Research article   **Medical research**

The prevalence of infertility among outpatient department attendants in Orotta national referral maternity hospital in Asmara-Eritrea, 2007-2015

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ABSTRACT

Introduction

The clinical definition of infertility is a failure to achieve a clinical pregnancy after 12 months of regular unprotected sexual intercourse. The four main categories of causes of infertility well recognized in clinical practice are male infertility, female infertility, infertility in both male and female partners, and unexplained infertile couples. The objective of the study is to estimate the prevalence and describe the magnitude of identified causes of infertility based on the clinical and laboratory findings of the attendants in Orotta National Referral Maternity Hospital (ONRMH).

Methodology

A descriptive retrospective cross-sectional study was conducted. The sampling frame and sampling size were based on the patients' cards of ONRMH. Ethical consideration was thought and permission was obtained from the respected bodies.

Results

A total of 55287 in reproductive age patients visited the outpatient department (OPD) starting 01/01/ 2007 to 31/12/2015 in ONRMH and 1547 patients were diagnosed as infertility cases. The prevalence of infertility was 2.8%. Majority (82.7%) were couples. About half (43.5%) of the attendants were between 25-34 years old. Almost all of the participants (92.4%) were married. The male factor of infertility was highest 48% followed by female factor 25%. Primary infertility (64%) was more dominant than secondary infertility.

Conclusion and Recommendation

This study showed that the prevalence of infertility was very low. Male factor and primarily infertility were the highest contributors. Age, sex, and year of visit were found to have significant net effect on infertility. There is a need of public sensitization to increase attendants from all zones to the infertility referral hospital.

Keywords: Prevalence, Infertility, Reproductive age

INTRODUCTION

According to World Health Organization (WHO) the clinical definition of infertility is a

failure to achieve a clinical pregnancy after 12 months regular unprotected sexual intercourse. The epidemiological definition of infertility is the

inability to conceive within two years of exposure to pregnancy, whereas, demographic studies use a period of five years [7].

Infertility can be classified as primary when the woman has never conceived and secondary when she has achieved pregnancy before, regardless of the outcome [10] and [11].

Worldwide, nearly 372 million persons (about 186 million couples) reside in low- and middle-income countries with the exclusion of China [13]. An average of 48.5 million couples are unable to have a child, of which 19.2 million couples are unable to have a first child, and 29.3 million couples are unable to have an additional child (the latter figure excludes China). Of these 10.8 million live in Sub-Saharan Africa [10]. An "infertility belt" spreading through West Africa, through Central Africa to East Africa has been labeled [3] and [7]. In this belt, in some countries up to one-third of women may be childless at the end of their reproductive years [16].

Four main categories of causes of infertility are well recognized in clinical practice. These are male infertility (when infertility is principally due to poor semen parameters), female infertility (when infertility is due to such factors as occlusion of the fallopian tubes, uterine and endometrial abnormalities, abnormal cervix and anovulation in the female partner), infertility in both male and female partners (when factors present in both males and females are responsible for infertility), and unexplained infertile couples (when both partners are normal yet they are infertile) [12].

This study adopted the WHO diagnosis of infertility standard protocol which was adopted in 33 countries across the world [2] and [6].

Problem Statement

Despite the increasing prevalence of infertility of pathological origin in sub-Saharan Africa, infertility prevention and care often remain neglected public health issues, or at least they rank low on the priority list for these low-income countries that are already under population pressure [4]. The trends of infertility prevalence and the magnitude of it in the ONRMH of Eritrea have not been yet studied.

General objectives

The objective of the study is to estimate the prevalence and describe the magnitude of identified causes of infertility in clients attending in ONRMH in Asmara over the nine years (2007-2015).

Specific objectives

- ✓ To describe the possible association between the prevalence of infertility and socio demographic characteristics.
- ✓ To describe the causes of infertility with socio demographic characteristics.
- ✓ To sort-out the identified factors of infertility according to their ethological factors
- ✓ To describe the trend of infertility over the last nine years.
- ✓ To describe the primary and secondary infertility

Significance of the study

This survey will address the trends of infertility that could help for programmatic action for the concerned bodies. The magnitude of both male and female causes of infertility will be identified. The study recommendations may help for prevention and treatment of infertility in the country. In addition to this the researchers believe that the study can be used as a reference for further study.

Hypothesis

H_0 = Prevalence of infertility in males ≠ Prevalence of infertility in females
H_1 = Prevalence of infertility in males = Prevalence of infertility in females.

Research question

What is the prevalence of infertility among the OPD attendants from 01/01/2007 to 31/12/2015 in ONRMH?

METHODOLOGY

Study design

The survey is retrospective cross-sectional quantitative type, conducted in 2017 in ONRMH Asmara-Eritrea.

Study population

All patients in reproductive age (male 15-59 and female 15-45 years) who attended the OPD in ONRMH, Asmara, Eritrea.

Sampling method

A census type of sampling technique was used to include all the patients with diagnoses of infertility from 01/01/2007 to 31/12/2015.

Source of data

The registration book and patient cards of OPD of ONRMH were the sources of data for this study.

Data collection tool

A form similar to the patients' card was developed from the card of the patients and used for data collection tool.

Inclusion criteria

✓ All patients in reproductive age who attended in OPD in ONRMH from 01/01/2007 to 31/12/2015.

Exclusion Criteria

✓ Unreadable patients' cards, defaulters, and patients under workup.

Data collection and data analysis method

The data was collected from patients' cards. Data was cleaned and transferred from hard copy to soft copy. The variables were summarized using frequencies and percentages in table and graph forms. Association between infertility types as well as causes of infertility and socio- demographic characteristics were carried out using the Chi square test. Statistical significance was maintained when *P* value was <0.05 and CI of 95%. Those with significant association (p-value<0.05) were further analyzed using logistic regression analysis.

Dependent variables

Dependent variable is infertility.

Independent variables:

Age, marital status, sex, address, year of visit, causes and type of infertility.

Validity

The validity of the final instrument for infertility was established as it was adopted from the registration book of the hospital and cards of patients which includes all the variables of infertility.

Reliability

The reliability of the instrument was computed using the Cronbach's alpha and was found to be reliable (r=0.7).

Ethical consideration

Permission was obtained from research ethical committee of concerned bodies. The patients' cards were handled with a great responsibility and confidentiality.

RESULT

Distribution of Socio demographic characteristics of attendants

Out of 1547 who attended having problem with infertility in ONRMH, majority (82.7%) were couples. Majority (43.5%) of the age group lies between 25-34 years. The percentage distribution of attendants based on address depicts that most of them were from Zoba Maekel (41.6%). Most of the attendants (92.4%) were married. First visit peaked in the year 2012 accounting for 22.4% (Table 1).

Table 1. Distribution of Sociodemographic characteristics of the infertile attendants (n=1547)

Background characteristics		Number	Percentage
Attended to ONRMH	Alone	267	17.3
	Couple	1280	82.7
Age in years	15-24	300	19.4
	25-34	673	43.5
	35-45	451	29.2
	46-59	123	8.0
Sex	Male	764	49.4

	Female	783	50.6
Address	Maekel	644	41.6
	Debub	393	25.4
	NRS	120	7.8
	SRS	99	6.4
	Gash-Barka	162	10.5
	Anseba	129	8.3
Marital status	Single	83	5.4
	Married	1429	92.4
	Divorced	35	2.3
Year of first visit for infertility	2007	18	1.2
	2008	15	1.0
	2009	24	1.6
	2010	52	3.4
	2011	109	7.0
	2012	347	22.4
	2013	337	21.8
	2014	306	19.8
	2015	339	21.9
	Total	**1547**	**100.0**

Prevalence of Infertility

The prevalence of infertility over the nine years was found to be 2.8% and the peak prevalence was 337 (7.9%) in 2013 and the lowest prevalence was found to be 15 (0.3%) in 2008 (Table 2).

Table 2: The prevalence of infertility among the attendants (n=55287)

| Year of first visit	Diagnosed as infertile	Total attendant	Prevalence of infertility
2007	18	4688	0.4
2008	15	4729	0.3
2009	24	6113	0.4
2010	52	7223	0.7
2011	109	6346	1.7
2012	347	5703	6.1
2013	337	4260	7.9
2014	306	7819	3.9
2015	339	8406	4.0
Total	**1547**	**55287**	**2.8**

Trend of infertility

The trend of infertility prevalence over the nine years gradually increases and its startes to peak on 2011 and reaches maximum peak in the year 2013 and shows decline in 2014 (Figure 1).

Figure 1: Trends of infertility among the attendants (n=1547)
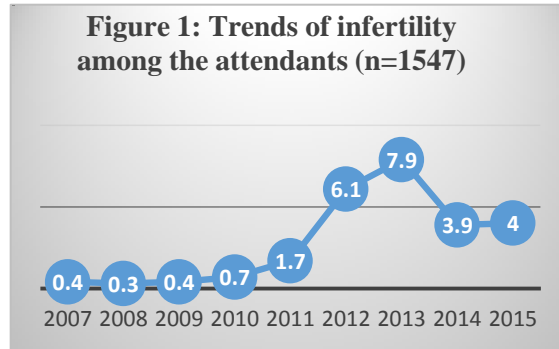
Categories of infertility according to etiological factor (n=1547)

The percentage distribution of etiological factors for infertility, male factor (48%) showed highest identified cause of infertility (Figure 2).

Figure 2. Categories of infertiolity according etilogical factor
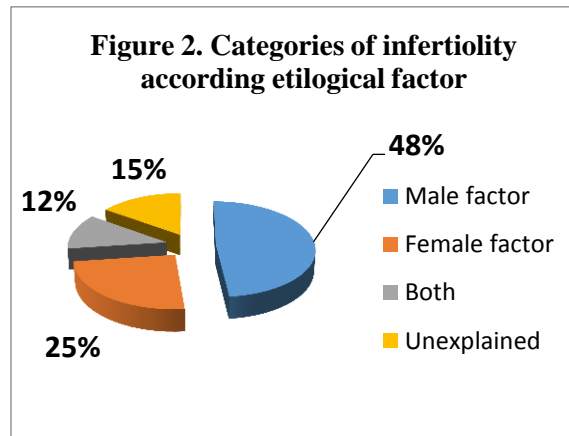
Type of infertility

The primary infertility accounted majority (63.9%) of infertility among the study subjects (Table 3).

Table 3.Type of infertility (n=1547)

Type of infertility	Frequency	Percentage
Primary infertility	989	63.9
Secondary infertility	558	36.1
Total	**1547**	**100.0**

Socio-demographic characteristics associated with types of infertility (n=1547)

A significant relationship was established among infertility types with socio- demographic characteristics (Table 4). This relationship was carried out using the Chi square test. A significant association was established between infertility types and the age category where the primary infertility peaked in the age group 25-34 (68.6%) and the secondary infertility was found to peak in the age group 46-59 (45.5%) years at a P value of 0.001. There was a significant association between sex category and types of infertility where both types of peaked primary infertility in males (67.4%) and secondary in females (39.5%) at a *P* value of 0.005 and also there was significant association between in a year first visit category where the primary infertility peaked in the year group 2013-2015 (68.2%) and the secondary infertility was found to peak in the year group

2010-2012 (44.3%)   at a *P* value of 0.000. However, there was no significant association between the other socio demographic characteristics such as address and marital status.

Table 4. Socio-demographic characteristics associated types of infertility (n=1547)

Characteristics	Infertility		Total (%)	P-value
Age	Primary Infertility (%)	Secondary Infertility (%)		
15-24	173 (57.7%)	127 (42.3%)	300 (100%)	**0.001**
25-34	462 (68.6%)	211 (31.4%)	673 (100%)	
35-45	287 (63.6%)	164 (36.4%)	451 (100%)	
46-59	67 (54.5%)	56 (45.5%)	123 (100%)	
Total	**989 (63.9%)**	**558 (36.1%)**	**1547 (100%)**	
Address				
Maekel	400 (62.1%)	244 (37.9%)	644 (100%)	
Debub	256 (65.1%)	137 (34.9%)	393 (100%)	**0.765**
NRS	82 (68.3%)	38 (31.7%)	120 (100%)	
SRS	63 (63.6%)	36 (36.4%)	99 (100%)	
Gash-Barka	107 (66%)	55 (34%)	162 (100%)	
Anseba	81 (62.8%)	48 (37.2%)	129 (100%)	
Total	**989 (63.9%)**	**558 (36.1%)**	**1547 (100%)**	
Marital status				
Single	51 (61.4%)	32 (38.6%)	83 (100%)	**0.395**
Married	912 (63.8%)	517 (36.2%)	1429 (100%)	
Divorced	26 (74.3%)	9 (25.7%)	35 (100%)	
Total	**989 (63.9%)**	**558 (36.1%)**	**1547 (100%)**	
Year of first visit of respondents				
2007-2009	36 (63.2%)	21 (36.8%)	57 (100%)	**0.000**
2010-2012	283 (55.7%)	225 (44.3%)	508 (100%)	
2013-2015	670 (68.2%)	312 (31.8%)	982 (100%)	
Total	**989 (63.9%)**	**558 (36.1%)**	**1547 (100%)**	

NB: NRS=Northern Rea Sea
    SRS=Southern Red Sea

Sociodemographic characteristics associated with identified causes of male and female infertility

As shown in table 5 causes of male and female infertility were found to have no association with all the socio-demographic characteristics.

Table 5. Sociodemographic characteristics associated with causes of male and female infertility (n=1129)

Characteristics	Male		Female	
Age in years	Frequency	P-value	Frequency	P-value
15-24	71	**0.321**	126	**0.410**
25-34	277		168	
35-45	265		93	
46-59	129		-	
Total	**742**		**387**	
Single	89	**0.702**	50	**0.353**
Married	567		309	
Divorced	86		28	
Total	**742**		**387**	
Maekel	238	**0.351**	174	**0.375**
Debub	172		74	
NRS	82		36	
SRS	76		32	
Gash- Barka	89		41	
Anseba	85		30	
Total	**742**		**387**	

Multivariate Analysis Results

Multivariate analysis was carried out using logistic regression model to identify the net effect of factors on primary and secondary infertility by controlling the effect of other factors in the model. Separate logistic regression analysis was made for primary and secondary infertility.

Primary Infertility

Factors tested to have significant association with primary infertility (age, sex, and year of visit) were included in the regression analysis. Results of the analysis (Table 6) indicated that the fitted logistic regression model correctly predicts the primary infertility of 65% of the patients and this was found to be statistically significant (p=0.000<0.05).

The odds ratio of the factors included in the model indicate that males were 1.4 times more likely to have primary infertility compared to females after controlling the effects of age and year of visit and this was statistically significant (p=0.004 <0.05). Age was also tested to have significant net impact on primary infertility after controlling sex and year of visit (p=0.001 <0.05). Patients in the age groups 25-34 years 1.4 times more likely to be primary infertile than those in the young age group (15-24) and this was significant (p=0.045<0.05). Patients in the age group 35-44 years have similar likelihood of primary infertility as to those in 15-24 years and the difference was tested to be insignificant (p=0.955>0.05). However, old patients (46 years and above) were significantly less likely to have primary infertility than those in the young (p=0.040<0.05).

Patients who visited during the period 2013-2015 were found to have significantly higher chance of primary infertility compared to those who visited during the period 2010-2012 with an odd ratio of 1.7 (p=0.00<0.05).

Table 6: Results of multiple logistic regression analysis for primary infertility

Background Characteristics	Regression Coefficient (B)	Standard Error (SE).	Wald Statistic	Degree of Freedom	P-Value	Odds Ratio (Exp(B))
Sex						
Female (Reference)						1.000
Male	.361	.124	8.442	1	.004**	1.435
Age			17.381	3	.001**	
15-24 (Reference)						1.000
25-34	.304	.152	4.008	1	.045*	1.356
35-45	.010	.171	.003	1	.955	1.010
46-59	-.496	.241	4.236	1	.040*	.609
Year of Visit						
2010-2012 (Reference)						1.000
2007-2009	.302	.291	1.074	1	.300	1.352
2013-2015	.528	.114	21.531	1	.000***	1.695

Note: * Significant at 0.05 level of significance, ** at 0.01, *** at 0.001

Secondary Infertility

Factors tested to have significant association with secondary infertility (age, sex, and year of visit) were included in the regression analysis. Results of the analysis (Table 7) indicated that the fitted logistic regression model correctly predicts the secondary infertility of 65% of the patients and this was found to be statistically significant (p=0.000<0.05).

The odds ratio of the factors included in the model indicated that females were 1.4 times more likely to be the cause for secondary infertility compared to males after controlling the effects of age and year of visit and this was statistically significant (p=0.004 <0.05). Age was also tested to have significant net impact on secondary infertility after controlling sex and year of visit (p=0.001 <0.05). Patients in the age groups 15-24 years were 1.4 times more likely to have secondary infertility as compared to those in the age group 25-34 (p=0.045<0.05). Patients in the age group 35-44 years were also tested to have significantly higher level of secondary infertility than those in the reference age with odd ratio of 1.3 (p=0.027<0.05). Old patients (46-59 years) were 2 times more likely to have secondary infertility compared to those in the age group 25-34 (p=0.000<0.05).

Patients who visited during the period 2007-2009 were found to have significantly higher chance of secondary infertility compared to those who visited during the reference period 2013-2015 with an odd ratio of 1.7 (p=0.00<0.05).

Table 7: Results of multiple logistic regression analysis for secondary infertility

Background Characteristics	Regression Coefficient (B)	Standard Error (SE).	Wald Statistic	Degree of Freedom	P-Value	Odds Ratio (Exp(B))
Sex						
Male (Ref)						1.000
Female	.361	.124	8.442	1	.004**	1.435
Age			**17.381**	**3**	**.001****	
25-34 (ref)						1.000
15-24	.304	.152	4.008	1	.045*	1.356
35-45	.295	.133	4.910	1	.027*	1.343
46-59	.800	.209	14.650	1	.000***	2.226
Year of visit			**21.543**	**2**	**.000*****	
2013-2015 (ref)						1.000
2007-2009	.528	.114	21.531	1	.000***	1.695
2010-2012	.226	.285	.628	1	.428	1.254

Note: * Significant at 0.05 level of significance, ** at 0.01, *** at 0.001

DISCUSSION

Majority (43.5%) of the subjects in this study were between the age group of 25-34 years and only 8.0% lie in the age group of 45-59. A similar study done in Saudi Arabia [1] revealed that mean age of the respondents was 33.38 ± 5.39 years. Similarly, the mean age of infertile participants revealed 36.3 ±10 in a study in Iran [9]. Comparatively in this study the mean age of the primary infertile participants was 32 and the mean age of the secondary infertile participants was 33.

In this study, the prevalence of infertility over 9 years was found to be 2.8%. In contrast, the prevalence of infertility was found to be 18.9% in a study done in Saudi Arabia, 2014 [1]. In the cross-sectional study in Pakistani population the prevalence of infertility was 7% [15]. Moreover, a cross-sectional study on prevalence and risk factors of infertility at a rural site of Northern China showed that the prevalence of infertility was 13.19% [4]. Whereas; a retrospective descriptive cross sectional study on prevalence of infertility who complains in ONRMH in Eritrea revealed that the one year prevalence of infertility in 2010 was 10.8% [14].

In our study the prevalence of primary and secondary infertility was found to be 63.9% and 36.1% respectively. This is similar with the study done in Saudi Arabia, 2014 in which the prevalence of primary infertility was 78.99% [1]. Unlike to a study done in Sub-Saharan Africa revealed that primary infertility accounts for 40% and secondary infertility accounts for 60% [8]. Inconsistent to this study a study done in Northern China showed that the prevalence of primary infertility was 0.99% and the secondary infertility prevalence was 12.10% [4].

In our study, the categories of infertility according etiological factors shows that male factor, female factor, both and unexplained comprises of 48%, 25%, 12%, and 15% respectively. Unlike to our study a study done in Sub-Sahara Africa and India revealed the categories of infertility according etiological factors shows that male factor, female factor, both and unexplained comprises of 8%, 37%, 35%, 5% and 13%, 45%, 15%, 26% in sub-Sahara Africa and India respectively [8].

Limitation

Age, sex, and year of visit were three factors were able to predict correctly the infertility status of 65% of the patients. This implies that there are other factors that are not captured by the study that have impact on infertility for the remaining percentage of the cases.

Hypothesis Testing

The hypothesis of the study was there is statistically significance difference in the level of infertility (primary and secondary) between males and females among those patients of infertility who visited ONRMH during the period 2007-2015. The bivariate and multivariate analysis results revealed that the level of infertility differed significantly between males and females at p= 0.05 level of significance. Accordingly, the null hypothesis which stated that there is no difference in level infertility between males and females was rejected and the alternative hypothesis which stated that there is significance difference was accepted.

CONCLUSION

Age, sex, and year of visit were tested to have statically significant association with primary and secondary infertility using the bivariate analysis. The multivariate logistic regression analysis also revealed that these three factors were found to have significant net effect on infertility by controlling the effect of other factors.

Recommendations

✓ Public sensitization regarding infertility is needed to increase attendants from all zobas of the country.
✓ There is a need of further study to address the cause of infertility

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