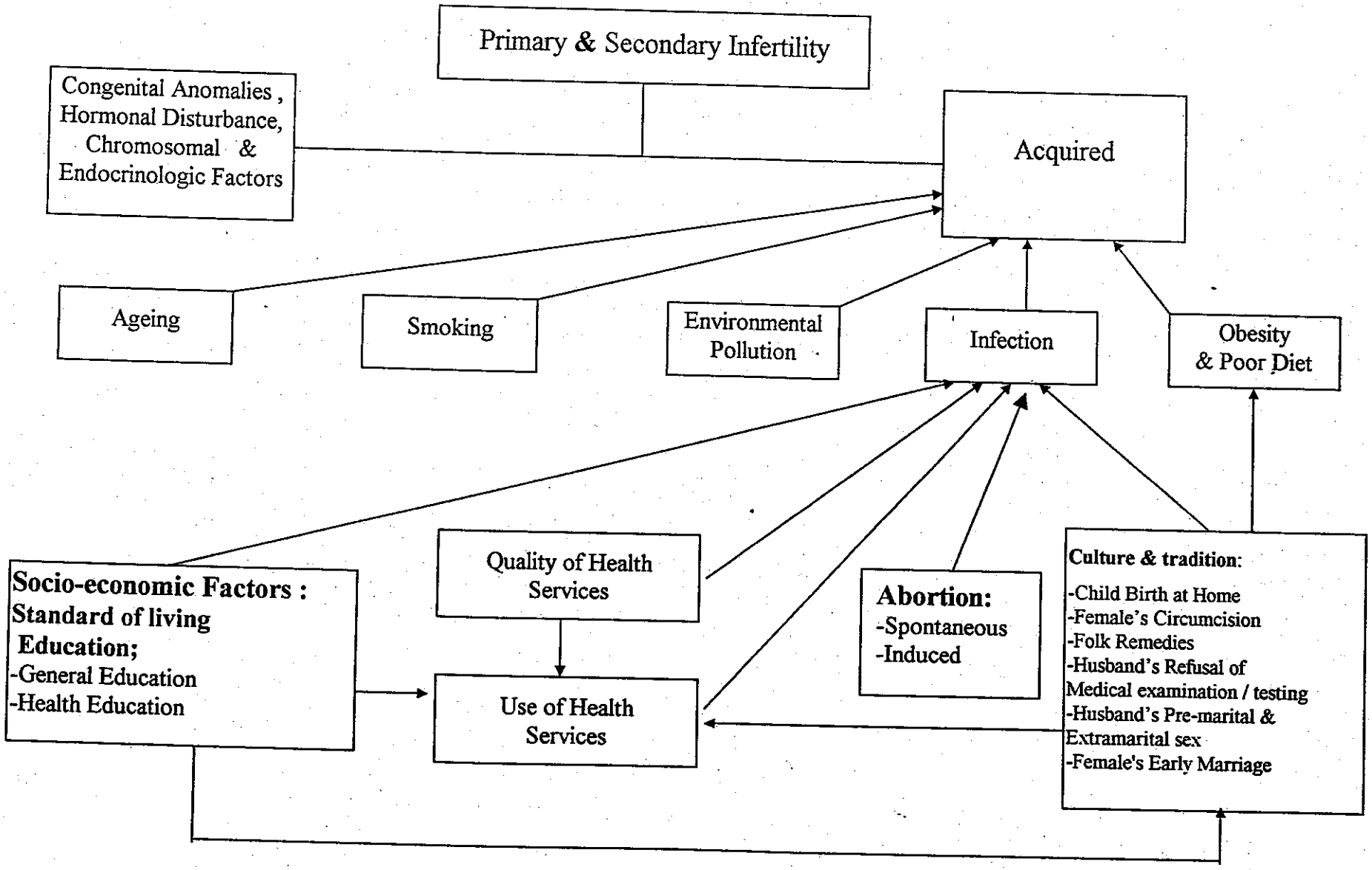
A set of proximate determinants can lead to the primary infertility of a couple. They include; chromosomal, congenital, endocrinologic factors and/or some acquired health problems. Meheus, Reniers, and Colletet (1986) estimated a worldwide "core" infertility rate of 5% due to the three mentioned factors: chromosomal, congenital and endocrinologic. Rates above this are indicative of acquired infertility. In contrast, secondary infertility incidences are almost totally an acquired health problem. There are cases, however, in which couples never get pregnant without medical assistance. For instance, some women may suffer from hormonal and endicrinological disturbances and some males may suffer from week sperms. The precipitating factors that directly cause a couple's acquired primary and secondary infertility include some which can cause females' or males' infertility and some which are males'/females' specific. They are grouped in the following categories, (Figure 2): 1) *the natural aging process of women:* the older the woman the less her chance of conception becomes, (Cates, *et al.* 1994, Younis, *et al.* 1987; Dunphy, *et al.* 1989). The reduction of the biological "quality" of the ovum, the rise in the proportion of anovular cycles, the increase in intrauterine mortality, all may be aggravated by ageing. Yet, the role of biological aging may be confounded by several interrelated behavioral factors. For instance, the length of the periods of separation of husbands and wives, the frequency of the sexual intercourse, the distribution of this intercourse within the cycles and its nature, (Pittenger, 1973; Leridon, 1977; Menken et al., 1986) Another factor held true in the instance of secondary infertility is the possible reproduction impairment associated with more pregnancies and hence with older ages (Menken et al., 1986). It is impossible to separate from the available surveys the role of aging from the role of these confounding factors. With aging there is, for example, a possible reduction in the frequency of sexual intercourse, there is a possible introduction of health problems that obstacle pregnancies, and there is a possible extra-marital sex with other partners. 2) *Inflammatory diseases;* Pelvic Inflammatory Diseases *(PIDs) and* Sexually Transmitted Diseases *(STDs)* are key etiologic factors inducing infertility. Almost all studies agree that the majority of primary and secondary infertility cases are consequences of the sexually transmitted diseases and pelvic inflammatory diseases. STDs are the main cause of male's infertility (blockage of sperm ducts or reduced sperm counts). STDs including gonococcal, Chlamydia, and

Syphilis, and Postabortal sepsis and Salpingitis can lead to pelvic inflammatory diseases which in turn cause tubal occlusion among females. The number and intensity of infections with these diseases, delaying its medication and age in which initial infection occurs all are linked directly to male/ female infertility, (Serour *et. al*, 1991; Gerais *et. al*, 1992; Inhorn, 1994; WHO,. 1991; Meheus, 1986; Larsen, 1995, 1996; Belsey, 1983). 3) *Malnutrition* and *Obesity* are obviously linked to ovarian infertility. Poor nutrition can lead not only to the increase in the frequency of anovular cycles but also may reduce the fecundability of the ova in each cycle (Leridon, 1977). Amenorrhea, disturbances in the ovulatory cycle or polycystic ovary syndrome may be aggravated by obesity, (Inhorn: 1994; Younis, *et al.* 1987). 4) Some Tropical Diseases, specially Schistosomiasis, Malaria, Filariasis, and Genital tuberculosis can potentially influence infertility in several ways, including; a) Infection of the upper genital tract and chronic pelvic inflammatory diseases; weakening and irritation of tubal tissues which render them more vulnerable to secondary infection with PIDs; b) Increasing rate of coital inability; c) Malnutrition and anemia; and d) Rising the likelihood of spontaneous abortions, stillbirths, ectopic pregnancies. For more details see, (Belsey,1983; Larsen, 1996; Talaat,2001; and the literature cited their in). 5) *Environmental pollution*'s influence on a male's fertility (through air, water and food pollution) is indicated in some studies. spermatogenesis involves rapid proliferation may react with certain sensitivity to biological changes when humans are exposed to an increasing amount of chemicals in the food chain. High levels of arsenic in the drinking water in Mexico, has found to be a threat not only to males' fertility but is also held responsible for some cases of birth defects (Lamb *et. al*, 1994; Leke *et. al*, 1993). And 6) *Smoking* has been found in some studies to have bad effects on women's fecundity through affecting the menstrual cycle periodicity, tubal function, embryo transfer, the development and viability of the ovocyte, age at menopause and bone metabolism. Smoking can possibly cause alteration in the physiological characteristics of tubes, resulting in a disturbance of the intratubal transport of the embryo, a premature or delayed arrival of the blastocyst in the uterus and alterations in the immune system. It can also decrease the number of the ovocyte viability. Smoking in males may affect their fertility by increasing the incidence of morphologic anomalies and reducing the mobility and density of the sperms. However, the evidence is not conclusive, (Cates *et. al*, 1994). Yet, research is dearth and the evidence is not conclusive for the last two factors.

Indirect Determinants

As previously mentioned primary infertility is partly an acquired health problem whiles secondary infertility is completely an acquired one. There are some socio-economic, cultural and health factors that are hypothesized not only risking the chance of conception and having a live birth but also modifying the prevalence and diversity of infertility in different areas and among different groups of the population. Moreover, it is assumed that the socio-economic and cultural factors are causing infertility only through some behavioral, and health links. Those indirect determinants include primarily, Figure 1) *Quality of the health services:* the quality of the health services provided depends on one hand, how much experience, readiness, care, technology, and scientific research are conducted in the health units and on the other hand on the health services-area coverage. An inexperienced, careless gynecologist, for instance, may cause tubal damage. Poor hygienic and sanitary conditions and medical precautions may expose women to sepsis. The scientific environments in most developing countries lack up-to-date information and the used technology is outdated and can potentially be harmful to patients.

Figure 2 : Conceptual Framework of The Determinants of The Incidence of Primary & Secondary Infertility



2) *Use of health services:* the use of health services by the couples is influenced by the prevailed culture and traditions, their socio-economic status and/or their previous experiences with the health sector. Women especially the poor and uneducated, whom their conceptions have been delayed for several months may resort to folk prescriptions and methods, healers, spiritual treatment or even self-medication. Hereby predisposing herself to many serious damages to her reproductive functions. Most women in the developing countries do not seek childbirth at health units, preferring child birth by midwives at homes. They may get infected with PIDs or suffer complications during child birth which cause tubal damage or risk her life and the baby's. Larsen found that women who were not attended by a trained health personnel at their last delivery have significant odds of being infertile than women who were assisted by others (Larsen, 1994). 3) *Spontaneous and induced abortions* are important factors influencing the fertility of the woman, espcially if they happen in places different than the health units, by untrained health personnel, in poor hygienic environment or if they were carried out by the pregnant women themseleves. All these factors may endanger the woman health with a possibility by PID infection or damage in the reproductive tract, (Pinto, 1985; Cooke, 1977, Tzonou et. al, 1993; Larsen, 1995). Tubal obstruction originated mainly by post-partium and post-abortive infections, represents the most common etiologic factor in female infertility, (Abdullah, *et al.* 1982; Serour, *et al.*, 1991), 4) *Culture and traditions* influence the woman's fecudity in a number of behavioral links: a) Females' circumcision which is widely practiced in Egypt and many of the African countries can lead to primary infertility by causing cysts or chronic inflammation. b) Early marriage is still wide spread in Egypt, especially in the rural areas. c) Tradition put wives under pressure to proof their fertility, consequently wives expose their bodies to multiple strategies of diagnoses and cure including healers, ritual practices and self-medication, some of which induces the use of folk intra-vaginal remedies, herby providing an active environment for infection with PIDs, (Inhorn: 1994, p:8). d) Culture still discourages women to seek delivery at health units. e) Culture may not encourage women to use formal health services, especially if provided by male gynecologists. f) Persons infected with STDs are often stigmatized and accused of promiscuity, or described as "indecent"; husbands get reluctant or embarrassed to visit a doctor. Instead they probably resort to self-medication by taking antibiotics or chemotherapy. In most cases they are not enough to overcome the infection, and those STDs are injected into the vagina of their wives. And g) As observed by Inhorn, "mild female obesity is a cultural ideal in Egypt and...many women who begin marriage with "ideal", mildly obese body types end up expanding after marriage from mild to moderate or sever obesity" (Inhorn: 1994, 21). And the last vital factor is, 4) *The economic status and level of education in general (and health education in particular)* of *the couple.* Research on the relationship between infertility and the socio-economic status is rare. We expect levels of economic status and education determine the couple's use of health services and their complying with medical prescriptions. They determine how far folk traditions and prescriptions and rumors, influence couple's behavior in case of illness. The low socioeconomic individuals are those who are suffering from inability to afford medical care and mal-nuterion. Lack of health education on issues such as reproduction, healthy sexual behavior, and STDs, etc., is a significant link to the several practices that cause infertility. (Laresn, 1995; Leridon, 1977).

III. Sources of Data and their Limitations

There are two major sources of information on reproductive capacity of the couples; clinical studies and surveys data. Each has, however, its own limitations. The clinical reports provide inadequate measure of infertility level of prevalence for three important factors. 1) These reports represent an ill-defined and incomplete population, 2) They refer to self-selected couples and 3) The clinics varies much in their diagnostic techniques and the definition of abnormal results, (Belsey ,1983).

The major limitation of the available national surveys that meant to study human reproduction in almost all the developed and developing countries (e.g. The World Fertility Survey, The Demographic and Health Survey, etc.) is that they have not included studying infertility among their objectives. Hereby, the most related behavioral and health risk factors and their different weights are hardly to study. Nevertheless, those surveys allow measuring infertility indirectly through utilizing answers to the questions: "have you ever had alive child?" "have you ever experienced an abortion (spontaneous or induced)?", and "have you ever experienced a stillbirth ?". It is will recognized, however, that utilizing secondary information is always causing biases in the estimates of the phenomenon of interest. Furthermore, it is impossible in these surveys to distinguish between female and male infertility, and only women are addressed in these surveys but the results naturally refer to the couples' infecundity or infertility.

The Egypt Demographic and Health Survey (DHS2000) is used in this study; the wife's questionnaire in DHS 2000 is administered to 15573 ever-married women aged between 15-49. The main objectives of this national survey were to generate quantitative and qualitative data necessary for a coherent picture of fertility and its determinants in Egypt, particularly contraceptive use. This survey (as well as other recent retrospective studies conducted in a series of Demographic and Health Surveys) was not intended to measure infertility. Therefore they did not allow examining the underlying risk factors.

IV.1 Prevalence of primary infertility among currently Married Egyptian women[2]

Although Egypt is located just north of the Central African belt of infertility, an area where infertility is considered a public health problem, the very few available statistics show less startling levels of primary infertility. As provided by Farley and Belsey (1988), the childlessness rate among currently married Egyptian women aged 45-49 is 4% (Table 1). Abdullah, Zarzoor and Ali (1982) estimated the overall infertility rate among 3,243 married couples in 3 villages in Assuit by 10.2%, of which 54.5% is primary; i.e., the rate of primary infertility is 5.5%. The Egyptian Fertility Care Society (1995) estimated the rate of prevalence among ever-married women aged 18-49 by 4.3%.

Table (1): Estimates of Primary Infertility Rates by Region

Africa	**10.1**	**Caribbean**	**6.5**	**Middle East**	**3.0**
Angola	12	Dominican R	6	Jordan	3
Burkino Fasso	6	Haiti	7	Egypt	4
Burundi	3	Jamaica	7	Turkey	2
Cameroon	15	Trinidad & T	5	Syria	3
C African R	17				
Chad	11	**Asia and Oceania**	**4.8**	**Europe**	**5.4**
Congo	21	Bangladesh	4	Belgium	7
Gabon	32	Fiji	4	Bulgaria	6
Ghana	3	Indonesia	7	Czechoslovak	4
Guinea	6	Korea	2	Denmark	6
Ivory Coast	10	Malaysia	4	Finland	5
Kenya	7	Nepal	6	France	6
Lesotho	4	Pakistan	5	Great Britain	6
Mali	8	Philippines	2	Italy	6
Mozambique	14	Sri Lanka	4	Norway	5
Niger	9	Thailand	2	Poland	3
Nigeria	8			Romania	6
Senegal	4	**Latin America**	**3.1**	Spain	4
Sudan	9	Colombia	4	Sweden	11
Tanzania	10	Costa Rica	2	Yugoslavia	5
Zaire	21	Guyana	9		
Zambia	14	Mexico	3	**North America**	**6**
		Panama	3	USA	6
		Paraguay	3		
		Peru	3		
		Venezuela	2		

Sources: African Population Conference, Dakar 1988, Vol. 1, IUSSP.
Africa – percentage of childless women aged 45-49, by Frank (1987).
Europe and USA – percentage of currently married women aged 40-44 and childless, by UNECE (1987), except Sweden – percentage of women aged 40-44 and childless, by WFS Country Summary.
Other regions – percentage of women aged 40-44, married for at least 5 years and childless, by Vaessen (1984), except Egypt – percentage of currently married women aged 45-49 and childless, from WFS country summary.
Regional figures – weighted average of country specific rates (1985).

One basic criterion to measure prevalence rate of infertility from retrospective data on the national level is the duration of unprotected exposure to the risk of pregnancy or risk of having a live child. This factor not only influences the estimated incidence (the longer the period gets the higher the possibility of conception for each fecundity level is) but also the prevalence levels. The longer the period gets, the lesser the prevalence of infertility is; longer periods allow for the success of curative interventions. To measure infertility according to the UN demographic definition, (Figure 1), researchers usually used the cut-off point of five years under the assumption that very few births will take place after that period, (Vaessen, 1984). This criterion will, in the same time, avoid selection biases. In shorter durations, women with high fecundity have a greater chance of conceiving during short periods than other women. Hence, shorter period allows measuring the ability to conceive quickly. Moreover, a cut-off point of five years takes account of early intrauterine mortality. Yet, if there is no continuous exposure to the risk of pregnancy an over-estimate of infertility is unavoidable.

It is not an easy task in surveys that did not mean to measure infertility to assess the overall time and continuity of exposure to the possibility of conception and live birth.

Two criteria are utilized to overcome as far as we can this problem. a) the currently married women at time of the survey are only considered, and b) a distinction between those who never used contraceptives and those who ever used them is performed. Studying infertility among the currently married women and discarding the divorcees and widowed suffers from two biases acting in two opposite directions. Some women got divorced after duration of less than one or two years for delayed child birth and they are in fact fecund. This is especially true in rural areas, and among the poorly socio-economic families. In such instance there will be an upward bias. In contrast, some women who are divorced are really infecund. Excluding them will lead to downward bias of the level of infertility. The measure of infertility prevalence among only the non-contracepting segment of the population calls for two assumptions, 1) there is no relation between any contraceptive use and infertility and 2) the measure of infertility among non-contraceptive population is not an over-estimate of the level for the whole population. We claim that these two assumptions do not hold in case of Egypt. In a less developed country as Egypt, it is less likely that the married couples delay their first pregnancies for more than one year (unless they are highly educated and at young ages 20-25 or unless some are living in unstable marriage). Hence, we expect the prevalence rate of primary infertility among non-contracepting populations does remarkably deviate from that among the contracepting ones.

Three measures of the prevalence rate of primary infertility from three Egyptian national demographic surveys; Egypt World Fertility Survey, 1980 (WFS), Egypt Maternal and Child Health Survey, 1991 (MCH), and Egypt Demographic and Health Survey, 2000 (DHS2000) are provided. These three surveys will let examining the trend in the level of infertility during the last two decades of the twentieth Century, Table (2). The first measure is Childlessness which is defined as the proportion of currently married women without any living children. This case occurs due to either a) inability to conceive, or b) inability to carry a pregnancy to full term, or c) stillbirths. It is usually measured among women who are at the end of their reproductive career[3]. The second measure is the primary infertile women using WHO criterion, (WHO, 1975). Accordingly, the primary infertile women are those who are currently married, have duration of marriage equal or greater than 24 months (2 years) and never conceived and not currently pregnant[4]. The third measure considers the UN demographic criterion. Accordingly the primary infertile women are those who are currently married, have duration of marriage equal or greater than 60 months (5 years) and never have alive child and not currently pregnant.

Statistics assure that Egypt has, on average, a low prevalence rate of primary infertility (col. 5, Table 2). The two measures, WHO and UN, for the three points in time show remarkable decline on the national level. When we distinguish women according to their family planning practice, several important points are in order. 1) It is interesting to recognize that there is no infertility problem among the group who ever used contraceptives. In contrast, the level of primary infertility is very high among those who never used contraceptives. According to the UN demographic definition, about 9% of the currently married women who have duration of marriage of five or more years are unable to give live birth. The level rises to 16% among the oldest cohort (40-49). This finding adds to our knowledge that Egyptian women still never resort to contraceptives unless they have at least their first child (or prove their fertility). 2) The prevalence is increasing over time. According to the childlessness estimate the recent rate is two and half times higher than that prevailed in the eighties, (16.6% vs. 6.6%, respectively).

When we consider all ages together, according to the UN demographic definition, the level in the year 2000 is two folds that in 1980 (8.9% vs. 4.4%, respectively). Available data could not help us interpreting this rising trend. We suggest that the decline of non-contracepting population (the denominator) may partially explain this rise. The percentage of currently married women who never used any family planning method declined from as high as 51.5 (WFS 1980) to 34.6% (MCH 1991) and then to about one quarter, 22.7% (DHS2000).

Table (2): Prevalence of Primary Infertility among Currently Married Egyptian Women Aged 15-49, according to the Different Definitions and Different Surveys

Measures of Primary Infertility	Surveys	Ever Used Contraceptives	Never Used Contraceptives	All Women
Childlessness (40-49)	WFS 1980	0.1	6.6	3.4
	MCH 1991	0.0	10.5	2.9
	DHS 2000	0.1	16.6	3.0
WHO Definition	WFS 1980	0.2	7.4	4.3
	MCH 1991	0.0	8.4	2.9
	DHS 2000	0.1	12.7	2.9
UN Demographic Definition	WFS 1980	0.1	4.4	2.6
	MCH 1991	0.0	6.8	2.4
	DHS 2000	0.0	8.9	2.0

Geographic pattern of primary infertility: In contrast to the assumption the urban women should have lower rate of infertility than rural counterparts, the results show the reverse, (Table 3). Adopting the demographic definition of primary infertility[1], data of DHS 2000 shows apparent differences between women living in the urban and rural areas, especially among the natural fertility group. Larsen found similar pattern in Tanzania where both childlessness and infertility are higher among urban than rural residents, (Larsen, 1996). Previous evidence suggests that the prevalence rate of pregnancy loss especially abortion (induced and spontaneous) is higher in urban areas than in rural (El-Saadani, 2000, 2001; Casterline, 1989). In addition, males pre-marital sex with several partners may be higher in urban cities and coastal areas[5]. The regional profile of the prevalence rate among the non-contracepting group reveals that the four urban governorates (Cairo, and the three coastal governorates; Alexandria, Suez and Port Said) have the highest rates of primary infertility.

Table (3): Prevalence of Primary Infertility among Currently Married Egyptian Women (15-49) according to Place of Current Residence, DHS2000

Place of current residence	Never Used Contraceptives	All Women
Urban	12.4	2.1
Rural	07.2	1.9
Regions		
Urban Gov.	14.2	2.4
Urban Lower	11.6	1.7
Urban Upper	10.2	2.1
Rural Lower	08.0	1.5
Rural Upper	06.6	2.5
Total Women	3262	14383

[1] Throughout the rest of the paper, we adopt the demographic definition of primary and secondary infertility

Age pattern and duration of marriage: The level of prevalence is higher among the oldest age group 40-49 and declines among the younger cohorts, (Table 4). This may partly be explained by the introduction of the new technologies and the remarkable advances in the medical treatments, which the younger cohort is recently, make benefit of it. Furthermore, the prevalence rate of infertility decreases by longer duration of marriage, the highest being among recently married couples (less than 10 years, 21.7and 3.8% among the non-contracepting group and all women, respectively). Longer duration allow for more chance to cure from infertility.

Table (4): Prevalence of Primary Infertility among Currently Married Egyptian Women (15-49) according to Use of Family Planning, Current Age and Duration of Marriage, DHS2000

Use of Family Planning	Current Age		
	20-29	30-39	40-49
Never used contraceptives	04.8	16.9	15.5
All women	02.4	02.3	02.7
	Duration of Marriage		
	5-9	10-14	15+
Never used contraceptives	21.7	18.1	14.0
All women	03.8	02.4	02.1

Another factor that contributes to such apparent rise of the level of infertility among the older cohorts and the decline by longer duration is the high risk of infertility among later married women. As Table 5 indicates the prevalence of primary infertility sharply increases among later married women. It is almost six and half times higher than that among who married at younger ages (less than 30). Two factors related to aging may contribute to this extreme level: women's fecundity declines by age and the risk of intrauterine mortality may aggravate by age.

Table (5): Prevalence of Primary Infertility among Currently Married Egyptian Women (15-49) Who Never Used Contraceptives according to Current Age and Age at First Marriage

Age at First Marriage	Current Age	
	<30	30+
<30	03.7	15.5
30+	-	24.1

Women's Education: It was expected that the incidence and prevalence of primary infertility declines by advances of education. However, data show a U-shape relationship, (Table 6). Furthermore, the prevalence rate is the highest among university-education women. This is true in both urban and rural areas. Women who got level of education up to preparatory level (9 years of education) have prevalence rate similar to that prevailed among the illiterates. The level sharply declines among secondary-education women.

Table (6): Prevalence of Primary Infertility among Currently Married Egyptian Women (15-49) according Who Never Used Contraceptives by Level of Women's Education and Place of Current Residence, DHS2000

Level of Women's Education	Urban	Rural
No formal education	15.3	08.1
Primary and preparatory	15.0	08.0
Secondary	07.4	04.0
University +	18.4	11.5
Total Women	1093	2169

Health Correlates*: *Female's Circumcision: Information on females' circumcision (the practice of excising a part of the genitalia of young girls, 6-12 years) on the national level reveal that such practice is almost universal; 97% of ever married women was circumcised, (El-Zanaty, *et.al.*1995, p: 171). The available data suggest no association between women primary infertility and the type of circumcision practiced (mainly, partially or completely removed clitoris and/or labiae minorae). Yet, there is a slight decline in the level of prevalence among the group who are not circumcised but the differences are not statistically significant, (Table 7). This result may be confounded by infertility that caused by male factors especially in urban areas. Further data is needed to thoroughly study the circumcision hypothesized effects on women's fecundity.

Table (7): Prevalence of Primary Infertility among Currently Married Egyptian Woman (15-49) Who Never Used Contraceptives according to Females' Circumcision, DHS2000

Female's Circumcision	Urban	Rural
Yes	12.4	7.2
No	12.1	6.1

The infrequent information that have been available through clinical studies (Serour, *et al.* ,1991) show that female factor infertility is the primer cause in 64% of the cases. Male factors represent (20.6%) and both male and female (12.2%)[6]. Male factor is the most important factor in primary infertility cases and the next common etiological factor in secondary infertility, (Abdullah, *et al.* 1982). Oligospermia and azospermia are the major causes of male infertility.

IV.2 Prevalence of secondary infertility among currently married Egyptian women

We adopted the UN demographic definition of secondary infertility. Accordingly, the secondary infertile women are those who are currently married and do not have another child since last birth for at least 5 or more years of unprotected exposure to the risk of pregnancy at the time of the survey. For the group of women who ever used contraceptives the criterion of "not currently using contraceptives" is utilized in measuring secondary infertility. This choice brings about two biases acting in two opposite directions. On one hand, some women may have used contraceptives some time after the delivery of the last birth. As timing and duration of the use are not available, an overestimation of the prevalence level of secondary infertility is unavoidable. On the other hand, some women do not know that they are sterile and are

using contraceptives because of their fear of bearing another child; a matter that can cause underestimation of the prevalence level.

According to the different surveys (Table 8), the prevalence rate of secondary infertility is constantly rising. The level by the end of the ninety decade far exceeds that prevailed in the eighties. The prevalence of secondary infertility is, however, much higher among the natural fertility group. It is almost three folds the level among those who ever used contraceptives, according to DHS'2000 (31.4% vs. 11.7%). One plausible explanation for the rising trend and the gap between the two groups is the increasing prevalence of family planning practice, as previously mentioned. Larsen found similar pattern in Cameroon where the odds of infertility are lower among the group who have ever used a modern contraceptives, (Larsen, 1995; p:344).

Table (8): Prevalence of Secondary Infertility among Currently Married Egyptian Women Aged 15-49, according to Family Planning Practice, Different Surveys

Use of family planning	WFS 1980	MCH 1991	EDHS 2000
Never used contraceptives	19.5	21.4	31.4
Ever used contraceptives	04.5	09.3	11.7
All women	12.5	12.8	14.8

Age pattern of secondary infertility: several indices have been developed to measure the level and age pattern of secondary infertility in the population. Most of them are based on complete historical data; namely, the childlessness estimator (Vincent, 1950). the Demonstrated Fecund estimator (Henry, 1961), and the Subsequently Infertile estimator (Henry, 1965). The subsequently infertile estimator considers the number of infertile couples (have no live birth) subsequent to age '*a*' as a proportion of the total number of couples observed at that age.

One major problem faces researchers when using cross-sectional data to measure the level and age pattern of secondary infertility (and primary infertility to some extent) is the incomplete birth history data that lead to the censoring problem. Some fecund women may get pregnant after their expel from observation, before they reach 50. In measuring the prevalence of secondary infertility, information on the period after the last pregnancy and age at which the woman actually become infertile are needed, (Larsen and Menken, 1989). As previously mentioned, WHO's opened birth interval based estimator has declared a two-year observation period, while Vaessen (1984) proposed 5 years. Larsen and Menken used a stochastic micro-simulation model to investigate the characteristics of several sterility indices, when using incomplete birth history data. Using data from six countries; Cameron, Ghana, Keny, Lesotho, Sudan, and Historical England (1550-1894) they concluded that the subsequently infertile estimator after considering a length of 5 years of observation is proved to be more "robust to variations in reproductive determinants, sample size and sampling variation than the other measures" (Larsen and Menken: 1989, p:185).

Proposing an inflated model of opened birth interval, El-Shalakani and Suchindran (1993) estimated an age pattern of secondary infertility among Egyptian women, using data of the Egyptian Fertility Survey (WFS 1980), (Table 9). They concluded that, "the age pattern of secondary infertility rises until age 30, after which the proportion of sterile women increases. Although this is clearly an indirect relationship working through biological factors, it gives an estimate of the possible effect on birth intervals

duration with increasing urbanization. At the age of 45 most women cease reproduction, and the incidence of secondary sterility may include menopause. However, another bias affects the estimates of secondary infertility because of the non-inclusion of intervening fetal wastage in the formulation of the model"(Shalakani and Suchindran:1993, p:68-69).

Table (9): Estimates of Secondary Infertility Derived from Open Birth Interval Data in Egypt, 1981

Age Group In Years	Inflated Model of Open Birth Interval 1980				
	Residence		Education		Total
	Urban and Semi-urban	Rural	None	School	Women
25-29	0.0103	0.0090	0.0072	0.0127	0.0104
30-34	0.1056	0.0760	0.0950	0.0836	0.0906
35-39	0.2951	0.2607	0.2587	0.2871	0.2673
40-49	0.7707	0.6989	0.6881	0.7681	0.7350

Shalakani,M.H. and C.M. Suchindran. 1993. "Estimation of Fecundity and Secondary Sterility from Survey Data on Birth Intervals in Egypt". *Human Biology*. V.65, No.1, 67.

Applying the subsequently infertile estimator for Egypt, results show that the level of secondary infertility rises by age, (Table 10). Furthermore, there are remarkable differences between the two groups of women, the natural fertility group and the group who ever practiced family planning. The later group has constantly lower prevalence of secondary infertility if compared with the first one. These estimated levels for never users and among all women are quite close to those estimated by Larsen and Menken (1989), (Figures 3.a and 3.b). Our estimates for all women are higher than those estimated by Shalakani and Suchindran for all age groups but the oldest one.

Table (10) : The proportion of Subsequently Infertile "SI(5)" Currently Married Egyptian Women (15-49) according to Contraceptive Use, DHS 2000

Age groups	Never used contraceptives	Ever used contraceptives	All Women
15-19	.014	003	.048
20-24	.080.	.020	.028
25-29	.210	.870	.104
30-34	.408	.210	.245
35-39	.601	.350	.404
40-49	.710	.403	.623
Number of cases	1903	7735	7735

Figure 3.a Proportion of women who are secondary Infertile by Age, All women*

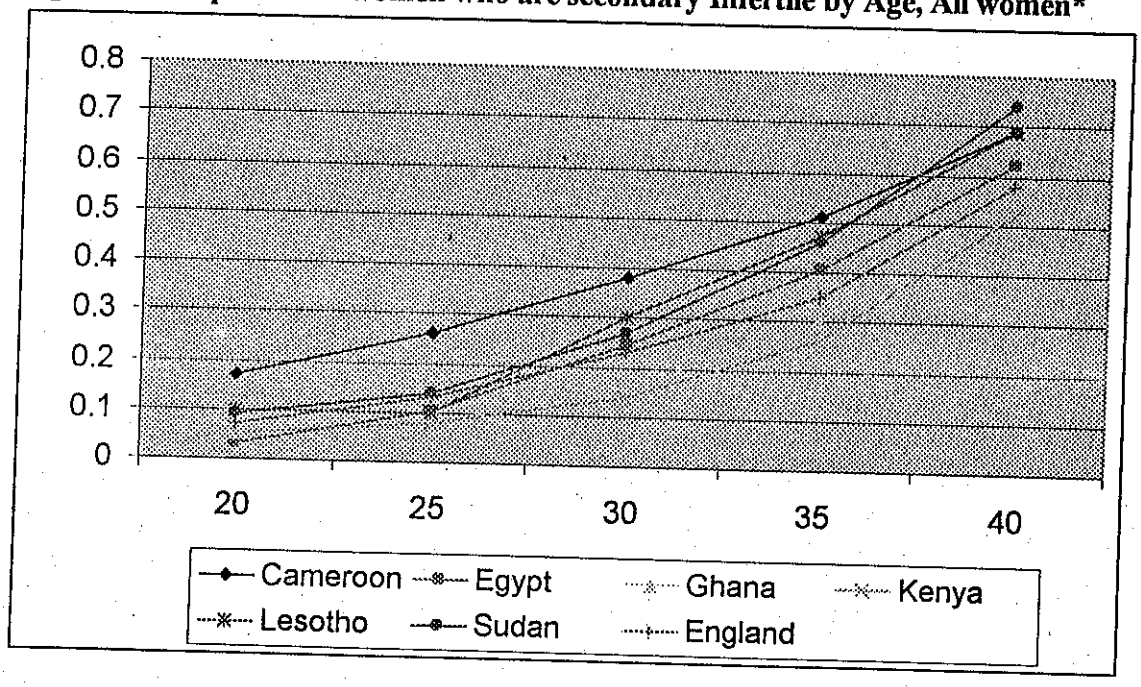
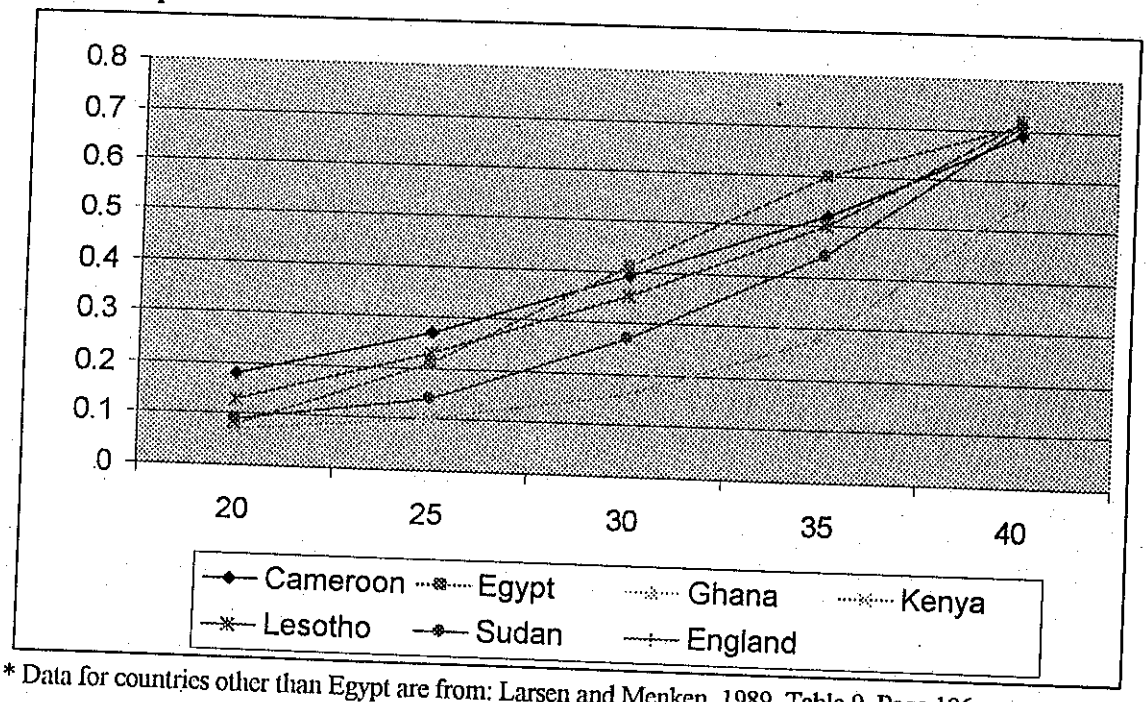


Figure 3.b Proportion of women who are secondary Infertile by Age, Never Used Contraceptives



* Data for countries other than Egypt are from: Larsen and Menken, 1989, Table 9. Page 196.

Geographic pattern of secondary infertility: according to Egypt DHS2000 the prevalence level among women who never used contraceptives in urban areas is remarkably higher than that among those who are living in rural places, (Table 11). This is in agreement with Larsen (1996) and Shalakani and Suchindran (1993). And the gap is much wider if compared to those who ever used family planning. Two factors may contribute to such regional pattern. The prevalence of contraceptive use and the prevalence of pregnancy loss especially abortion are higher in urban than in rural areas.

Table (11): Prevalence of Secondary Infertility among Currently Married Egyptian Women (15-49) according to Contraceptive Use and Place of Current Residence, DHS2000

Variables	Never Used Contraceptives	Ever Used Contraceptives
Place of Residence		
Urban	36.9	13.2
Rural	29.2	10.5
Regions		
Urban Gov.	38.4	13.6
Urban Lower	34.1	11.9
Urban Upper	38.6	14.1
Rural Lower	32.8	10.1
Rural Upper	27.3	11.0
Total Cases	2030	11110

Women's Education: unlike in the instance of primary infertility, secondary infertility has a clear negative association with the level of wife's education, especially in rural areas. It is important to notice that there is a wide gap in the prevalence of infertility between the illiterates and primary/ preparatory and those who have secondary or more education. Such pattern is true regardless of the practice of family planning.

Table (12) Prevalence of Secondary Infertility among Currently Married Egyptian Women (15-49) according to Contraceptive Use, by Level of Women's Education and Place of Current Residence, DHS2000

Women's Education	Never Used Contraceptives		Ever Used Contraceptives	
	Urban	Rural	Urban	Rural
No education	47.1	35.7	19.1	13.4
Primary & preparatory	47.9	29.7	17.9	12.7
Secondary	23.4	05.9	8.7	02.3
University +	31.7	(04.3)	10.1	02.8
Total	557	1453	5227	5882

Numbers in parenthesizes are for cases less than 30.

Health Correlates: we tried to explore, through available data the effect of the level of reproductive health on the prevalence of secondary infertility. Women who are exposed to health risks, e.g., the experience of pregnancy loss, are likely to suffer infertility more than their counterparts who never experienced fetal loss (Table 13).This is evident regardless of the practice of family planning or place of current residence. Furthermore, according to data of the Egypt Maternal and Child Health Survey (MCH)[7] events of stillbirth endanger the fecundity status of women more than abortions do. Furthermore, the survey data agree on a likely increase of secondary infertility with the increasing number of losses (abortion or stillbirth).

Table (13): Prevalence of Secondary Infertile among Currently Married Egyptian Women (15-49) according to Pregnancy Loss Episodes, MCH 1991

Types of Pregnancy Loss	Never Used Contraceptives		Ever Used Contraceptives	
	Urban	Rural	Urban	Rural
Pregnancy loss				
Never had	30.2	16.1	8.5	6.0
Ever had	43.1	25.3	15.7	11.4
Type of Pregnancy loss				
Ever had abortion	43.3	24.2	15.9	11.0
Ever had stillbirth	51.9	36.9	13.5	13.6
No. of abortions				
1	30.8	16.5	13.8	7.9
2+	57.8	32.0	18.7	15.2
No. of stillbirths				
1	47.4	35.1	12.1	12.6
2+	62.5	40.4	17.9	14.5
Total Cases	357	1854	2751	2721

Unfortunately, we could not examine the association between the quality of health services and the level of their use is because the information available are confined to women who have their last child during the five years preceding the survey[8].

IV. 3 Logistic analysis for the prevalence of primary and secondary infertility

To further investigate the apparent association between primary and secondary infertility and the different predictors, a multiple regression analysis is carried out by which it is possible to examine the net association of each variable after controlling for all other variables simultaneously. In a logistic relationship, the probability of primary infertility is assumed to be conditioned on age at first marriage, circumcision, duration of marriage and repeated marriage. Level of education and place of current residence are two main background variables that are assumed to confound the association of the previous predictors with primary infertility. In the instance of secondary infertility two logistic models are tested. One for the group of women who had never used contraceptives and the other for those who had ever used. The predictors are current age, parity, duration since last birth, repeated marriage and level of education and place of current residence. The results of the three models are displayed in Table (14). For the instance of primary infertility, Model I, all the predictors are statistically significant but circumcision. As previously mentioned that the practice of circumcision is almost universal in Egypt. A fact that hinders proper analysis for its hypothesized effect. Results confirm that the risk of primary infertility rises by late marriages, especially above age 30 as indicated in Table (5). The odds of infertility among those who married at age less than 20 declines to half the level among those who got married at age above 30. The prevalence of infertility declines by longer duration of marriage, where the odds of infertility among women who have marriage duration 5-9 years (recently married) is three folds the level among who have durations as long as 30 years. The odds of infertility among those of durations

Table (14): Logistic Regression Analysis for models predicting Primary and Secondary Infertility among Currently Married Egyptian Women (15-49), DHS 2000.

Predictors	Model I Primary Infertility		Model II Secondary Infertility Never Used Contraceptives		Model III Secondary Infertility Ever Used Contraceptives	
	B	Odds Ratio	B	Odds Ratio	B	Odds Ratio
Age at first marriage						
< 20	-.683**	0.505	-	-	-	-
20-25	-.744**	0.475	-	-	-	-
Duration of marriage (in years)						
5-9	1.180**	3.256	-	-	-	-
10-14	0.851*	2.342	-	-	-	-
15-19	0.793*	2.210	-	-	-	-
20-24	0.962**	2.618	-	-	-	-
25-29	0.586	1.689	-	-	-	-
Marriage stability (once)	-1.072**	0.342	0.243	1.274	-.273	0.761
Circumcision (yes)	0.654	1.923				
Current age (< 30 years)	-	-	-4.129**	.016	-1.878**	0.153
Parity	-					
1	-	-	.604**	1.829	0.435*	1.545
2-3	-	-	.710**	2.033	-0.329**	0.720
Duration since last birth (in years)						
0-9	-	-	-	-	-2.309**	0.099
10-14	-	-	-	-	-0.800**	0.449
Education						
No education	-0.890**	0.411	1.091**	2.977	0.532**	1.702
Primary and preparatory	-0.706*	0.492	0.956**	2.601	0.377**	1.458
Secondary	-0.863**	0.422				
Place of residence (urban)	0.524**	1.689	0.415**	1.514	0.228**	1.256
Constant	-1.091	0.336	-1.203**	0.300	-0.155	0.856

Reference categories: age at first marriage, 20+; duration of marriage, 30+; marriage instability, married more than once; circumcision, no; current age, 30+; parity, 4+; duration since last birth, 15+; level of education, university + for model I and secondary + for models II and III; place of residence, rural.

10-24 is about two times higher the level among those of longer duration of marriage. Results confirm that the prevalence of infertility is high among women who married more than once, the odds of infertility declines to 0.3 the odds among those of stable marriage (married only once). Results suggests that, controlling for other variables, there is negative association between the level of a woman's education and the risk of infertility and also a negative association between urbanization (living in the cities) and the risk of infertility and the results are statistically significant. In the instance of secondary infertility, Models II, and III), the logistic analysis prove that all the predictor variables are statistically significant with secondary infertility except the variable of marriage stability. The result confirms that the risk of secondary infertility is higher the women getting older. The odds of secondary infertility declines to 0.16 and 0.15 among younger women (of current age less than thirty) relative to those of older ages. Controlling for other variables, the odds of secondary infertility is high among low parity women especially among the natural fertility group. In contrast, there is no consistent association between parity and secondary infertility among women who had ever used contraceptives. A result that call for further analysis.

It is interesting to find that, in contrast to the instance of primary infertility, the odds of infertility rises among illiterate women and those who have some education (primary and preparatory. Result confirm that living in urban centers has negative association with secondary infertility. This is true regardless the practice of family planning.

V. Implications of Primary and Secondary Infertility

Infertility has profound social implications; the blame is often assigned to the woman who, as a result, may suffer marriage instability or even get divorced. Secondary infertile women also suffer social problems. In a society whom its members favor and put high values on a large number of children, especially boys, women who give birth to few children are at risk of divorce or living in polygamy. The study has attempted to measure the magnitude of these problems.

The rate of divorce among infertile women is extremely high. As data reveal (Table 15) the rate of divorce among the primary infertile women is 6 times higher than that among fertile couples.

Table (15): Percentage of Divorced Women by Infertility Status, DHS2000

Type of fertility	Never used contraceptives	All Women
Fertile	04.9	01.8
Primary Infertile	11.0	11.0

Results of Egypt DHS1995 indicated the negative attitude towards infertile women, even by the women themselves. Results (Tables 16 and 17) show that about one third of the total sample of women agrees that the husband has good reason to seek divorce if wife was unable to have children and denies such right for the wife in case that her husband is responsible for childlessness. In contrast a much lower percent, the lowest of all (6.4%) agrees that the wife has good reason to seek divorce if husband was unable to have children and denies such right for the husband in case that his wife is responsible for childlessness.

Table (16) Percent of Women Who Agree/Disagree that Husband/Wife Has Good Reason For Seeking Divorce If the Other Partner Is Infertile, DHS1995*

Wife has good reason to seek divorce if husband was unable to have children	Husband has good reason to seek divorce if wife was unable to have children	
	Yes	No
Yes	14.4	06.4
No	32.1	43.5

* The numbers do not add to 100% for there is 3.7% of the respondents do not know.

As shown in Table 16, The level of unfairness is obviously high among the low educated group if compared with the educated women.

Table (17) Percentage of Women Who Agree that Husband/Wife Has Good Reason For Seeking Divorce by Specific Divorce Scenarios and Level of Education, Egypt DHS1995

Divorce Scenario	No Education	Some Primary	Primary through Secondary	Completed Secondary and Higher	Total
Wife has good reason to seek divorce if husband was unable to have children	17.8	22.1	25.4	23.5	21.0
Husband has good reason to seek divorce if wife was unable to have children	51.4	51.4	45.4	36.1	47.1

Source: El-Zanaty, Fatma et al. 1995. Egypt Demographic and Health Survey 1995. Calverton, Maryland [USA]: National Population Council [Egypt] and Macro International Inc. Table 14.11, p.199.

Marriage instability (Table 18) is also apparent among the infertile women. The prevalence of primary infertility among women married more than once is three folds the level among those married only once.

Furthermore, almost fifty percent of those who married more than once and never used contraceptives are secondary infertile. It declines to about the third among those married only once. The prevalence of infertility declines considerably among contraceptive users Yet the same pattern of association persists. However, the results, especially those of secondary infertility should be taken with care, because the data do not allow us to specify which is the cause and which is the result; e.g., is marriage instability the outcome of secondary infertility or is it the cause?

Table (18): Prevalence of Infertility by Type of Infertility and Repeated Marriage, DHS2000

Type of infertility	Once	More then once
Primary infertility	07.8	28.0
Secondary infertility		
Never used contraceptives	30.6	46.2
Ever Used contraceptives	11.5	18.0

Data on the opened birth interval (OBI) for secondary infertile women indicate that the secondary infertile women "cease" reproduction very early, (Table 19). Women aged 30-40 cease reproduction at around age 25 and older women cease reproduction in early 30. On average they have been waiting between 8-12 years to conceive. There are no remarkable differences depending on the use of family planning.

Table (19): Mean of the Opened Birth Interval for the Secondary Infertile Currently Married Egyptian Women, by Current Age and Contraceptive Use, DHS2000

Current Age (Age group)	Use of Family Planning		Total Women
	Never Used Contraceptives	Ever Used Contraceptives	
	Mean ± SE	Mean ± SE	Mean ± SE
15-29	06.7 ± 0.429*	06.6 ± 2.925	06.6 ± 2.283
30-34	08.7 ± 1.133	07.9 ± 3.280	08.2 ± 2.835
35-39	09.9 ± 1.281	09.0 ± 2.414	09.3 ± 2.313
40+	12.8 ± 1.899	13.3 ± 1.845	13.1 ± 1.606
Total	11.8 ± 0.406	12.1 ± 1.624	12.0 ± 1.381

The mean is in years. SE: Standard Error. * Number of cases is less than 30.

Results, Table 20, show that the Egyptian culture of procreation does not favor one child family and two to three children is the ideal family size in Egypt. Although declining by longer duration of marriage still a considerable segment of the secondary infertile women have only one child if compared to the fertile groups. The majority of them wants another child, whiles securing two children makes about two thirds of them do not want another child, (Table 21).

Table (20) Percentage Who Have One Child among Currently Married Egyptian Women (15-49) according to their Fertility and Use of Family Planning DHS2000

Duration of Marriage	Secondary Infertile		Fertile	
	Never Used Contraceptives	Ever Used contraceptives	Never Used Contraceptives	Ever Used contraceptives
5-9	85.2	69.2	17.7	05.6
10-14	37.7	47.4	07.1	00.7
15-19	17.1	04.8	07.4	00.3
20-24	14.8	01.1	0.0	00.2
25-29	06.8	01.1	0.0	00.1
30-34	04.1	00.3	0.0	00.1

Table (21) Percentage of Secondary Infertile among Currently Married Egyptian Women (15-49) Who Never Used Contraceptives by The Desire for More Children and Total Number of Children Ever Born, DHS2000

Total Number of Children Ever Born	Desire for More Children		
	Wants	Does Not Want	Undecided
1	56.7	17.3	26.0
2+	11.4	68.3	20.3

Conclusion

An attempt has been made in this article to estimate the prevalence rates of primary and secondary infertility in Egypt. Statistics reveal that the prevalence rate of primary infertility, on the national level, is very low if it is compared with other developing countries. However, the prevalence rate is high among women who never used contraceptives. Mainly Egyptian women prefer to practice family planning after having their first child. The prevalence rate of primary infertility is higher in urban centers than in villages and among the highly educated women. The prevalence rate is high among late married women (at age above 30) but declines by longer duration of marriage. The prevalence rate of secondary infertility is very high, reaches level as high as one- third of women who never used contraceptives suffers from secondary infertility. Furthermore, it is increasing over time especially among the natural fertility group. The age pattern of secondary infertility shows a remarkable rise by age and coincides with those estimated in some African countries. Similar to primary infertility, prevalence of secondary infertility is higher in urban centers. But unlike the case of primary infertility, the prevalence rate declines by rising level of education.

Egyptian women suffer agonizing burden due to inability to have children and faces the injustice attitude towards them and the unfairness of the blame that assigned to them, even by the women themselves. The rates of divorce and repeating marriages are higher among the infertile segment if compared to the fertile group.

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[1] For instance, WHO Task Force on the Diagnosis and Treatment of Infertility in 33 countries, developed and developing, defined infertility as the inability to conceive despite cohapitation and exposure to pregnancy during a period of two years, (WHO, 1975). Tindall (1987: 578) defines infertility as "the absolute state of inability to conceive; subfertility is a relative state of lowered capacity to conceive. Secondary infertility and subfertility are the same states developing after an initial phase of fertility".

[2] [2]Dealing with infertility among currently married Egyptian women does not mean that the direct causes for couples' infertility are women factors.

[3] Some authors add the criterion failure to have a live born child that survives infancy, Vassen, 1984. Although his suggested measure is undemanding it provides a measure of primary infertility that will be influenced by the levels of mortality to which children are subject to throughout their lifetime. The toll of infant and child mortality is very high in developing countries if compared with the more developed ones. It does provide, however, an upper ceiling to the level of primary infertility in any society.

[4] Measures of infertility according to WHO definition are suffering from additional biases acting in two opposite directions. An upward bias due to a failure to recognize conceptions by respondents (particularly when early miscarriages are not noticed). And a downward bias due to some women may not be willing to admit during the interview infecundity and report having had either unsuccessful pregnancies or infant mortality or some women may conceal the instance of induced abortions especially if they illegally performed.

[5]protitudes are known to be more likely resident in urban cities It is known that STD's are more prevailed among the prostitudes compared with other groups of the population (Larsen, 1996).

[6] Their measures consider both primary and secondary.

[7] Data on the history of fetal loss are available in such survey, while they are available in DHS 2000 for only the 5 years preceding the survey.

[8] We examined the association utilizing the criterion of at least 2 or more years of exposure to pregnancy for estimating secondary infertile women. Data (Table not shown) certify that delivering children in places different from the health units and its subsequent practices cause infertility. Another important result is that women who have Cesarean have prevalence higher than that among those who have normal delivery. Cesarean operation may be a media for reproductive tract infection and voluntary sterilization. As previously mentioned Tubal obstruction represents the most common etiologic factor in female

infertility, originated mainly by post-partium and post-abortive infections. The result, however, should be regarded with caution.