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Who is responsible for couple infertility: A clinic-based survey in Ouagadougou (Burkina Faso)

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This study was carried out to describe the male or female original causes of infertility among couples and the semen quality among men attending fertility clinics. A descriptive cross-sectional study was conducted with a retrospective data collection from 2003 to 2012. From 14 to 18th January, 6 982 patients were included and analyzed 6642 patients’ data from 15 private and public medical centres in Ouagadougou, Burkina Faso. The mean age was 36.4 (95% CI: 35.3, 37.6), 30.0 (95% CI: 29.6, 30.4) and 29.6 (95% CI: 29.4, 29.8) for men, infertile and fertile women, respectively. The origin of the infertility was related to female or male factor in 25.1 and 7.7% of the cases, respectively while unexplained infertility represented 62.5% of the cases. The trend of the male infertility had a slight but steady increase over the last years of the study. Regarding semen quality, the male-factor infertility was more associated with the sperm quality (morphology, motility and vitality) than the spermatoozoon count or the volume. Our findings tended to confirm that male infertility is increasing. Prospective studies are needed to investigate the specificities of infertility in Burkina Faso as well as the different partners’ contribution to this.

Key words: Infertility, semen quality, prevalence, sub-Saharan Africa, Burkina Faso.

INTRODUCTION

Infertility is a clinical, psychological and social issue challenging couples and health professionals. Globally, 10 to 15% of couples would be facing this problem in their lifetime (Skakkebaek et al., 1994; Kliesch, 2014; Meacham et al., 2007). There are regional and country variability regarding the magnitude of the problem (Agarwal et al., 2015). Rates in sub Saharan Africa (SSA) range between 12.7 and 16.9% with a midpoint of 14.9% (Eriksen and Brunette, 1996; Agarwal et al., 2015). With respect to the etiology, 30 to 50% of the couple infertility are due to female factors and 20 to 40% related to male factors, 20 to 40% relate to both male and female factors.
and up to 20% remained unexplained (Velez de la Calle et al., 2001; Sohrabvand et al., 2015; Nwajiaku et al., 2012). Among the different causes of infertility, male infertility is a complex challenge for health professionals because of the difficulty to have an accurate diagnosis (Agarwal et al., 2015; Skakkebaek et al., 1994; Irvine, 1998). Globally, accurate information on the magnitude of male infertility is lacking (Agarwal et al., 2015). Male infertility is not well reported because men are often reluctant to medical visits. Besides, cultural and social representations of infertility most often give clearance to men regarding the responsibility of the infertility inside couple to blame the female partner (Sciarrà, 1994; Nwajiaku et al., 2012). However, a study by Carlsen et al. (1992) concluded to a reduction in male semen quality over a 50-year period (Carlsen et al., 1992). This finding triggered many other researches on male infertility and male reproductive health in general. The results are controversial regarding the hypothesis of increase in the prevalence of couple or male infertility (Agarwal et al., 2015). In Africa, the prevalence is between 2.5 and 6.3% with differences according to the regions and the lab procedures to analyze semen (Agarwal et al., 2015). Though controversial, some authors believe that secondary infertility is more prevalent in SSA (Ericksen and Brunette, 1996; Cissé et al., 2002; PATH, 1997).

Female genital tract, specifically tubo-ovarian infections are the main causes of infertility in couples in SSA (Ericksen and Brunette, 1996; Collet et al., 1998; Audu et al., 2009; Sciarrà, 1994). However, it has been indicated that the trend would be reversing in favor of male infertility fueled by environmental pollution and some modern lifestyle (Multignier and Oliva, 2001).

In Burkina Faso, the prevalence of infertility among couples is between 16.6 and 17.2% (Ericksen and Brunette, 1996). Pollution is rampant in Ouagadougou the capital city (Lindén, 2011, 2009 Lindén et al., 2007), due to a mixture of smoke and dust from the use of motorcycle and old cars with defective engines driving incomplete fuel combustion, many open air commercial charcoal barbecue and the traffic on dirty roads. This environmental pollution could contribute to a change in the couple infertility epidemiology, leading to more contribution of the male factor. Because it is well established worldwide that environmental pollution causes many male infertility cases (Jurewicz et al., 2009; Selevan et al., 2000; Hansen et al., 2010). There is a paucity of data on male infertility in Burkina Faso. Our study aimed to investigate the male or female origin of couple infertilities and the semen quality among infertile men visiting fertility clinics in Ouagadougou (Burkina Faso).

MATERIALS AND METHODS

Study design, sites and population

It was a cross-sectional and descriptive study with retrospective census of data from clinics’ registries and patients’ files. Fourteen private and five public fertility clinics were identified as the study sites, because of their technical ability to manage infertility cases. All couples with the woman aged 18 to 49 and the men of 18 to 60, attending the clinics, were included whatever the reason of the visit, except those coming for ante natal visit. Also excluded are couples with a known human-induced cause of infertility such as vasectomy, tubal ligation or road or other accident complicated with impotence. An infertile couple were defined as a couple that failed to conceive a child after at least 12 months of regular unprotected sexual intercourses (Larsen et al., 1999; Larsen, 2005, 2000). This is the operational definition practitioners used countrywide. On the contrary, a fertile couple is a couple that is naturally capable to produce offspring (https://en.wikipedia.org/wiki/Fertility).

Data management and analysis

Field investigators were trained for the use of the data collection logs for one week including pre-test period. Then, they were distributed at a ratio of one by site except large clinics like the Gynecology Department of the University Teaching Hospital in Ouagadougou and the private clinic “Notre Dame de la Paix” that received four and three investigators, respectively. Data were collected by the field investigators from patients’ medical files and the clinics’ registries. They were cross-checked by the field coordinator, coded and computerized by data entry team including study coordinator, resident medical students and data entry operators.

Descriptive univariate analysis was conducted. Frequencies of patients’ clinical and demographic characteristics were calculated. To calculate the prevalence of couple’s infertility, we use the operational definition that is also the WHO’s clinical definition: “one year of regular unprotected intercourse without pregnancy” (Larsen, 2000, 2005; Larsen et al., 1999).

The denominator was all women visiting the clinic whatever the reason and the numerator was, the women who have been seeking child unsuccessfully after at least a one-year period of regular unprotected intercourses. Further, we presented the proportion of infertilities according to the original causes that may stem from the male, female partner or from a combination of causes from both partners or remain unexplained. We thus considered as denominator, only couples visiting the fertility clinics and that have been seeking child unsuccessfully for at least one-year period. In those cases, the proportion of male infertility was calculated as infertile couples (denominator) where the man had semen abnormalities (azoospermia, oligospermia, asthenospermia, necrospermia, and oligo-asthenospermia) and the woman was diagnosed with no reproductive health issue (numerator). Reversely, the proportion of female infertility was calculated as infertile couples (denominator) where the woman presented reproductive health issue such as (uterine malformation or synaechia, tubal obstruction, ovulatory disorders, sequelae of abortion, abnormal cervical mucus, Shehan disease) and the man was diagnosed with no semen abnormalities (numerator).

The proportion of mixed infertility (infertility due to a combination of male and female factors) was measured as infertile couples (denominator) where both man and woman were diagnosed with reproductive health illness (numerator). Lastly, the proportion of unexplained infertility was the case of infertility where both male and female partners presented no reproductive health illness. Regarding men semen quality, we used available semen analysis data from the patients’ medical files. We presented the frequencies of the semen impairments using WHO 1992 definition (World Health Organization, 1999; Esteves and Agarwal, 2011).

We used the t-test to compare means and the Wilcoxon-Mann-Whitney test to compare proportions in STATA/SE 13.1 (4905 Lakeway Drive College Station, Texas 77845 USA).
\[ P = \frac{a}{b} \quad P_{m} = \frac{b}{c} \quad P_{f} = \frac{c}{d} \quad P_{e} = \frac{d}{a} \quad P_{u} = \frac{e}{a} \]

where

- \( P \)= general infertility prevalence
- \( P_{m} \)= male infertility prevalence
- \( P_{f} \)= female infertility prevalence
- \( P_{e} \)= mixed infertility prevalence
- \( P_{u} \)= unexplained infertility prevalence
- \( N \)= total number of people attending study clinics whatever the reason
- \( a \)= couple seeking a child unsuccessfully for more than 12 months,
- \( b \)= men with reproductive health problems (semen impairments) and whose wives/partners have no reproductive health issue
- \( c \)= men with no reproductive health problems (semen impairments) and whose wives/partners have a reproductive health issue
- \( d \)= both partners have a reproductive health issue
- \( e \)= none of the partners have a reproductive health issue.

**Ethics**

All authorizations were obtained from regulatory and administrative health authorities including the health authorities of the Centre Region and the National Ethics Committee for Health Research. We conducted the study according to the principles of Helsinki Declaration. The sponsor had no role in the design, implementation of the protocol nor the analysis of the data and the presentation of the data in the current manuscript.

**RESULTS**

**Socio-demographic characteristics**

Between 14 and 18th January, 2013, a cross-sectional study was conducted in ten private and five public health centres (four private clinics denied access to their registries and patients’ files because they were concerned about confidentiality). We collected data from 6 982 patients and analyzed 6642 subjects. The mean age of male partners was 36.4 (95% CI: 35.3, 37.6). With respect to mean age and marital regime, the fertile and infertile women were similar. More fertile women were married in comparison to infertile ones (p<0.01) (Table 1). Since we only collected infertile men socio-demographic characteristics, we were not able to make a comparison with fertile men.

**Characteristics of infertility**

The proportion of infertile men with more than 50% motile spermatozoa and less than 30% spermatozoa of normal morphology was 30.7 and 6.1%, respectively (Table 2).

Regarding semen quality, the distribution of abnormalities was balanced between necrospermia, oligospermia, azoospermia and asthenospermia. Overall, 15.1% of infertile couples presented male semen impairments (Table 3).

The prevalence of infertility in the general population was 1 179 couples representing 17.8% (95% CI: 16.8, 18.7) of the population.

Unexplained infertility was 62.5% of all infertility (Figure 1). Unexplained infertility steadily decreased over years while the male semen impairments were fluctuating, mostly between 2006 and 2009. Female infertility and male semen abnormalities had a pick between 2009 and 2010, while the male infertility rate was slightly decreasing before taking a slight but steady positive slope until the end of the survey (Figure 2).

**DISCUSSION**

In 62.5% of the cases, we were not able to find any original causes to the infertility. Unexplained infertility tended to decrease over the years from 2006 to 2012. Infertility due to male factors was 8% of the cases.

**Socio-demographic data**

In a study in Nigeria (Nwajiaku et al., 2012), the mean age of the male partners was 39.1±6 years (higher than the mean age of our males sample); the mean duration of infertility was 5.0 years lower than our mean duration of 70 months. In a study in military population in Brest (France), the mean ages were 31.6 and 30.0 years for infertile men and women, respectively. The mean duration of infertility was 37.9 months (Velez de la Calle et al., 2001). In less developed countries, infertile couples used to present later at fertility clinics to seek care. This may explain these important differences regarding age and duration of infertility with the French population.

**Origin and etiology of infertility**

In a study on global male infertility showing regional differences, when the authors presented the data based on various studies reporting male or female infertility, the prevalence of infertile males ranged between 2.5 and 4.8 in SSA, while the percentage of couples that were reported infertile ranged from 12.5 to 16% (Agarwal et al., 2015). Though the infertility prevalence was similar to our finding (17.8 95% CI: 16.8, 18.7) and to the one in Nigeria (18.5%) (Nwajiaku et al., 2012), the male infertility rate was lower compared to our results (7.7 95% CI: 6.3, 9.5). The authors themselves estimated that there might be an underestimation of the male infertility rate in SSA due to an underreporting because of cultural differences, patriarchal societies and traditions (Agarwal et al., 2015). When they extrapolated the data from WHO results on infertile women, North and West Africa rates ranged from 4.24 to 6.35%, more similar to our finding. Therefore, our results may be closer to the reality because minds are
changing and it is now accepted that a man can be infertile. As a result, more and more men undergo fertility assessment. Compared to the results of the same study from WHO results (Agarwal et al., 2015), our finding on male infertility rate was closer to the rates in regions like Europe or Australia and was included in the global range (2.5 to 12%). The differences of our results from the 25% of male infertility, 45% of female infertility and 20% of unexplained infertility found in Nigeria was important (Nwajiaku et al., 2012). Our results regarding male infertility were also different from the findings of an Iranian study with 23.7% of male-related factor and 19.3%
of combined male-female-related factor (Sohrabvand et al., 2015). These differences may be due either to the studies’ design or to real country specificities knowing that male infertility are influenced by environmental factors including daily life habits and pollution (Turek, 2008; Multigner and Oliva, 2001; Oliva et al., 2001; Wong et al., 2003).

In studies in French regions (Thonneau et al., 1991) and Southeastern Nigeria (Ikechebelu et al., 2003), the female factor for infertility represented 30 and 25.8%, respectively, close to our finding. In a review to examine trends in male infertility in the United Kingdom, the authors found a prevalence of women suffering from infertility ranging from 14 to 26% (Povey and Stocks, 2010). On the contrary, regarding combined (male and female factors) infertility, our finding was lower than the 20 to 40% presented by Agarwal et al. (2015) when they reported data based on various studies reporting male or female infertility. However, we had a high rate of unexplained infertility. Our hypothesis was that due to limitation in means of diagnosis in Burkina Faso as well as in many areas in SSA and to financial constraints, many couples cannot undergo a thorough fertility exploration, thus this high rate of unexplained infertility. It
might also be due to “the trend of deferring attempts to conceive and an increase in women’s age (Povey and Stocks, 2010). Cultural differences and traditions might have played a role here too. Interestingly, over the years, the proportion of unexplained infertility steadily decreased. This may confirm our results that lack of diagnosis resource including qualified human resource contributed at the beginning at the high rate of unexplained infertility that decreased with the development of the health sector. Anyway, one should keep in mind that the high rate of unexplained infertility may be related to multifactorial causes. When the data were extrapolated from WHO results, the combined infertility rate lowered to 7.1% closer again to our rate.

In another study in Southeastern Nigeria, the main semen fluid abnormalities were asthenozoospermia (16.7%), astheno-oligozoospermia (14.7%) and astheno-oligoteratozoospermia (13.2%). Azoospermia represented only 1.4% (Ugboaja et al., 2010). These results were different from ours’ where necrospermia, oligospermia and azoospermia were the three leading abnormalities while oligoasthenospermia represented only 3.13%. Both studies were retrospective ones and might not be fully comparable by design.

We reported physician-synthesized data from patients’ files while the Nigerian study reported data directly from lab files. In another study in Nigeria, oligospermia and asthenozoospermia were the leading causes with respectively 60.9 and 17.4%, while azoospermia represented only 13.0% (Nwajiaku et al., 2012). Our results presented also different abnormalities compared to the Iranian study (Sohrabvand et al., 2015).

We agree with the authors of this latter study that in terms of infertility assessment, according to different geographical conditions and habits, the male factor infertility may present different causes and characteristics (Sohrabvand et al., 2015).

In a study that assessed the quality of semen during the past 50 years, the mean sperm count decreased from $113 \times 10^6/ml$ in 1940 to $66 \times 10^6/ml$ in 1990 ($p<0.0001$) and the mean seminal volume from $3.40$ to $2.75$ ml ($p=0.027$) (Carlsen et al., 1992). We found $3.0$ (95% CI: 2.8, 3.3) ml and $56.4 \times 10^6$ (95% CI: 44.4, 68.3) for seminal volume and sperm count, respectively for a period of 10 years from 2003 to 2012. However, our data was related to infertile men, while Carlsen et al. (1992) study referred to fertile men.

Our finding fitted in the WHO normal values for seminal volume and sperm counts.

It was believed that infertility due to male factors in our population was more related to the sperm quality (morphology, motility and vitality of the spermatozoa) than the count or volume.

We should also acknowledge that many aspects of the male semen profile according to WHO (among which the semen volume and count) are subjective and not evidence-based.

Therefore, it is difficult to make an accurate diagnosis with respect to infertility due to male factors (Irvine, 1998).

**Study limitations**

A retrospective study was conducted with data collected from hospital registries and patients’ files. Therefore, we had to face the challenge of missing or incomplete data. Regarding the semen quality assessment, semen analysis results were used from different laboratories that may have used different procedures as acknowledged in many critics of semen analysis (Cooper et al., 2010). This lack of standardization of the procedures might have also led to the differences that our results presented regarding the semen anomalies.

Our study was a clinic-based survey and thus, would be expected to underestimate the general prevalence of infertility since only those couples seeking care would be counted.

The missing data made it a non-representative population. However, we believe that our findings allowed grabbing the essential trends of couple infertility in Burkina Faso which is critical to design new studies that will investigate more deeply the phenomenon in order to provide more efficacious response to the patients.

**Conclusion**

The couple infertility in Burkina Faso was within the global infertility range of rates. Unexplained infertility rate was higher than many similar studies. However, over the years, this proportion tended to decrease. In general, the different categories of infertility kept fluctuating over time without any clear tendency to a trend. However, we were able to perceive a slight increasing trend for male infertility starting around 2009. Though controversial, this tendency was more coherent with the hypothesis that male semen quality is decreasing while male infertility is increasing. Prospective studies are needed to investigate more deeply these findings to confirm the specificities of the couple infertility in Burkina Faso as well as the contributions of both male partner and environmental influence in this phenomenon.

**Conflict of interests**

The authors have not declared any conflict of interests

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REFERENCES


