PREDICTORS OF SECONDARY INFERTILITY AMONG WOMEN OF REPRODUCTIVE AGE ATTENDING KISII TEACHING AND REFERRAL HOSPITAL, KISII COUNTY, KENYA

Abstract: Secondary infertility is one type of female infertility in which a woman who had previously conceived is unable to subsequently conceive despite engaging in regular unprotected sexual intercourse for a period of one year. Although globally 60-80 million couples are suffering with infertility with most of them being in Sub-Saharan Africa, there is a paucity of data on the prevalence of secondary infertility in Kenya. Moreover secondary infertility has a multi-factorial etiology but there is a paucity of data on its predictors in Kenya. This study was designed to determine the predictors of secondary infertility among women of reproductive age attending Kisii Teaching and Referral Hospital. To this end a Case control study design of 113 cases and 113 age-matched controls was used. Data was collected using self-administered questionnaires. Categorical data was analyzed using Chi-square while association between secondary infertility and the predictors was analyzed using univariate and multivariate regression analysis to compute odds ratio (OR). Analysis revealed that those who had not undergone ANC screening were less likely 0.81(.04-1.6) to have secondary infertility relative to those who had not been screened. Therefore, public health programs aimed at preventing secondary infertility need to put in place through improved antenatal care screening services, improved screening for STIs and early treatment, proper obstetric care avoiding unsafe abortion, provision of family planning services adequately and pre-conceptual care.

Keywords: World Health Organization, Women of Reproductive Age, Total Fertility Rate, Kenya Fertility Survey, Focused Group Discussions, Traditional Birth Attendants.

1. INTRODUCTION

Infertility is the inability to conceive despite engaging in regular unprotected sexual relationship for one year (Dhont *et al*., 2013). It manifests either as primary infertility where there is no history of previous pregnancy or secondary infertility where there is a failure to conceive after one year of unprotected sex following previous pregnancies (WHO 2012). Globally there are about 60-80 million infertile couples with sub-Saharan Africa suffering the brunt of these cases (WHO 2012). Although the current estimates of secondary infertility in developing countries is primarily based on Demographic and Health Survey (DHS), data indicate that 9-38% of women experience secondary infertility (Rutstein and Shah, 2004).

Of significance Kenya is within the infertility belt that comprises countries with high incidences of secondary infertility (Waithaka, 2008). However, due to high fertility rates in Kenya most reproductive health studies are focused on how to control fertility (Olenja *et al*., 2001). Of note, treatment for secondary infertility takes up to 60% of gynecologists' time in major and local hospitals in Kenya (Akoko *et al*., 2003). Nyanza region has 30% of women of reproductive age having secondary infertility KDHS (2012). However, there is a paucity of data on the prevalence of secondary infertility among women of reproductive age attending reproductive health clinic. Therefore, this study is designed to determine the prevalence and the socio-demographic characteristic of women of reproductive age attending infertility health clinic in Kisii Teaching and Referral Hospital (KTRH) with secondary infertility (WHO 2012).

According to previous studies, possible causes of secondary infertility include; advanced reproductive age, (Sami *et al*., 2012, Orji *et al*.,2008) structural complications such as tubal factors and endometriosis; co-morbidities like hypertension or weight again; modifiable risk factors related to behavior and health practices (ASRM 2012, Ali *et al*.,(2007). Other studies have revealed causes of secondary infertility in females is associated with ovulation problems, tubal problems, endometriosis, nutritional, cervical mucus hostility, uterine problems and unexplained secondary infertility (WHO 2010, Olukunmi *et al*.,(2012). Other causes might be marital problems, psychological factors, sexual factors, lack of education and knowledge (WHO 2012; Ford WC *et al*., 2000; Roupa Z *et al*., (2009). Increasing age of female partners and reduced vital frequency may also influence this decline (Waldenstrom *et al.,* 2002). Several lifestyle factors may affect reproduction, including dietary habits, clothing, exercise, and the use of alcohol, tobacco, and recreational drugs (Michael *et al*., 2000, Koenig MA *et al* (2008). Exposure to textile dyes, lead, mercury and cadmium, volatile organic solvents and pesticides has been also associated with infertility (Reproductive Health Outlook, 2002, Dechanet C *et al*., 2011). More importantly, infertility has been shown to be surrounded by many mistaken beliefs about its causes, such as witchcraft and possession by evil spirits, and these beliefs negatively affect its management (Namujju *et al*., 2013, Collin *et al*., 2006). In Africa there is a paucity of data especially the demographic causes of secondary infertility, (Balen *et al*., 2002, Barben *et al*., 2005). This is partly due to limited resources, policies aimed at reducing population growth, and the expense of modern infertility treatment (Dhont *et al*., 2010).

Successful policy implementation of reproductive healthcare services is increased uptake . Following implementation of government policies on reproductive health care services there are specific factors that lead to difficulties in uptake of these services and fertility morbidity rates within a country (Olenja *et al.,* 2001, Anderson *et al*., 2008), indicating the need to thoroughly identify and address factors influencing secondary infertility hence uptake of reproductive health care, if improved fertility is to become a reality in developing countries. Although causes of secondary infertility are rectifiable, a majority of the infertile women are unaware of the reasons for secondary infertility and the remedies available to overcome the problem (Blumer *et al*., 2003). Hence, there is need to identify factors influencing secondary infertility among women of reproductive age (Dhont *et al*., 2010, Rutstein *et al*.,2008). Therefore, this study aimed to determine the prevalence and predictors of secondary infertility among women of reproductive age in Kenya. This will help in formulation of community-specific appropriate interventions strategies by policy makers to develop study interventions targeted at those at risk, improved uptake of reproductive health services.

2. REVIEW OF LITERATURE

According to WHO (2010), age is a factor that can affect one's chances of conception and it is inevitably a factor in secondary infertility. Fertility starts to decline from age 30 and more sharply from 35 onwards in women. Women over 35 years have an estimated 50% chance of becoming pregnant naturally. A study in Egypt on age influence on secondary infertility, highest prevalence was realized among wives who are near the end of their reproductive life with 66.8%. Moreover, studies indicate the average age of a girl's first period (menarche) is 12-13 (12.5 years in the United States, Anderson *et al*., (2003) , but, in post menarche girls, about 80% of the cycles are anovulatory in the first year after menarche, 50% in the third and 10% in the sixth year, (Waldenstrone U *et al*.,2002). A woman's fertility peaks in the early and mid 20s, after which it starts to decline, with this decline being accelerated after age 35 (Roupa *et al*., 2007). However, the exact estimates of the chances of a woman to conceive after a certain age are not clear, with research giving

differing results. The chances of a couple to successfully conceive at an advanced age depend on many factors, including the general health of a woman and the fertility of the male partner, Dhont *et al.*, (2012).According to other studies in Sweden, the average age for a first childbirth in Sweden has increased by four years during the last 30 years and is now 29 years. Young women's fertility is somewhat reduced already around the age of 20 to 30 years and after 35 years it is reduced increasingly faster and therefore postponing childbirth increases the risk for involuntary infertility. Children born to older mothers have an increased occurrence of chromosomal changes. There are several other problems associated with postponed pregnancy including risks for complications during pregnancy and childbirth such as miscarriage, diabetes, hypertension, premature birth, labor and dystocia. (Statistics Sweden, **Population statistics 2000;** Ford WC *et al.*, 2000;Waldenstrom *et al.*, 2002).

According to studies in Pakistan, results showed that women with low socio economic status, who are housewives and carried out inappropriate practices for delivery like insertion of medicines intra-vaginally and deliver under unskilled birth attendants, tend to have secondary infertility, (Barden *et al.*, 2005; Koenig *et al.*, 2008).Studies indicate the importance of community education in the prevention and adequate treatment of S.T.ls. The incidence of secondary infertility increases as the level of education in the community decline, that is, the less women are informed of the factors influencing secondary infertility, the more they delay to seek for the treatment of S.T.Is and this is dangerous to women who desire child, Okonofua *et al.*, (2012). Other studies in Nigeria on secondary infertility showed that women who lived in urban areas were 2.9 times more likely to suffer secondary infertility relative to those who lived in rural areas. As regards educational level, less educated women were 2 times at risk of secondary infertility as compared to those who are highly educated. Concerning occupational status high percentage of 55 with secondary infertility was among women not working (; Inhorm *et al.*, 2003; Okonofua *et al.*, 2006; WHO, 2008).

Other studies indicate that Tobacco smoking is harmful to the ovaries, and the degree of damage is dependent upon the amount and length of time a woman smokes or is exposed to a smoke-filled environment. Nicotine and other harmful chemicals in cigarettes interfere with the body's ability to create estrogen, a hormone that regulates folliculogenesis and ovulation. Also, cigarette smoking interferes with folliculogenesis, embryo transport, endometrial receptivity, endometrial angiogenesis, uterine blood flow and the uterine myometrium, (Dechanet *et al.*, 2011). Some damage is irreversible, but stopping smoking can prevent further damage. ASRM 2009 Smokers are 60% more likely to be infertile than non-smokers. Smoking reduces the chances of IVF producing a live birth by 34% and increases the risk of an IVF pregnancy miscarrying by 30%. Also, female smokers have an earlier onset of menopause by approximately 1–4 years, (Fertility sterile 2008; Anderson *et al.*, 2012).

Studies have shown that twelve percent of all infertility cases are a result of a woman either being underweight or overweight. Fat cells produce estrogen, (Koning *et al.*, 2001) in addition to the primary sex organs. Too much body fat causes production of too much estrogen and the body begins to react as if it is on birth control, limiting the odds of getting pregnant. Too little body fat causes insufficient production of estrogen and disruption of the menstrual cycle, (ASRM 2009). Both under and overweight women have irregular cycles in which ovulation does not occur or is inadequate. Proper nutrition in early life is also a major factor for later fertility (Sloboda *et al.*, 2010). Another study in the USA, indicated that approximately 20% of infertile women had a past or current eating disorder, which is five times higher than the general lifetime prevalence rate, Dacey *et al.*, (2008). A review from 2010 concluded that overweight and obese sub fertile women have a reduced probability of successful fertility treatment and their pregnancies are associated with more complications and higher costs. In hypothetical groups of 1000 women undergoing fertility care, the study counted approximately 800 live births for normal weight and 690 live births for overweight and obese ovulatory women. For ovulatory women, the study counted approximately 700 live births for normal weight, 550 live births for overweight and 530 live births for obese women. The increase in cost per live birth in anovulatory overweight and obese women were, respectively, 54 and 100% higher than their normal weight counterparts, for ovulatory women they were 44 and 70% higher, respectively(Koning *et al.*,2008).

Conceptual Framework:

Figure 1 below presents schematic conceptual framework of the predictors of secondary infertility among women of reproductive age attending Kisii Teaching and Referral Hospital, Kisii County, Kenya.
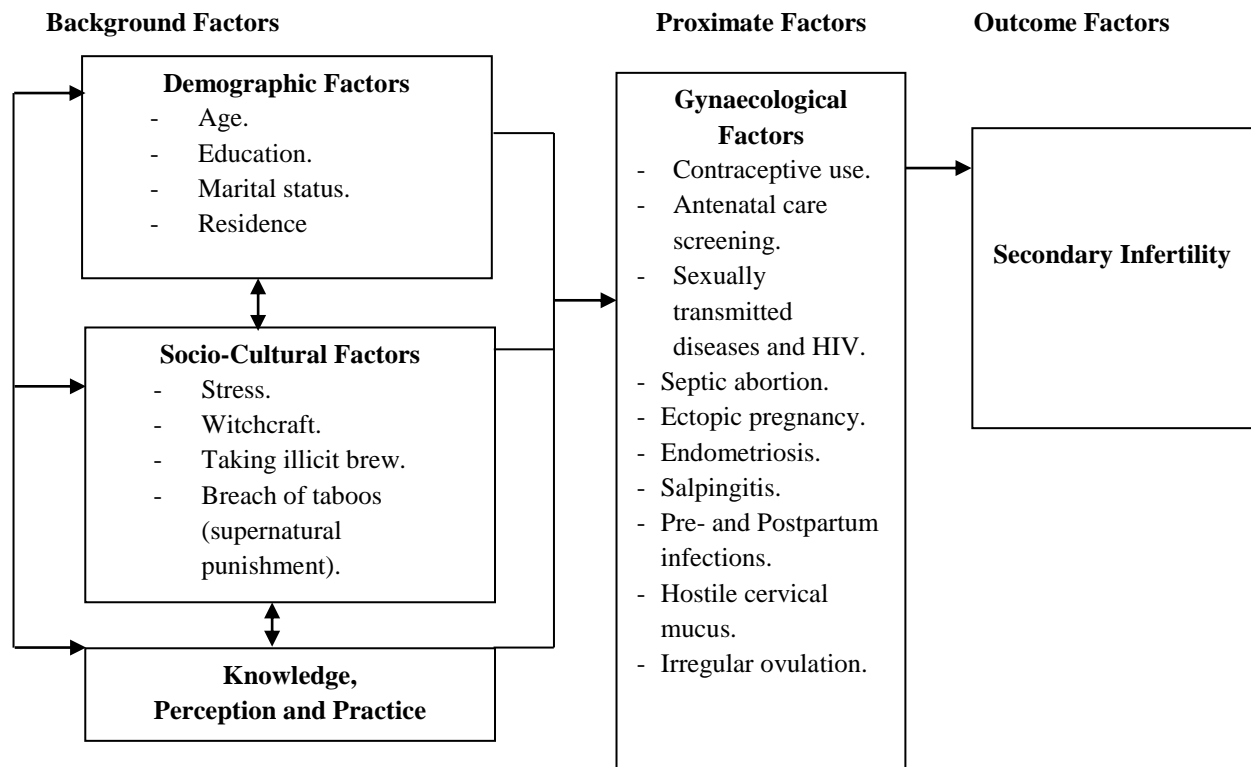
Source: Researcher (2016)

Figure 1: Schematic Conceptual Framework

Objectives of the Study and Research Questions:

General Objective:

To determine factors influencing secondary infertility, among women of reproductive age in KTRH.

Specific Objectives:

1. To determine socio-demographic characteristics of women of reproductive age suffering from secondary infertility attending Kisii Teaching and Referral Hospital.

2. To establish knowledge, perception and practices among women of reproductive age suffering from secondary infertility attending Kisii Teaching and Referral Hospital.

3. To determine obstetric characteristics of women of reproductive age suffering from secondary infertility attending Kisii Teaching and Referral Hospital.

4. To determine factors that influence secondary infertility among women of reproductive age attending Kisii Teaching and Referral Hospital.

Research Questions:

1. What are the socio-demographic characteristics of women of reproductive age suffering from secondary infertility attending KTRH?

2. What are the knowledge, perception and practices among   secondary infertile women attending KTRH?

3. What are the obstetric factors among women attending KTRH influencing secondary infertility?

4. What are the factors influencing secondary infertility among infertile women attending KTRH?

Study Limitations:

  i. Respondents who might treat the researcher with suspicion and withhold some information which may hamper the outcome of the research.

 ii. Prevailing weather conditions may turn bad thus limiting the researcher to accomplish tasks as scheduled.

iii. Lack of ability for the researcher to control extraneous factors in secondary infertility.

 iv. Difficulty to capture new cases of secondary infertility other than relying on old cases in the hospital attending reproductive clinics.

3. RESEARCH METHODOLOGY

Material Methods:

Study design and setting:

This was a case-control study conducted at the infertility and reproductive health clinics, Kisii Teaching and Referral Hospital (KTRH). KTRH is a government funded teaching and referral hospital in Kisii County in western Kenya with 500 bed capacity and provides clinical care to a population of 1 million people (MOH 2014). Indicate the number of women attending infertility and reproductive health clinics.

Study population:

This study enrolled 113 cases who were women of reproductive age (20-44 years) who had been pregnant at least once irrespective of the outcome and have been in unprotected sexual relationship for one year and attending infertility clinic in Kisii Teaching and Referral Hospital (KTRH). In addition fertile age-matched controls who were women who have recently given birth and were multifarious from reproductive health clinic at KTRH were also recruited.

Study sample size determination:

According to annual operation plan of Kisii County 2013/2014, there are 200 infertile women and out these 120 have secondary infertility in the infertility clinic (REF). Since the population of women with secondary infertility is less than 10,000 we used Fisher's et al., 1998 formula to calculate the sample size as follows;

$$n = Z^2 pq/d2$$

Where Z=standard normal deviation (1.96) 95% confidence interval, p=proportion of estimated population estimated to have particular characteristics and when there is no reasonable estimate 50% is used. Therefore 50% will be used since there is no secondary infertility proportion. d = the level of statistical significance set and q= 1-p

n = (1.96) 0.5 x 0.5= 0.99604= **384**

0.05 x 0.05   0.0025

But when the target population is less than 10,000 the required sample size will be obtained by:-

n =1+n/N

Where n = the desired sample size (when population less than10, 000). n = the desired sample (when population more than 10,000).

N = Estimated total population

On Substitution

n=384/1 + 384/120 = 93

To take care of attrition 20 individuals were added to 93 to give a figure of 113. Therefore, we had a sample size of 113 cases and 113 controls.

ISSN 2350-1049

International Journal of Recent Research in Interdisciplinary Sciences (IJRRIS)
Vol. 4, Issue 3, pp: (10-22), Month: July - September 2017, Available at: www.paperpublications.org

Data collection:

Data was collected from the study participants using a semi structured questionnaire containing both closed and open ended questions specifically designed for the study. The questionnaire was pretested in Iyabe level 4 hospital in Kisii County for 2 days to evaluate validity and reliability of the data collection tools. Piloting of questionnaire was aimed at determining the duration it takes to administer it, to assess its clarity, rate of return, presence of extraneous responses provided for individual questions, appropriateness of language and sensitivity of questions and average. Detected inconsistencies with the questions were modified to enhance reliability after analysis of response from the pilot study.

A structured questionnaire was used to collect socio-demographic data: age, level of education, occupation, residence, age of marriage, marital status and gynecological history:, menstrual history, age of menarche; regularity, family history of infertility and reproductive tract infections; Obstetrical and reproductive history, including: ever used intrauterine contraceptive device, age of first pregnancy, ever had unwanted pregnancy, pregnancy with another partner, no prenatal care in last pregnancy, unattended birth, adverse pregnancy outcome, stillbirth, unsafe abortion, caesarean section and postpartum infection relevant medical history such as diabetes mellitus, thyroid diseases, hypertension. Psychosocial factors as well as knowledge, perception and practices about secondary infertility among women of reproductive age.

Data management and analysis:

Data collected was checked on the field and cleaned at the end of each day to ensure completeness, consistency, credibility and eligibility. This was done to correct errors or to fill in missing information before another day of data collection. Categorical data was be analyzed using Chi-square while association between secondary infertility and its predictors was analyzed using univariate and multivariate regression analysis to compute odds ratio (OR). *P* value ≤ 0.05 will be considered statistically significant. All the data will be analyzed using SAS version 9.2 (SAS Institute Inc., Cary, North Carolina, USA).

Data analysis:

Categorical data was analyzed using Chi-square while association between secondary infertility and its predictors was analyzed using uni-variate and multivariate regression analysis to compute odds ratio (OR). In addition attributable risk and population risk factors were calculated for modifiable risk factors. Qualitative data was coded and stratified into the emerging themes. *P* value ≤ 0.05 was considered statistically significant. All the data was analyzed using SPSS version 20.

Ethical Consideration:

The study was approved by the ethical review board of University of East Africa Baraton (REC: UEAB/xx/xx/2016). All the study participants gave their written informed consents.

4. EMPIRICAL ANALYSIS RESULTS

The Socio- demographic characteristics of the study participants:

As shown in table 1 there was a total of 226 women (133 cases and 113 controls) were enrolled in the study. There was a significant statistical difference in secondary infertility based on age strata with most of the cases (28.3%) being between 40-44years (p=0.0001). Among the cases, proportion of women who were married (91.2%) was higher relative to those who were single (8.8%) (p=0.042). Most of the cases (70.89%) were residing in urban areas relative to rural areas (29.2%) (p=0.0001). In terms of education, most of the cases had primary education (35.4%) and a majority (89.4%) was Christians. In addition, a majority (54%) were overweight.

Table 1: Socio-demographic characteristics of study participants

Characteristics		Cases ((n=113)	Controls (n=113)	P Value
Age (years)				
	20-24	9(8%)	9(8%)	0.0001
	25-29	17(15%)	17(15%)	
	30-34	24(21.2%)	24(21.2%)	

ISSN 2350-1049

International Journal of Recent Research in Interdisciplinary Sciences (IJRRIS)
Vol. 4, Issue 3, pp: (10-22), Month: July - September 2017, Available at: www.paperpublications.org

	35-39	31(27.4%)	31(27.4%)	
	40-44	32(28.3%)	32(28.3%)	
Marital Status				
	Married	103(91.2%)	110(97.3%)	0.042
	Single	10(8.8%)	3(2.7%)	
Residence				
	Rural	33(29.2%)	63(55.8%)	0.0001
	Urban	80(70.89%)	50(44.2%)	
Education				
	Primary	40(35.4%)	23(20.4%)	0.0001
	Secondary	36(31.9%)	50(44.2%)	
	Tertiary	27(23.9%)	40(35.4%)	
	None	10(8.8%)	-	
Religion				
	Christianity	101(89.4%)	96(85%)	0.213
	Muslim	12(10.6%)	17(15%)	
Weight				
	Below average	12(10.6%)	3(27%)	0.0001
	Average	40(35.4%)	80(77.8%)	
	Above average	61(54%)	30(26.5%)	

The knowledge and practices influencing secondary infertility among WRA in KTRH:

We assessed the women of reproductive age knowledge on secondary infertility. As shown in table 2 most of the cases 59(52.2%) and controls 57(50.4%) defined secondary infertility as failure to conceive after the first delivery. Regarding the causes of secondary infertility, most of the cases believed that it is caused by contraceptives 30(26.5%), septic abortion 28(24.8%), sexually transmitted diseases 20 (17.7%) and lack of ANC screening 20 (17.7%). All cases 113(100%) believed that smoking had not influence on secondary infertility. In relation to cultural beliefs having influence on secondary infertility, majority of infertile women 92 (81.4%) believed it had an influence while majority 80(70.8%) believe that stress had no influence on secondary infertility.

Table 2: Knowledge and practices associated with secondary infertility among cases and controls

Characteristics			
Knowledge on secondary Infertility			0.001
Failure to conceive after the first delivery	41(36.3%)	0	
Failure to conceive	59(52.2%)	57(50.4%)	
Had no idea	13(11.5%)	56(49.6%)	
Causes			0.042
Alcohol	5(4.4%)	4(3.5%)	
Contraceptives	30(26.5%)	28(24.8%)	
Septic abortion	28(24.8%)	31(27.4%)	
Sexually transmitted diseases	20(17.7%)	19(16.8%)	
Lack of ANC screening	20(17.7%)	19(16.8)	
Smoking			0.001
Yes	0	0	
No	113(100%)	113(100)	
Cultural practices			0.001
Yes	92(81.4%)	53(46.5%)	
No	21(18.6%)	60(53.1%)	
Stress			0.001
Yes	33(29.2%)	63(65.8%)	
No	80(70.8%)	50(44.2%)	
All the data was analyzed using Pearson Chi-square			

ISSN 2350-1049

International Journal of Recent Research in Interdisciplinary Sciences (IJRRIS)
Vol. 4, Issue 3, pp: (10-22), Month: July - September 2017, Available at: www.paperpublications.org

Obstetric characteristics of the study population:

As shown in table 3, a majority of the cases 70(61.9%) had used hormonal contraceptives, a majority 70(61.9%) also had irregular menstrual cycle and 60(53%) had normal pregnancy. Only 12(11%) had undergone pelvic surgery. Most of the cases 63(56%) had unskilled care during their first delivery. In addition, 43(38.1%) of the cases had been infected with sexually transmitted diseases and a majority 30(69%) had stayed for long before seeking treatment. Further analysis revealed that 20(17.7%) of the cases had relationship with another partner. In addition, a majority of cases 70(61.9%) had not undergone ANC screening.

Table 3: Obstetric characteristics of infertile and fertile women

Characteristics		Cases (n=113)	Controls No.(%)	P Value
Contraceptive				
	Hormonal	70(61.9%)	9(8%)	0.0001
	IUCD	8(7.1%)	2(2%)	
	Condoms	3(3%)	1(0.9%)	
	None	32(28.3%)	101.1(89.4%)	
Menstrual cycle				
	Regular	43(38.1%)	108(95%)	0.0001
	Irregular	70(61.9%)	5(5%)	
Pregnancy				
	Normal	60(53%)	110(97%)	0.0001
	Abnormal	53(47%)	03(3%)	
Pelvic surgery				
	Yes	12(11%)	2(2%)	0.005
	No	101(89%)	111(98%)	
Delivery during 1st pregnancy				
	Skilled personnel	50(44%)	95(84%)	0.0001
	Unskilled personnel	63(56%)	18(16%)	
STD's				
	Yes	43(38.1%)	2(2%)	0.0001
	No	70(61.9%)	111(98%)	
Stay before treatment				
	Immediately	30(69%)	2(2%)	0.0001
	After some time	13(31%)	-	
Relationship another partner				
	Yes	20(17.7%)	3(2.7%)	0.0001
	No	93(82.2%)	110(97.3%)	
ANC screening				
	Yes	43(38.1%)	99(88.480)	0.0001
	No	70(61.9%)	13(11.6%)	
No. of pregnancies	One	113	0.	0.0001
	More than one	0	113	

Factors associated with secondary infertility:

Associations of secondary infertility with several factors are presented in table 4. Women with secondary infertility were more likely to have used hormonal contraceptives 3.6(2.2-3.1), to have had irregular menstrual cycle 10.7(4.6-25.2) or to have had abnormal pregnancy 2.4(1.6-3.6). This study revealed that those who had sought unskilled care 2.9(1.9-4.5) or had suffered from sexually transmitted 3.6(2.2-3.1) were more likely to have secondary infertility. In addition, those who had stayed for long before seeking treatment for STDs 1.79(1.39-2.3) and those who had relationship with other partners 7.8(2.3-27.4) were more likely to have secondary infertility. Further analysis revealed that those who had not undergone ANC screening were less likely 0.81(.04-1.6) to have secondary sexual infertility relative to those who had not been screened.

Table 4: Factors associated with secondary infertility

.Characteristics		Cases (n=113)	Controls (n=113)	OR(95% CI)	P Value
Contraceptive					0.0001
	Hormonal	70(61.9%)	9(8%)	3.6(2.2-3.1)	
	IUCD	8(7.1%)	2(2%)	0.27(.075-.99)	
	Condoms	3(3%)	1(0.9%)	0.31(.85-.99)	
	None	32(28.3%)	101.1(89.4%)	ref	
Menstrual cycle					0.0001
	Regular	43(38.1%)	108(95%)	ref	
	Irregular	70(61.9%)	5(5%)	10.7(4.6-25.2)	
Pregnancy					0.0001
	Normal	60(53%)	110(97%)	ref	
	Abnormal	53(47%)	03(3%)	2.4(1.6-3.6)	
Pelvic surgery					0.005
	Yes	12(11%)	2(2%)	ref	
	No	101(89%)	111(98%)	2.7(.7-.99)	
Delivery in 1st pregnancy					0.0001
	Skilled personnel	50(44%)	95(84%)	ref	
	Unskilled personnel	63(56%)	18(16%)	2.9(1.9-4.5)	
STD's					0.0001
	Yes	43(38.1%)	2(2%)	3.6(2.2-3.1)	
	No	70(61.9%)	111(98%)	ref	
Stay before treatment					0.0001
	Immediately	30(69%)	2(2%)	ref	
	After some time	13(31%)	-	.1.79(1.39-2.3)	
Relationship another partner					0.0001
	Yes	20(17.7%)	3(2.7%)	7.8(2.3-27.4)	
	NO	93(82.2%)	110(97.3%)	ref	
ANC screening					0.0001
	Yes	43(38.1%)	99(88.480)	0.81(.04-1.6)	
	No	70(61.9%)	13(11.6%)	ref	

5. DISCUSSION

The aim of this study was to determine the prevalence and predictors of secondary infertility among women of reproductive age in western Kenya. This was a case control study carried out in 113 cases and 113 age matched controls to find out the factors associated with secondary infertility. We found that most of the cases were aged between 35-39 years and 40-44 years; this is consistent with previous studies that showed that the prevalence of secondary infertility increases with age (Safarinejad et al., 2007; Momatz et al., 2011). The World Health Organization showed that age is a factor that affects one's chances of conception (WHO, 2010). Previous studies in Egypt showed that as women approach menopause they were more likely to suffer from secondary infertility (Inhorn *et al.,* 2003).

This study found that most of the cases resided in urban centers. These findings are consistent with previous studies that found that those living in urban areas experienced highest number of secondary infertility due to access to various contraceptives and high level of promiscuity unlike those living in rural areas (WHO, 2008 & Okonofua et al., 2006). Indeed, the current study reveals that a majority of the cases were had used hormonal contraceptives. We also found that most of the cases had primary education consistent with an earlier study that reported that the incidence of secondary infertility increases as the level of education in the community declines (Sownini *et al.,* 2007). This is attributed to the fact that low level of education may lead to women being less informed about less informed on both secondary infertility and the factors influencing it infertility resulting in reduced health seeking behaviors. Consist with this arguments is a study in Pakistan that found health seeking behavior and decision making on reproductive health is low especially in women with low level of education who were also unemployed (Sathar et al., 1998; Sami et al., 2012). Further analysis revealed that

most of the cases with secondary infertility were married. This can be partly due to the fact that in Kenya most reproductive health studies are focused on how to control fertility because of the high fertility rates (Olenja et al., 2001). Since most of the reproductive health issues are integrated in ANC package in Kenya hence most married women use contraceptives for birth control and this can lead to the high prevalence of secondary infertility among married women. Women's status at household levels one of the most important determinant on women health seeking behavior and making decisions on reproductive health including using contraceptives (Alsaawi and Adamchack, 2002; Sami et al., 2012).

Women's knowledge about the causes of secondary infertility influences their health seeking behavior (Sami et al., 2012). This study found only 36.3% of women with secondary infertility described it as failure to conceive after one year of unprotected sexual intercourse after the first pregnancy. This data thus suggest that most of the women suffering from secondary infertility needs to educated about it to increase the knowledge levels, this will results in changes in health seeking factors. In developing countries, the leading causes of infertility includes sexually transmitted infections (STIs), unsafe abortion, previous use of contraceptives and unsafe birth practices (Ali et al., 2007;Olukunmi, 2012; Sami et al., 2012). Similarly, in this study, women with secondary infertility associated it with previous use of contraceptives, septic abortion, sexually transmitted infections and lack of ANC screening.

The main finding of this study is that obstetric events and STIs contribute approximately equally to secondary infertility in Kisii. Furthermore, the study identified some previously unknown obstetric history risk factors for secondary infertility such as a history of lack of antenatal screening during the last pregnancy, early age of first pregnancy, unwanted pregnancies and stillbirths. A history of pelvic surgery was strongly associated with secondary infertility in KTRH .This positively correlates to other study which indicate that infections acquired during a previous delivery were strongly associated with secondary infertility as reported by other authors. (Orji et al., 2008) (Orji et al., 2008; Collin et al., 2006; Barben et al., 2005).

Previous studies have shown that secondary infertility is associated with previous infection with sexually transmitted diseases (Jorn et al., 2088; Sami et al.2012). This study revealed that had suffered from sexually transmitted were more likely to have secondary infertility. Our analysis further revealed that the length of time one took before seeking treatment for STDs was associated with having secondary infertility. This needs education of women on the role of STDs and delaying in seeking treatment in causing secondary infertitility this will change their health seeking behavior. Additionally, the awareness programs targeting the women could them on the need to have one partner or to use condoms during sexual intercourse with other partners apart from their spouses since this study also found that those who had relationship with other partners were more likely to have secondary infertility probably through acquiring sexually transmitted infections and delay in seeking treatment due to stigma associated with STDs in most African cultures. Of significant our this study reveal that that lack of ANC screening is associated with secondary infertility indicating that the packages includes in ANC including diagnosis and treatment of STDs greatly reduces the chances of women developing secondary infertility. These findings are consistent with results from Egypt that showed that mothers who were screened antenatal experienced least secondary infertility while those who were never screened had highest secondary infertility (Okonofua et al., 2006). This is attributed to lack early diagnosis and treatment of STIs, Rhesus factor identification, diagnosis of danger signs and delayed management. Access and previous use of contraceptives is associated with secondary infertility (WHO, 2008 & Okonofua et al., 2006).

This study also found that women with secondary infertility were more likely to have used hormonal contraceptives indicating that there is need of studies to look at the physiological dysfunctions that results from continual use of hormonal contraceptives especially in African countries where hormonal contraceptives are being promoted to control fertility because of the high fertility rates (Olenja et al., 2001). Our findings are consistent with a study in Nigeria that found that abuse of contraceptives influences secondary infertility by interfering with ovulation (Williams et al., 2001). Alternatively it can results from infections that arise due to medical procedures during insertion of IUCD (Sami et al., 2012). Our results also showed that menstrual irregularities or those who had abnormal pregnancy are associated with secondary infertility. In deed previous studies showed that inability to conceive range from absence of menstrual blood, menstrual blood of poor quality and quantity (Helman et al., 1994), suggesting that hormonal dysfunctions may be contributing to secondary infertility. Further analysis revealed that women who had sought unskilled care were more likely to suffer from secondary infertility this is consistent with previous studies in Africa that showed that unskilled birth

attendants may engage in unsafe birth practices postpartum that may have adverse consequences on women (Ali et al., 2006;Ghani et al., 2007). These unsafe practices include intra-vaginal placement of homemade traditional medicines that can lead to infection of the reproductive tract leading to secondary infertility (Goodburn et al., 1994; Fikree et al., 2004).These results that there is need to upscale programs that lead to enhanced uptake of skilled maternal health care services to reduce the chances women developing secondary infertility.

6. CONCLUSION

In conclusion that risk factors associated with secondary infertility includes use of hormonal contraceptives, having irregular menstrual cycle or abnormal pregnancy, seeking unskilled care during birth, having suffered from sexually transmitted and staying for long before seeking treatment, those who had relationship with other partners and not undergoing ANC screening. Therefore, public health programs aimed at preventing secondary infertility be achieved through improved antenatal care screening services, improved screening for STIs and early treatment, proper obstetric care avoiding unsafe abortion, provision of family planning services adequately and pre-conceptual care. There should be programs that enhance community utilization of maternal health services placing emphasis on refocusing on family planning, pre-conceptual care, safe abortions, antenatal care, postnatal care, early diagnosis, prevention and management of STIs in individuals.

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