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Profile of Premature Ovarian Failure in a Cohort of Hypofertile Couples at Bogodogo University Teaching Hospital, Ouagadougou, Burkina Faso

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Abstract

Introduction: Premature ovarian insufficiency (POI) is not an uncommon phenomenon among patients who consulted during the assisted reproduction campaign. **Objective:** The aim of our study was to investigate the frequency and factors associated with premature ovarian failure (POI) in a cohort of women during the campaign for assisted reproduction at the University Teaching Hospital of Bogodogo (UTH-B) from December 15, 2022 to June 15, 2023. **Methodology**: We conducted a retrospective descriptive and analytical cross-sectional study from 2022 to 2023. The study population consisted of women with POI. Data were collected using a questionnaire containing the variables. We calculated frequency, crude odds ratios (crude OR) and adjusted odds ratios (adjusted OR) at a 95% confidence interval, and variables with a p-value < 0.05 were considered statistically significant**. Results:** The prevalence of premature ovarian failure was 4.42%. Factors independently associated with premature ovarian failure were irregularity of menstrual cycle [OR = 10.35, CI95% = (4.04-26.50), p = 0.001]; history of twins [OR = 3.55, CI95% = (1.63-7.69), p = 0.001]; absence of history of gestation [OR = 1.47, CI95% = (1.02-2.15), p = 0.047]. **Conclusion**: The study showed that POI remains a major challenge in reproductive health, due to its relatively high frequency. Action is needed to raise awareness of the signs, so that the population can be consulted at an early stage.

Keywords

Risk Factors, Premature Ovarian Failure, Campaign, UTH-B, Ouagadougou

1. Introduction and Statement of the Problem

Atresia, which begins in intrauterine life, continues progressively, as do ovulations during puberty. Thus, premature menopause or premature ovarian insufficiency (POI) could occur in any woman who starts life with a decreased number of follicles or undergoes accelerated follicular apoptosis [1]. It is defined by the occurrence of primary or secondary amenorrhea lasting more than 4 months before the age of 40, associated with increased pituitary gonadotropins (FSH > 20 IU/L) and low estradiol levels on 2 occasions, at least 4 to 6 weeks apart are compatible with a diagnosis of POI [2] [3]. Demographic data have shown that around 3.7% of women worldwide suffer from POI and subsequent infertility [4]. This prevalence varied significantly by continent: in Latin America, it was 1.5%, and 1.9% in Europe [5]. However, it was higher in Asia and Africa, at 2.7% and 2.4% respectively [6] [7]. In Burkina Faso, a study conducted in 2023 found a prevalence of 2.4% [7].

In the same context as Burkina Faso, the level of infertility was estimated to be 17.76% of the general population in 2016 [8]. Tiemtoré found in his study that the causes were ovarian in 67.82% of cases, uterine in 25.28% and tubal in 6.89%. Moreover, the most frequent ovarian pathology was polycystic ovary syndrome (PCOS) (44.04%) [9]. For Sakande, tubal obstructions were the most common cause of hypofertility, accounting for 50.0% of cases [10].

The timing of menopause is an indicator of ovarian function and has important health implications. Indeed, premature ovarian failure is associated with an increased risk of all-cause mortality [11] [12]. To prevent the occurrence of these complications, it is necessary to be aware of the risk factors for premature ovarian failure. Worldwide, a number of studies have identified determinants of premature ovarian failure, including socioeconomic factors [12]-[14]. Furthermore, understanding and clarifying these risk factors will facilitate prevention strategies to optimize women's health. We therefore set out to study the epidemiological profile, frequency and factors associated with premature ovarian failure in a cohort of hypofertile couples at the University Teaching Hospital Bogodogo (UTH-B), in order to contribute to better reproductive health in Burkina Faso.

2. Methodology

2.1. Setting and Field of Study

The University Teaching Hospital of Bogodogo (UTH-B) is located in the city of Ouagadougou, the political and administrative capital of Burkina Faso, which was our field of study and the CHUB, our study setting.

2.2. Type and Period of Study

This was a prospective descriptive and analytical cross-sectional study from December 15, 2022 to June 15, 2023.

2.3. Study Population

The study population consisted of all couples who participated in the campaign.

2.4. Selection Criteria

The patients included in our sample met the following criteria:

(1) Having under 40 years of age;

(2) Having participated in the screening campaign for medically assisted reproduction in the UTH-B obstetrics and reproductive medicine department;

(3) Having completed their biological work-up (FSH, LH, AMH, Oestradiol….);

(4) having carried out 2 previous biological assessments with an interval of at least 6 months and concordant;

(5) Having given their verbal consent over the telephone to participate in the study.

2.5. Collection Techniques and Tools

A literature review from August 1 to October 302 with a questionnaire and a telephone interview from November 1 to 15 were used to collect the data.

2.6. Study Variables

The following variables were collected on the data collection forms:

(1) Socio-demographic characteristics: age, profession, marital status, level of education, place of origin;

(2) Gynaeco-obstetrical, medical and surgical history;

(3) Eating and physical habits;

(4) Clinical examination: blood pressure, Body mass index (BMI);

(5) Results of paraclinical examinations: hormone assessment (FSH, LH, estradiol, AMH, TSH prolactin…), ultrasound, hysterosalpingography (HSG), diagnostic hysteroscopy.

The dependent variable or variable of interest was premature ovarian failure, a qualitative binary variable (Yes/No). The independent variables were socio-demographic and lifestyle variables, and clinical and paraclinical variables.

2.7. Data Processing

A data entry mask was created and the data collected was entered progressively on a computer using Epi info software version 7.2.2.6. The manually collected data were entered, processed and analyzed on a computer, using Word, Excel version 2016 and Epi info version 7.2.5.0.

Data analysis involved 3 levels:

(1) Descriptive analysis: involved calculating percentages for qualitative variables and measures of central tendency (mean, median) and dispersion (standard deviation, minimum, maximum) for quantitative variables.

(2) Univariate analysis: the Chi-square test was used to compare percentages; when the conditions for applying the test were not met, Fisher's exact test was used. The Student's t-test was used to compare means.

(3) Multivariate analysis using logistic regression.

(4) A p threshold of less than 0.05 was considered significant; the Odds ratio was used as a measure of association with a 95% confidence interval.

3. Results

3.1. Descriptive Study

1. Frequency

A total of 1,200 women of all ages took part in the assisted reproduction campaign at CHU-B. Of these, 53 women were diagnosed with premature ovarian failure, representing a frequency of 4.42%.

2. Socio-Demographic and Lifestyle Characteristics

A total of 261 women under 40 years of age were included. The mean age of women with ovarian insufficiency was 34.64 ± 3.97 years, with extremes ranging from 24 to 39 years. The level of education was high in 206 women from the general population, 41 of whom (19.90%) had been screened for POI. In the study population, 242 women were married, including 50 women screened for POI, *i.e.* 20.66%, and 66 consumed alcohol, including 17 screened for POI, *i.e.* 25.76% (Table 1).

Table 1. Distribution of women according to socio-demographic and lifestyle characteristics during the CHUB 2022-2023 MPA campaign.

Features	Total N = 261	POI N = 53	No POI N = 208
	N	N (%)	N (%)
Age groups			
[20 - 30]	65	08 (12.31)	57 (87.69)
[31 - 40]	196	45 (22.96)	151 (77.04)
Educational level			
High	206	41 (19.90)	165 (80.10)
Low	55	12 (21.82)	43 (78.18)
Occupation			
Housewife	25	04 (16.00)	21 (84.00)
Salaried	150	33 (22.00)	117 (78.00)
Informal	58	14 (24.14)	44 (75.86)
Student	24	01 (4.16)	23 (95.84)
Farmer	04	01 (25.00)	3 (75.00)

Continued

Marital status			
Married	242	50 (20.66)	192 (79.34)
Cohabiting	19	03 (15.79)	16 (84.21)
Residence			
Rural	38	09 (23.68)	29 (76.32)
Urban	223	44 (19.73)	179 (80.27)
Body mass index			
Normal	187	38 (20.32)	149 (79.68)
Low weight	03	01 (33.33)	02 (66.67)
Obesity	71	14 (19.72)	57 (80.28)
Alcohol			
Yes	66	17 (25.76)	49 (74.24)
No	195	36 (18.46)	159 (81.54)
Physical activity			
Yes	42	07 (16.66)	35 (83.34)
No	219	46 (21.00)	173 (79.00)
Age	33.43 ± 3.97	34.64 ± 3.96	33.12 ± 3.92

3. Clinical (History and Symptoms) and Paraclinical Data

In our study population, 145 women had an irregular menstrual cycle, including 48 with premature ovarian failure (33.10%). One hundred and thirty-four (134) women had dysmenorrhea, 23 of whom (17.16%) had been diagnosed with POI. Hypofertility was primary in 165 women, of whom 33 (20%) were screened for POI. Endometriosis was present in 18 women from the general population, including 3 with premature ovarian failure (16.66%). Diabetes was present in 7 women from the general population, including 3 women (42.86%) with premature ovarian failure. IVF was performed in 20 women from the general population, including 9 with premature ovarian failure (45%). Myomectomy was performed on 26 women from the general population, including 6 (23.08%) with premature ovarian failure (Table 2).

Table 2. Distribution of women according to their history during the AMP campaign at CHU B.

Features	Total N = 261 N	POI N = 53 N (%)	No POI N = 208 (%)
Menstrual cycle irregularity			
No	116	05 (4.31)	111 (95.69)
Yes	145	48 (33.10)	97 (66.90)
Dysmenorrhea	134	23 (17.16)	111 (82.84)
Yes	127	30 (23.62)	97 (76.38)

Continued

No			
Spaniomenorrhea	54	11 (20.37)	43 (79.63)
Yes	207	42 (20.29)	165 (79.71)
No			
Contraception	39	08 (20.51)	31 (79.49)
Yes	222	45 (20.27)	177 (79.73)
No			
Hypofertility	165	33 (20.00)	132 (80.00)
Primary	96	20 (20.83)	76 (79.17)
Secondary			
Previous pregnancy	96	23 (23.96)	73 (76.04)
Yes	165	30 (18.18)	135 (81.82)
No			
Previous childbirth	39	10 (25.64)	29 (74.36)
Yes	222	43 (19.37)	179 (80.63)
No			
Endometriosis	18	03 (16.66)	15 (83.34)
Yes	243	50 (20.58)	193 (79.42)
No			
PCOS	14	02 (14.29)	12 (85.71)
Yes	247	51 (20.65)	196 (79.35)
No			
hypertension	16	03 (18.75)	13 (81.25)
Yes	245	50 (20.41)	195 (79.59)
No			
Diabetes	07	03 (42.86)	04 (57.14)
Yes	254	50 (19.69)	204 (80.31)
No			
Salpingectomy	14	04 (28.57)	10 (71.43)
Yes	247	49 (19.84)	198 (80.16)
No			
Salpingoplasty	13	01 (7.69)	12 (92.31)
Yes	248	52 (20.97)	196 (79.03)
No			
Myomectomy	26	06 (23.08)	20 (76.92)
Yes	235	47 (20.00)	188 (80.00)
No			

Continued

Drilling	06	00 (0.00)	06 (100.0)
Yes	255	53 (20.78)	202 (79.22)
No			
Cystectomy	13	04 (30.77)	09 (69.23)
Yes	248	49 (19.76)	199 (80.24)
No			
Ovariectomy	03	02 (66.67)	01 (33.33)
Yes	258	51 (19.77)	207 (80.23)
No			
Caesarean section	07	01 (14.29)	06 (85.71)
Yes	254	52 (20.47)	202 (79.53)
No			
Stimulation	67	18 (26.87)	49 (73.13)
Yes	194	35 (18.04)	159 (81.96)
No			
Insemination	22	04 (18.18)	18 (81.82)
Yes	239	49 (20.50)	190 (79.50)
No			
IVF	20	09 (45.00)	11 (55.00)
Yes	241	44 (18.26)	197 (81.74)
No			
Family history of POI	00	00 (0.00)	00 (0.00)
Yes	261	53 (20.30)	208 (79.70)
No			
History of twins	18	12 (66.67)	06 (33.33)
Yes	243	41 (16.87)	202 (83.13)
No	7.1 ± 3.77	6.7 ± 3.32	7.18 ± 3.90
Duration of hypofertility in years	13.95 ± 1.61	14.03 ± 1.60	13.93 ± 1.61

Dyspareunia was present in 55 women, including 53 with premature ovarian failure (96.36%). AMH levels were low in 177 women from the general population and in all women with PCOI (Table 3).

Table 3. Distribution of women according to symptoms and biological result during the PMA campaign at CHU B 2022-2023.

Features	Total N = 261 N	POI N = 53 N (%)	No POI N (%)
Amenorrhea			
Yes	70	25 (35.71)	45 (64.29)

Continued

No	191	28 (14.66)	163 (85.34)
Hot flushes			
Yes	47	39 (82.98)	08 (17.02)
No	214	14 (6.54)	200 (93.46)
Loss of attention and memory			
Yes	34	34 (100.0)	00 (0.00)
No	227	19 (8.37)	208 (91.63)
Vaginal dryness			
Yes	55	53 (96.36)	02 (3.64)
No	206	00 (0.00)	206 (100.0)
Dyspareunia			
Yes	55	53 (96.36)	02 (3.64%)
[2]No	206	00 (0.00)	206 (100.0)
Sleep disturbance			
Yes	45	12 (26.66)	33 (73.34)
No	216	41 (18.98)	175 (81.02)
AMH			
Normal	84	00 (0.00)	84 (100.0)
Low	177	53 (29.94)	124 (70.06)

3.2. Etiological Analysis

1. Univariate Analysis

In our study, the variables associated with premature ovarian failure in univariate analysis (Table 4) were: history of gemellity (p = 0.002); history of pregnancy (p = 0.049); irregularity of menstrual cycle (p = 0.000), age over 30 (p = 0.068), diabetes (p = 0.018), oophorectomy (p = 0.089).

Table 4. Factors associated with premature ovarian failure in women during the CHUB 2022-2023 MAP campaign in univariate analysis.

Variables	OR	IC 95%	P
PCOS			
No	1		
Yes	2.56	[1.38, 4.74]	0.002
Previous			
childbirth	1		
No	1.80	[0.53, 6.11]	0.340
Yes			
Salpingectomy	1		

Continued

No	1.2	[0.45, 3.15]	0.711
Yes			
Insemination	1		
No	0.64	[0.13, 2.95]	0.568
Yes			
Dysmenorrhea	1		
No	0.69	[0.31, 1.53]	0.370
Yes			
Alcohol	1		
No	1.61	[0.48, 5.37]	0.432
Yes			
Contraception	1		
No	0.86	[0.27, 2.66]	0.795
Yes			
Marital status	1		
Married	1.30	[0.71, 2.39]	0.391
Cohabiting			
Single	1		
High blood pressure	1.53	[1.79, 2.96]	0.104
No			
Yes	1		
Hypofertility	0.98	[0.42, 2.28]	0.972
No			
Yes	1		
Physical activity	0.70	[0.19, 2.54]	0.588
No	0.91	[0.47, 1.78]	0.804
Yes			
Diabetes	1		
No	0.90	[0.24, 3.28]	0.873
Yes			
Caesarean section	1		
No	1.05	[0.56, 1.96]	0.871
Yes			
Residence	1		
Rural	1.32	[0.55, 3.18]	0.523
Urban			
Ovariectomy	1		

Continued

No	10.90	[1.49, 79.90]	0.018
Yes			
Pregnancy history	1		
Yes	0.64	[0.07, 5.49]	0.690
No			
Endometriosis	1		
No	0.79	[0.34, 1.79]	0.576
Yes			
Cycle irregularity	1		
No	8.11	[0.72, 91.28]	0.089
Yes			
Salpingoplasty	1		
No	1.36	[1.02, 1.87]	0.049
Yes			
Level of education	1		
High	1.05	[0.52, 2.11]	0.887
Low			
Profession	1		
Housewife	9.32	[3.82, 22.74]	0.000
Salaried			
Informal	1		
Student/Grower	0.31	[0.04, 2.47]	0.271
BMI	1		0.873
Normalrange	0.84	[0.39, 1.80]	0.659
Overweight	1		
Obese	1.48	[0.47, 4.61]	0.498
Age range >30 years	1.67	[0.48, 5.69]	0.412
No	0.22	[0.02, 2.20]	0.202
Yes	1.75	[0.14, 21.38]	0.661
PCOS			
No	1		
Yes	0.01	[0.001, 100.02]	0.976
Previous	1.30	[0.13, 12.8]	0.819
childbirth			
No	1		
Yes	2.12	[1.94, 4.77]	0.068

2. Multivariate Analysis

After uni-variate analysis, variables with p-values less than or equal to 0.20 were retained for multivariate analysis, and those with p-values less than 0.05 were significant.

Factors associated with POI were: cycle irregularity (p = 0.001); previous twin (p = 0.001); previous pregnancy (p = 0.047).

Table 5. Factors associated with premature ovarian failure in women during the campaign for assisted reproduction at CHUB 2022-2023 in multivariate analysis.

Variables	OR	IC 95%	P
Cycle irregularity			
No	1		
Yes	10.35	[4.04, 26.50]	0.001
Ovariectomy			
No	1		
Yes	5.12	[0.36, 72.22]	0.225
Pregnancy history			
No	1		
Yes	3.55	[1.63, 7.69]	0.001
Age range >30 years			
No	1		
Yes	0.67	[0.20, 2.21]	0.517
Pregnancy history			
Yes	1		
No	1.47	[1.02, 2.15]	0.047
Alcohol			
No	1		
Yes	4.91	[0.94, 25.60]	0.068
Diabetes			
No	1		
Yes	4.31	[0.44, 41.80]	0.207

4. Discussion

In our study, the frequency of premature ovarian failure was 4.42%, and the factors associated with premature ovarian failure on multivariate analysis were: cycle irregularity (p = 0.001); previous twinhood (p = 0.001); previous pregnancy (p = 0.047).

4.1. Limitations and Difficulties of the Study

Our study had certain limitations and biases, notably the retrospective nature of the study, where some data were incomplete and some patients were unreachable,

and the small sample size. In addition, the study was carried out in Ouagadougou, the capital of Burkina Faso, which may reduce the participation of women living in rural areas, thus compromising the extrapolation of results to the entire population of Burkina Faso. Notwithstanding these limitations and biases, we were able to compare our results with the literature.

4.2. Frequency

The frequency of premature ovarian failure in our study was 4.4%. Our prevalence is higher than that of Coulibaly *et al.* (2.4%), Yeo J H *et al.* (3.1%), Mishra G D *et al.* (2%), Jambarsang S *et al.* (3%), Rostami Dovom M (3.5%), Lim J M (2.4%) [12] [15]-[18]. This discrepancy could be explained by the small size of our sample and our reduced study period; the prevalence of POI would have been overestimated.

4.3. Social and Demographic Characteristics

1. Age

The mean age of our patients with premature ovarian failure was 34.64 years. Our results are similar to those of Coulibaly *et al.*, Sato *et al.* and Zhu D, who found a mean age of 32.8, 32.9 and 33.52 years respectively [7] [19]-[21]. This average age could be explained in our context by late consultations due to financial or cultural constraints (traditional treatment).

2. Level of Education

In our study, the highest level of education was represented by 41 of the 53 women with POI. This is explained by the fact that the campaign took place in Ouagadougou, where the majority of vocational schools and universities were located. Also, the campaign was well publicized, and women with a high level of education had easy access to information. This is confirmed by certain studies which show that women with a high level of education are generally more aware of the symptoms, which may influence the earliness of diagnosis [4] [22].

4.4. Clinical Characteristics

1. Duration and Type of Hypofertility

The average duration of hypofertility was 6.70 years. Our duration is shorter than that of Coulibaly *et al.* and longer than that of Zhu D *et al.* who reported a mean duration of 8.5 and 3.47 years respectively [7] [21]. Hypofertility was primary in 62.26% of our patients. Our rate is lower than that of Coulibaly *et al.* which was 72.55%, and higher than that of Zhu D *et al.* which was 32.25% [21].

Our results are based on patients with premature ovarian failure and Coulibaly's [7]. On the general population, hence the difference. The difference between our results and those of Zhu is explained by the delay in consultation due to financial difficulties and the fact that the problem of fertility remains a taboo subject in our context. In addition, the fact that our patients were recruited in the context of a fertility campaign where the cost of procedures was lower than in private structures could justify this. Could this difference also be an expression of

renewed hope for couples with a long history of infertility?

2. Duration of Menarche

The average age of menarche in our study was 14.03 ± 1.60 years, higher than that of Bompoula *et al.* who reported an average age of 12.2 ± 2.2 [23]. This difference may be explained by nutritional conditions and climate, which can influence pubertal development through hormonal and metabolic mechanisms.

3. Dyspareunia and Hot Flushes

In our study, dyspareunia and hot flushes were major symptoms in 96.30% of cases. Our results corroborate those of Sullivan *et al.*, Gupta *et al.*, Moustaki M. *et al.*, who found these two symptoms to be among the signs presented by women screened for POI [4] [22] [24] [25]. These signs are part of the classic signs of menopause linked to estrogen deficiency. Estrogen deficiency leads to vulvovaginal atrophy through reduced vascularization and thickness of the vaginal epithelium. This deficiency can also lead to dysregulation of the hypothalamus, causing instability of the thermal regulation threshold, leading to sudden vasodilatation and increased sweating. These symptoms underline the importance of hormone replacement therapy for patients with POI [27].

4.5. Factors Associated with Premature Ovarian Failure

1. Menstrual Cycle Irregularity

In our study having an irregular mentstrual cycle increased the risk of having premature ovarian failure 10.35-fold and this was statistically significant with p value = 0.001. Our results corroborate those of Bertone-Johnson E R *et al.* in 2018 who reported that cycle irregularity increased the risk of having POI 6.3-fold and this was statistically significant with $p < 0.001$. Similarly, Whitcomb B W *et al* in 2018 found that women with regular cycles had a lower risk than women with irregular cycles (OR = 0.51; p-value = 0.0001) [26] [27]. Indeed, irregular menstrual cycles, often associated with periods of amenorrhea (absence of menses), may indicate impaired ovarian function. In addition, irregularity may be a sign of fluctuations in the production of hormones, particularly estrogen and progesterone, which are necessary for the proper functioning of cycles. This may reflect a reduced ovarian reserve or ovarian dysfunction. It is, therefore important to monitor irregular menstrual cycles and consult a doctor for assessment, especially if symptoms occur.

2. Twin Pregnancy History

Twin pregnancy increases the risk of premature ovarian failure and this is statistically significant with an OR = 3.55; p-value = 0.0013 Mishra G D *et al.* in 2019 reported that twin pregnancy history was associated with the risk of developing POI [12]. One of the main reasons that may link the outcome of a twin pregnancy to the accumulated risk of POI is genetic predisposition. Women with a genetic predisposition to hyperovulation (releasing multiple oocytes) may have a lower long-term ovarian reserve. In fact, multiple ovulation consumes oocytes more rapidly, which could accelerate the depletion of ovarian reserve and therefore in-

crease the risk of premature ovarian failure (POF). If this tendency is passed on genetically to the daughter, she could also develop a reduced ovarian reserve earlier than average.

3. Previous Pregnancy

The absence of previous pregnancy is associated with a statistically significant risk of premature ovarian failure, with OR = 1.4732; p-value = 0.047.

In the literature, some authors have found that nulliparity is statistically associated with a risk of premature ovarian failure [14] [27]. This may be linked to the protective effects of hormones produced during pregnancy on ovarian function. These hormones may delay follicular exhaustion or limit oxidative damage to the ovaries.

The results of our study may be explained by the fact that POI leads to infertility, reducing the chances of pregnancy. Primary hypofertility (which accounts for 62.26% of our patients screened for POI) could mean that POI leads to pregnancy failure, rather than the reverse. Lack of pregnancy could also be linked to delays in diagnosis or limited access to care.

5. Conclusion

Premature ovarian failure represents a major reproductive health challenge due to its clinical and psychosocial implications. This study revealed a significant frequency of POI in the study population, as well as associated factors such as irregularity of the menstrual cycle, previous twinhood and previous pregnancy. These results underline the importance of early diagnosis and multidisciplinary management to improve the prognosis and quality of life of the patients concerned. They also call for increased awareness and targeted prevention strategies. Further research is needed to deepen understanding of the underlying mechanisms and develop innovative therapeutic approaches.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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