

Characteristics of Sub-Saharan African Women Seeking Assisted Reproductive Technique (ART) and Outcomes

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Received: 14/10/2022

Accepted: 20/01/2023

Published: 20/03/2023

Abstract

To describe the features of women seeking assisted reproductive technique (ART) in the Gabonese Republic (sub-Saharan Africa) and investigate In Vitro Fertilization (IVF) success in this sub-Saharan setting. In this retrospective study, we analyzed data of women on their first IVF round from January 1st, 2019, to December 31st, 2020. The Analyzed data included antimullerian hormone (AMH) levels, antral follicle count (AFC), number of mature oocytes collected, myomas, tubal obstruction, partner abnormality in the spermogram, and history of urogenital infection and pelvic surgery. Women seeking assisted reproductive techniques were characterized by a high prevalence of tubal obstructions (73.4%), myomas (39%), and a history of urogenital infection (35.5%). We retrieved a total of 1662 oocytes of which 1439 mature oocytes. The average serum AMH concentration was 2.33(+/-2.71) ng/ml while the average AFC WAS 14.63 (5+/-11.37). In up to 50% of infertile couples, a male factor plays a role. The rate of IVF procedures leading to live birth was 31%. Women who had gynecologic surgery had better odds to give live birth (2.7 odds; p-value = 0.01). Our study showed that a high and combined burden of fallopian tubal obstructions, urogenital infection, and myomas characterize IVF candidates in Gabonese Republic. Also, the IVF success rate in this setting is close to what is observed globally.

Keywords: Infertility, Assisted reproductive technologies, In vitro fertilization, sub-Saharan Africa

Introduction

There is no mother and child health without reproduction. However, infertility which is critical in reproductive health has been neglected. The assisted reproductive technique is often not covered or reimbursed by medical aid. Estimates suggest that 48 million couples worldwide are (sub-fertile) unable to achieve pregnancy after one year of regular unprotected intercourse (1). Reported data from selected Sub-Saharan African countries showed that the rate of infertility exceeded 25% of couples are infertile (2, 3). This is higher than the global average, which is estimated at 9% (4, 5).

Initially developed to overcome obstructed fallopian tubes, IVF, which is now more than 40 years old, has allowed couples previously unable to conceive of achieving a live birth. In sub-Saharan Africa, access to IVF is limited to a few. The procedure is not only expensive but also not available in some countries. Moreover, IVF experts are a scarce resource (6, 7).

In the Gabonese Republic, IVF has been introduced since 2011. Since then, it has remained a practice carried out in private health structures which do not communicate or publish their results either. Our work is therefore preliminary in this direction.

The Objectives of this work are to describe the features of women seeking assisted reproductive techniques in Gabon

(sub-Saharan Africa) and investigate IVF success in this sub-Saharan setting.

Method

We retrospectively analyzed the data of women medically assisted to conceive a child from January 1st, 2019, to December 31st, 2020, in a private fertility clinic in Libreville. Only women at their first IVF round were included in the study.

Ovarian stimulation protocol

We used the short antagonist protocol with pill deprivation. An average daily dose of 150 IU gonadotropin (Gonal F[®]) over about 12 days.

That consisted of subcutaneous injection, an average daily dose of a least 150 IU gonadotropin over about 12 days. from day 5 of the menstrual cycle. Average Body Mass Index 27.2, average antral follicle count 8, average Anti Mullerian Hormone 1.8. Follicular development was monitored by ultrasound from day 6 of stimulation and then every two (2) days when follicles were larger than 14mm. When follicles reached a size greater than or equal to 14 mm, cetrorelix was administered at a dose of 0.25 mg until the end of ovarian stimulation.

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Oocyte retrieval

At the moment the follicle exceeds a diameter of 18mm, one dose of human chorionic gonadotropin (hCG) was injected, and follicles were retrieved by ultrasound-guided puncture 36 hours later (under general anesthesia). In addition, to support the luteal phase, 800µg of Utrogestan® and 30mg of Dupaston® were given to women.

Fertilization and culture

Following the decolonization of oocytes, and based on the quality of the sperm, *in vitro* fertilization was carried out using classic or ICSI-based IVF. Embryos were transferred after day three (3) or day five (5). Following the European Society of Human Reproduction and Embryology (ESHRE) guidelines, a maximum of 2 embryos are transferred.

Data collected

Key data including age, body mass index (BMI), antimullerian hormone (AMH) levels, antral follicle count, number of mature oocytes collected, history of urogenital

infection, myomas, tubal obstruction, partner abnormality in the spermogram, and pelvic surgery (cystectomy, salpingectomy, myomectomy with or without laparoscopy) were recorded and analyzed. The clinical manager comity (acting ethic comity) approved this study.

Statistics

Statistical analysis was done using Prism® version 6 software. The contingency table was used for association studies (odd ratio etc.). For quantitative parameters, the Mann-Whitney U-test was used to investigate the differences between women with live births and the ones for which MAP was not successful.

Results

A total of 124 aged between 23 and 48 years old underwent IVF. In addition, 90% of the women were above the age of 32 years old, and 92% of them were either married or in a couple. Demographic, anthropomorphic, and relevant clinical data are reported in Table 1.

Table 1. Characteristics of African women seeking medically assisted procreation

Demographic and anthropomorphic and clinical data	All women N = 124	Pregnant N = 49 (39.5%)	Live birth N = 38 (31%)	Interrupted pregnancy N = 11 (9%)	MAP failure N = 75 (60.4%)
Age (years) (mean)	37.7	37.8	38	37	37.7
Body mass index (BMI) (mean)	28.15	27.5	28	25.8	28.6
Married N (%)	58 (46.8%)	23 (47%)	19 (49%)	4 (36%)	35 (47%)
In couple /Cohabitation N (%)	56 (45.2%)	20 (41%)	14 (37%)	7 (63.6%)	35 (47%)
Single women N (%)	10 (8%)	5 (10.2%)	5 (13%)	0	5 (6.6%)
History of urogenital infection N (%)	44 (35.5)	16 (33)	13 (34)	3 (27)	28 (37)
Chlamydia N (%)	27 (22)	8 (16.3)	7 (18.4)	0	19 (25.3)
Mycoplasma N (%)	22 (18)	7 (14.3)	5 (13)	1 (20)	15 (20)
Candida spp N (%)	8 (6.5)	3 (6)	3 (8)	2 (40)	0
Myomas N (%)	48 (39)	20 (41)	15 (39.5)	5 (45.4)	27 (36)
Tubal obstruction N (%)	91 (73)	34 (69)	27 (71)	7 (64)	55 (60)
Pelvic surgery N (%)	45 (40.3)	25 (51)	22 (58)	3 (27)	25 (33)
Cystectomy	5	1	1	0	3
Hysteroscopy	6	2	1	0	5
Myomectomy	25	9	8	0	16
Salpingectomy	13	10	8	3	9
Multiple procedures (Cystectomy +/- Salpingectomy +/- myomectomy with or without laparoscopy)	10	4	3	1	7
Parity (had at least 1 child (%))	53 (43)	20 (41)	14 (37)	6 (54.5)	33 (44)
Abnormality in the spermogram of the male partner (%)	58/114 (51)	20/40 (50)	14/29 (48)	6/11 (54.5)	38/74 (51)
Embryo stage “blastocyst” J5	55 (44.4%)	34(69.4%)	29 (76.4%)	5(45.5%)	21(28%)
Cleavage stage J3	45 (36.2%)	17(34.7%)	11(28.9%)	6(54.5%)	28(37.4%)
Embryo stage J2	24 (19.4%)	1(2%)	1(2.6%)	0	23(30.6%)

Discussion

Tubal obstruction was the main feature of women seeking ART. Indeed, 73.4% of women seeking MAP had tubal obstruction (68.5% had bilateral tubal obstruction). Also high were the prevalence of myomas (39%) and the history of urogenital infection (35.5%). Therefore, women who had

restorative surgery of the reproductive system had better odds for MAP success (2.7 odds; p-value = 0.01) than women with no pelvic surgery history. As tubal obstruction and myomas (+/- cysts) were very common among women seeking MAP, this would explain why restorative reproductive system surgery

improved the odds of MAP success. Indeed, in the group of women for whom MAP was a success, 73.5% of women with tubal obstruction had surgery. Whereas in the group of women for whom MAP failed, only 45.4% had surgery. This does not come as a surprise as in sub-Saharan Africa, tubal damage is the commonest cause of women's infertility.^{1,5}

We retrieved a total of 1662 oocytes of which 1439 mature oocytes. the average serum AMH concentration was 2.33(+/-2.71) ng/ml while the average AFC WAS 14.63 (5+/-11.37). In another hand, 51% of male partners of women seeking MAP had an abnormal spermogram, which is in line with the reported estimates, showing that, in up to 50% of infertile couples, a malefactor plays a role (8-11). This figure confirms that the male component in couple infertility is not to be neglected.

ART procedure leads to live birth in 31% of women. This figure is lower than reported in the Westernized world (>40% (irrespective of IVF cycles) (12, 13); but similar to what is generally observed after one (1) IVF cycle (14, 15). We found no significant difference in age, AMH, and antral follicle count between women with live births and those for which ART was not successful. The median age in both groups was 38 years old. The age of implanted embryo ranged between 2 and 5 days. The median and average ages of implanted embryos were relatively the same for all women. No association between the age of implanted embryos and ART success was observed. Also, the number of oocytes collected (9 on average) and the total number of embryos (6 on average) were similar in both women who had live births and women for whom ART was unsuccessful. Contrary to what was observed in Marseille – France (13). in our setting, the number of oocytes and embryos was not associated with an increased live birth rate after IVF.

Conclusion

Women seeking ART or IVF in Gabon (sub-Saharan Africa) are characterized by a high prevalence of tubal obstructions, myomas, and a history of urogenital infection. Nevertheless, our study showed that IVF could be done in sub-Saharan Africa with a success rate close to what is observed in the Westernized world.

Acknowledgments

We thank the staff of the Isowa Centre for Data Availability.

Funding sources

We did not obtain any source of funding.

Conflict of interests

The authors do not declare any conflict of interest.

Authors contributions

Opheelia Makoyo Komba contributed to study design, data collection, analysis, and manuscript editing. Elisabeth Lendoye contributed to the study design, data collection, and analysis. Edgard Brice Ngoungou did the statistical analysis. Pamphile Assoumou et Ulysse Minkobame, Lydie Moukambi, Emmanuelle Mounngoyi Massala Mouima did data collection. Jacques Bang Ntamack, Jean François Meye, and Joel Fleury Djoba Siawaya designed the study and corrected the manuscript. All authors have read and approved the final version of the manuscript.

Ethical issue

The use of the data has been anonymized.

References

1. Ombelet W, Onofre J. IVF in Africa: what is it all about? Facts Views and Vision in Obstetrics and gynaecology. 2019;**11**(1):65-76.
2. Inhorn MC, Patrizio P. Infertility around the globe: new thinking on gender, reproductive technologies and global movements in the 21st century. *Human Reproduction Update*. 2015;**21**(4):411-426.
3. WHO. Infertility. Health topics; 2020.
4. Nachtigall RD. International disparities in access to infertility services. *Fertility and sterility*. 2006;**85**(4):871-875.
5. Adegbola O, Akindele MO. The pattern and challenges of infertility management in Lagos, Nigeria. *African Health Sciences*. 2013;**13**(4):1126-1129.
6. Hörbst V. 'You cannot do IVF in Africa as in Europe': the making of IVF in Mali and Uganda. *Reproductive biomedicine & society online*. 2016;**2**:108-115.
7. Botha B, Shamley D, Dyer S. Availability, effectiveness and safety of ART in sub-Saharan Africa: a systematic review. *Human reproduction open*. 2018;**2018**(2):hoy003.
8. Dadhich P, Ramasamy R, Lipshultz LI. The male infertility office visit. *Minerva urologica e nefrologica = The Italian journal of urology and nephrology*. 2015;**67**(2):157-168.
9. Katz DJ, Teloken P, Shoshany O. Male infertility - The other side of the equation. *Australian family physician*. 2017;**46**(9):641-646.
10. Winters BR, Walsh TJ. The epidemiology of male infertility. *The Urologic clinics of North America*. 2014;**41**(1):195-204.
11. Carson SA, Kallen AN. Diagnosis and Management of Infertility: A Review. *Jama*. 2021;**326**(1):65-76.
12. Moragianni VA, Penzias AS. Cumulative live-birth rates after assisted reproductive technology. *Current Opinion in Obstetrics and Gynecology*. 2010;**22**(3):189-192.
13. Bosselut H, Paulmyer-Lacroix O, Gnisci A, Bretelle F, Perrin J, Courbiere B. (Prognostic factors of live-birth after in vitro fertilization for unexplained infertility: A cohort study). *Gynecologie, obstetrique, fertilité & senologie*. 2021; **49**(7-8): 601-7.
14. De Neubourg D, Bogaerts K, Blockeel C, et al. How do cumulative live birth rates and cumulative multiple live birth rates over complete courses of assisted reproductive technology treatment per woman compare among registries? *Human Reproduction*. 2015;**31**(1):93-99.
15. Toftager M, Bogstad J, Løssl K, et al. Cumulative live birth rates after one ART cycle including all subsequent frozen-thaw cycles in 1050 women: secondary outcome of an RCT comparing GnRH-antagonist and GnRH-agonist protocols. *Human reproduction (Oxford, England)*. 2017;**32**(3):556-567.