ORIGINAL RESEARCH ARTICLE

Ovarian reserve of infertile women in Libreville: A retrospective analysis of 124 cases at the University Mother and Child Hospital in Libreville, Gabon

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Abstract

There has been an increasing number of sub-fertile women in Gabon during the last 20 years. Antral follicle count (AFC) and serum anti-Mullerian hormone (AMH) are known as the most accurate markers of ovarian reserve in women and are related to age and weight. Therefore, the current study examines the relationship between AFC and serum AMH with age and weight among sub fertile Gabonese women. This is a retrospective study carried out in the assisted reproduction department of the Mother and Child University Hospital of Libreville. Over a period of 2 years, from 1st June 2019 to 30th May 2021. From the patient records we collected the following data, age, weight CFA and AMH of 124 women who had consulted for infertility. We excluded incomplete files. The average age and weight of women participating in the current study were 38 (±5.74) years and 76.3 (±14.59) kg. The average serum AMH concentration was 2.33 (±2.17) ng/mL) while the average AFC was 14.63 (±11.37). Significant negative correlation between the age and the serum AMH (r^2= -0.368; $p<0.0001$) and between the age and the CFA (r^2=-0.560; $p<0.0001$) were observed in the current study. This study suggests that sub-infertile women residing in Gabon generally have normal serum AMH concentration and AFC levels. Age significantly impact serum AMH and AFC levels. *(Afr J Reprod Health 2023; 27 [3]: 19-24).*

Keywords: Ovarian reserve, infertile, Libreville

Résumé

Le nombre de femmes présentant une infertilité a augmenté durant ces 20 dernières années au Gabon. Le compte des follicles antraux (CFA) et le taux de l'hormone anti-müllérienne (AMH) sont connus pour être des indicateurs important de la reserve ovarienne. Cette étude est la première du genre à Libreville, elle a pour objectif d'évaluer le rapport entre le CFA, l'AMH, l'âge et le poids des femmes infertiles Gabonaises. Il s agit d'une étude retrospective réalisée dans le service de procréation médicale assistée de l'hôpital Universitaire Mère et Enfant de Libreville. Sur une période de 2ans, de Juin 2019 à Mai 2021. A partir des dossiers des patientes nous avons relevé les données suivantes: age, poids CFA et AMH de 124 femmes qui avaient consulté pour infertilité. Nous avons exclus les dossiers incomplets. La moyenne d' âge et du poids des patients étaient respectivement de 38 (±5.74) ans et 76.3 (±14.59) Kg. La concentration moyenne de l'AMH était de 2.33 (±2.17) ng/mL) pendant que celle de l'AFC était 14.63 (±11.37). Cette étude a observé une corrélation négative significative entre l'âge et l' AMH (r^2= -0.368; $p<0.0001$) et aussi entre l'âge et le CFA (r^2=-0.560; $p<0.0001$). La présente étude démontre que les femmes infertiles à Libreville ont généralement des taux AMH et le nombre de CFA normaux. Aussi, cette étude vient confirmer que l'âge de la femme a un impact significatif sur l'AMH et le CFA. *(Afr J Reprod Health 2023; 27 [3]: 19-24).*

Mots-clés: Reserve ovarienne, infertilité, Libreville

Introduction

Infertility is defined as the inability to achieve a pregnancy within at least one year of adequate sexual exposure without the use of contraceptives and can affects both men and women with almost equal frequency[1]. Sub-Saharan Africa region has been reported as having the highest incidence of infertility in the world[2]. The geography of infertility in Africa shows specific zones, with low fertility rates evident in West Africa from Senegal, Mali, Burkina Faso to Niger, and in central Africa,

from Cameroon, Congo, Gabon to Sudan[2]. In sub-Saharan Africa over 50% of visits to gynaecology clinics concern infertility related issues[3]. Gabon is located on the west coast of central Africa. A study performed in Gabon in 2012, indicated an increase in the infertility rates during the past 20 years[4]. In Africa, 35% of women infertility causes are related to endocrine function (usually menstrual or ovulatory disturbances)[5].

Anti-Müllerian hormone (AMH) and antral follicles count (AFC) are both endocrine markers of ovarian reserve that were found to accurately predict feedback to control ovarian stimulation in the in-vitro fertilization procedure[6,7]. Anti-Müllerian hormone (AMH), also known as Müllerian-inhibiting substance, is a dimeric glycoprotein that belongs to the transforming growth factor-beta family[8]. In women, AMH is solely produced by the granulosa cells of preantral and small antral follicles and regulates ovarian activity and follicular steroidogenesis[9]. AFC is the total number of antral follicles in both ovaries as observed with transvaginal ultrasonography during the early-follicular phase[10]. A lower antral follicle count is associated with infertility. Several studies have highlighted age related decrease in women serum AMH concentrations and/or AFC counts in America[11], Europe[12-15], Asia[16-18]. However, limited data is available for sub-Saharan women. Conflicting results regarding the association between serum AMH and body mass index (BMI) are reported in the literature. For instance, significant positive relationship between serum AMH and BMI was highlighted[19]. While other studies found significant negative correlation between serum AMH and BMI[20-22].

The aim of this study is to evaluate the relationship between endocrine markers (AMH and AFC) with age and weight among sub-fertile women residing in Gabon.

Methods

A total of 124 women presenting for fertility screening at the Reproductive Laboratory of the Mother Child University Hospital located in Libreville (Gabon) were recruited in this cross-sectional study from 1st June 2019 to 30th May 2021. Demographic information on age, weight, and height was obtained from participant files. Predictors of natural fecundability such as blood

AMH and pelvic ultrasonography for AFC were used in the current study. The measurement of AFC was performed between Day 2 and Day 5 of the menstrual cycle. The authors do not specify ultrasound practice dates for AFC. Additionally, the number of oocytes retrieved, and embryos obtained were evaluated. We excluded incomplete files.

Data analysis

Statistical analysis was performed using the MedCalc® statistical software version 19.5 (MedCalc Software Ltd, Ostend, Belgium; https:www.medcalc.org; 2020). Descriptive statistics for variables were presented as sample size (n), minimum, maximum, mean ± SD, median and interquartile score. The Chi-Square test was used to determine the distribution of all the data sets. Correlations were determined using the non-parametric Spearman Rank correlation expressed as r^2.

Results

Data for this study was obtained from 124 women residing in Libreville. The average age and weight of the participants were 38 (±5.74) years and 76.3 (±14.59) Kg. Summary statistics for the evaluated parameters are presented in Table 1. The Chi-Square test for normality shows that anti-Mullerian hormone (AMH) and antral follicle count (AFC) parameters are not normally distributed and are therefore reported and analysed using non-parametric statistical tests based on the median and inter-quartile range (IQR). The average serum AMH concentration was 2.33 (±2.17) ng/mL) while the average AFC was 14.63 (±11.37).

The correlations and statistical significance between the age, AMH, AFC, number of oocytes and number of fertilized embryos are summarized in Table 2. The current study showed significant negative correlation between the age and the AMH (r^2= -0.368; p<0.0001) and between the age and the CFA (r^2=-0.560; p<0.0001). Although the age positively correlated with the number of fertilized embryos and the number of oocytes (r^2= 0.258 and r^2=0.100), these results were not significant. No significant correlations results were obtained between the AMH and the number of embryos (r^2=0.161) and between the serum AMH and the number of oocytes (r^2=0.278).

Table 1: Summary statistics

	N	Minimum	Maximum	Mean	Median	SD	25 - 75 P
Age	123	25.00	57.00	38.89	39.00	5.74	35.25 to 43.00
AMH (ng/mL)	111	0.02	9.80	2.33	1.65	2.17	0.71 to 2.93
CFA	124	1.00	55.00	14.63	12.00	11.37	6.00 to 21.00
Weight (Kg)	124	46.00	115.00	76.32	74.00	14.59	66.50 to 84.50

Table 2: Correlation between semen characteristics and reproductive hormones

		AMH	CFA	No Embryos	Number of oocytes	Weight
Age	r^2	-0.368	-0.560	0.258	0.100	0.108
	P	0.0001	<0.0001	0.1606	0.5186	0.2329
	n	110	123	41	97	123
AMH	r^2		0.623	0.161	0.278	0.070
	P		<0.0001	0.3866	0.0682	0.4681
	n		111	41	97	111
CFA	r^2			-0.027	0.127	-0.044
	P			0.8854	0.4131	0.6308
	n			41	97	124
Number of Embryos	r^2				0.919	0.056
	P				<0.0001	0.7666
	n				41	41
Number of oocytes	r^2					0.038
	P					0.8065
	n					97

Results obtained using the non-parametric Spearman Rank correlation expressed as r^2.

Discussion

Anti-Müllerian hormone (AMH) plasma levels is acting as a useful marker of ovarian reserve[23]. Several studies have evaluated the levels of AMH for the prediction of poor response to in vitro fertilization treatment[24-27] as well as for prediction of pregnancy following in vitro fertilization treatment[26,28,29]. Furthermore, some researches have investigated the association between serum AMH Level and ethnicity/race[20,30]. In the current study, the average AMH level of African women residing in Gabon was 2.33 (±2.17) ng/mL). The serum AMH obtained in the current study is lower than previously reported cut off values for prediction of clinical pregnancy after in vitro fertilization treatment in Egypt[31], China[29], United Kingdom[32,33]. The differences observed between studies can be attributed to the age of participants. An age-dependent distribution of AMH was previously reported in the literature[14,34,35]. The average age of patients in the current study was 38 years, which is higher than previous studies in Egypt, China and United Kingdom[29,31,32]. The ovarian antral follicle count (AFC) has emerged as a useful predictor of ovarian response and stimulation quality in assisted reproductive technologies (ART) and is found more predictive than age or basal serum FSH[36]. Low AFCs were significantly associated with infertility[37]. In the current study, the average AFC was 14.63 (±11.37). The AFC count obtained in the current study is higher than previously reported in normal fertile women in India[16] as well as in women residing in Eastern Europe[38].

Several studies have highlighted a decrease in AMH[14,39,40,41] and AFC[12,25,42,43] associated with women age. Previous studies showed that AMH and AFC significantly negatively correlated with age[13,24,38]. Additionally, significant positive correlation between AMH and AFC was reported[38,44]. This is consistent with our results where AMH (r^2=-0.368; P=0.0001) and AFC (-0.560; P<0.0001) negatively correlated with age. Furthermore, in the current study, AMH and AFC positively correlated (r^2= 0.623; P<0.0001).

The level of AMH and the number of AFC both had highly significant correlations with the number of oocytes retrieved and the number of oocytes fertilized[33,45]. Surprisingly, in the current study, there were no significant correlations between AMH, AFC and the number of oocytes retrieved and number of embryos. However, the sample sizes for the number of oocytes retrieved vs

AMH, AFC and embryos vs AMH, AFC is significantly lower that the age vs AMH, AFC. Although the average age 39 years, the current study highlighted the desire of women aged above 40 to have a child. Considering that age is an important factor affecting women reproductive ability, the importance of egg donation in advance maternal age, should be emphasized.

Ethical considerations

The research was approved by the Ethics Committee of the Fondation Mere Et Enfant Academic Hospital. Written informed consents were obtained from head of Department. The use of data has been anonymized.

Conclusion

The current study showed that the average age of women seeking fertility assistance in Gabon is 38, with most of them presenting with normal AMH levels. Furthermore, in this study positive correlation between AMH and AFC was observed. Considering the limited data on women fertility in Gabon, the current study provides significant information on Gabonese women consulting for fertility treatment.

Limitations

The measurements of AMH and AFC parameters in women in the current study was done at different time intervals. This could be a reason for caution. However, all women were examined at the same fertility clinic using the same sonographic algorithm and AMH immunoassay.

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