

Impact of Obesity on Fertility in a Population of Women in the Wilaya of Batna

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Abstract—Our study was designed to highlight changes in certain biochemical parameters (CH, TG, HDL, GOT, GPT, LDL and CRP), obese women infertile fertile witnesses and research potential pathophysiological link between obesity and infertility in this population of women. This practical work was focused on a population of 24 obese women infertile, compared to controls, subjects without any pathology causing disruption of parameters to be studied to determine the contribution of obesity in the etiology of infertility. The assay results revealed a highly significant difference between the two groups in serum CH, TG, HDL, TGO and TGP ($P < 0.0001$) and in the rate of LDL ($p = 0.0017$) and CRP ($p = 0.02$). The present study indicates that obesity is associated with infertility, but no direct pathophysiological link between obesity and infertility has been determined. Further in-depth studies are needed to determine the exact mechanism by which overweight leads to female infertility.

Keywords—Obesity, fertility, infertility, biochemical, women.

I. INTRODUCTION

INFERTILITY for one couple in six and one in ten couples will use treatments inducing ovulation or medically assisted procreation. During the reproductive years, many environmental factors such as nutrition and lifestyle may influence fertility. The role of weight and energy intake on ovulatory function are well established both in the sense of restriction or excess.

Weight is a major factor in the risk of infertility by anovulation. This risk is multiplied by 1.3 for a BMI between 24 and 25.9 kg/m² and about 3.7 for a BMI greater than 32 kg/m² [1]. The distribution of fat in the abdominal region is directly related to the prevalence of menstrual problems and chances of conception after treatment. Excess weight has significant negative effects on fertility, both in women than in men. In fact, obesity is associated with a decrease in spontaneous conceptions, increased spontaneous abortions and also has a negative impact on the long-term health of the mother and baby. Obesity causes dysovulation, which is expressed clinically by disorders of the cycle, as dysmenorrhea, elongation and irregular cycles, oligo amenorrhoea and infertility but also by hyperandrogenism. Obese women were 3.1 times more menstrual disorders and anovulatory cycles than women of normal weight [2].

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The presence of obesity in adolescence is associated with a higher risk of nulliparity in life compared to women with a normal BMI. It is also associated with lower fertility among women, even in a subgroup of women ovulating normally. This decrease in the fertility of women are obese even outside of polycystic ovary syndrome, it is therefore not only due to anovulation. On the other hand, obesity is known as a risk factor for failure of medically assisted procreation. Several mechanisms may be involved in these failures. The first implementation is based on a related compromised endometrial pathology. The second involves the oocyte; obese women would present a true secondary to obesity "oocyte disease."

A deeper understanding of the role of nutrition in reproduction would make recommendations to prevent infertility or offer a nutritional support associated with infertility treatments to increase the chances of pregnancy. To this end, our contribution through this work falls under study changes some biochemical in obese infertile women compared to fertile women (controls) to identify potential pathophysiological links between obesity and female fertility.

II. MATERIALS AND METHODS

Over a period of 6 months (1 January 2013 to 31 July 2013), we performed in the urology department of the University Hospital of Batna and urology Obstetrics and Gynecology of the medical-surgical clinical roses and Services cedar Batna and private medical laboratory in SAADELOUD, BATNA, a prospective study descriptive and analytical purposes. It focused on a population of women of reproductive age attending a clinic during the study period.

A. Samples

Our practice study was focused on a population of 24 obese women between the ages of 24 and 40 years (29.96 ± 0.81) compared to fertile women witnesses aged between 23 and 35 years (26.80 ± 0.73) infertile free of any disease causing disruption of parameters to be studied to determine the contribution of obesity in the etiology of infertility.

We considered to be suffering from infertility; any subject is unable to carry a pregnancy to term after a year or more of regular unprotected sex. All women received a deliberately unique and standardized assessment including an interview, a lipid and a comprehensive hormonal balance.

B. History and Examination

This is a fundamental step in the diagnosis because the interrogation provides half of guidance when conducted carefully. It must therefore be comprehensive and systematic.

A survey form was established for each patient. This examination includes age, duration and regularity of cycles (long and irregular moving towards a dysfunction ovulation, short sign early ovarian failure). Duration and bleeding (polyps, myomas), all general medical and surgical history, taking treatments (antidepressants, chemotherapy can affect ovarian function) tobacco or other drugs. Family history (maternal diethylstilbestrol) and exploration and previous treatments already made by the patient examinations. The interview contains gestity more hygienic life of the woman.

C. Para-Clinical Examination

All women underwent a standard pelvic exam in good condition with a Research morphotype [measure of weight, height, BMI, waist circumference, hip circumference and the WHR.

Blood samples were taken at the antecubital vein using sterile equipment. Blood samples were centrifuged at 5000g for 02 minutes. The serum is then collected and stored in tubes and frozen at -80°C until assayed. The blood was collected in a dry tube without anticoagulant for the determination of lipid and CRP TGO and TGP.

For the determination of various biochemical parameters: fat, transaminase, CRP, we used as a controller device analyzer PLC Biochemistry (COBAS: INTEGRA 400/800 Roche).

D. Statistical Analysis

Statistical analysis was performed using GraphPad Prism 5 software. t-Test (Student) was used to compare means of continuous variables between groups. The homogeneity of variance was tested by the F test In case the test is significant ($P < 0.05$), the distribution was normalized by the appropriate transformation (log, square root) where necessary. The Pearson test was used to search for possible correlations between the different parameters studied. The results are expressed as (mean \pm SEM). The statistical difference was considered significant when $P < 0.05$.

III. RESULTS AND DISCUSSION

To explore the role of obesity on fertility of women age procreate has Batna, we made a determination of lipid (CH, TG, HDL-CH, LDL-CH, GOT, GPT and CRP), in a population of 44 women of which 24 are women infertile obese women compared to 20 fertile controls to investigate the impact of obesity on female fertility.

A. Cholesterol and LDL

According to our results for the determination of CH and LDL in both populations in our study we observed a highly significant difference in the rate of CH is higher in obese infertile women ($2.49 \pm 0.07\text{g} / \text{l}$, $P < 0.0001$) compared with the rate of CH women fertile controls ($1.57 \pm 0.03\text{g} / \text{l}$, $P < 0.0001$) and a significant difference in serum LDL is higher in infertile obese women ($1.60 \pm 0.07\text{g} / \text{l}$, $p = 0.002$) by providing fertile control women ($1.24 \pm 0.04\text{g} / \text{l}$, $P = 0.002$).

Adipose tissue contains a significant amount of cholesterol, which is proportional to the volume of adipocytes. In older obese, it may represent more than 50% of total cholesterol. Biologically, an association between lipid levels and ovulation could be expected because of the role of cholesterol in the biosynthesis of steroids [3].

TABLE I
LIPID PROFILE IN OBESE INFERTILE PATIENTS AND CONTROL WOMEN
(MEAN \pm SEM)

Parameter	Control women (n = 20)	Obese women (n = 24)	P
CH (g/l)	1.57 \pm 0.03 ^a	2.49 \pm 0.07 ^b	<0.0001****
TG (g/l)	0.82 \pm 0.04 ^a	1.9 \pm 0.06 ^b	<0.0001****
HDL (g/l)	0.59 \pm 0.03 ^a	1.09 \pm 0.05 ^b	<0.0001****
LDL (g/l)	1.24 \pm 0.04 ^a	1.60 \pm 0.07 ^b	0.0017**

a, b: comparison between group means with a significance level ($P < 0.05$).

Illingworth et al. (1982) suggested that abnormalities in serum precursor of progesterone could affect the synthesis of progesterone and lead to a defect in the luteal phase [4] and Speroff et al. (1994) who reported that cholesterol is the main precursor of progesterone produced by the corpus luteum. Although the main source of cholesterol or LDL in the circulation, it has been shown that HDL and VLDL may also be effectively used as sources [5].

B. Triglycerides

Based on our findings, we observed a highly significant difference between the two groups of women whose rate of TG is higher in infertile obese women (1.9 ± 0.06 , $p < 0.0001$) compared with that of control fertile women (0.82 ± 0.04 , $p < 0.0001$).

Obesity is associated with insulin resistance and metabolic syndrome [6]. The National Cholesterol Education SM defined as the presence of at least three of the following five conditions: abdominal obesity (waist circumference 88cm), serum TG 150 mg / dL or more, HDL-C less than 50 mg / dL, blood pressure 130/85 mm / Hg or higher, and serum fasting glucose of 110 mg / dL or more.

The pattern of dyslipidemia found in the metabolic syndrome, which has triglycerides and low HDL cholesterol, has been reported in association with obesity in PCOS, but it was not found to differ from weight-matched control subjects. A large proportion of women with PCOS have several features of the metabolic syndrome, including obesity there and insulin resistance. In addition, the association between hyperinsulinemia and hyperandrogenism in PCOS is well organized [7].

C. HDL

Based on our findings, we observed a highly significant difference between the two groups of women whose HDL levels are higher in obese infertile women ($1.09 \pm 0.05\text{g} / \text{l}$, $P < 0.0001$) compared with that of fertile control women ($0.59 \pm 0.03\text{g} / \text{l}$, $P < 0.0001$).

The influence of abnormal lipoprotein metabolism in female infertility has not been thoroughly explored; despite the findings suggest a potential role for plasma lipoproteins,

especially HDL. In many species, including humans, the only lipoprotein detected in significant amounts in the follicular fluid surrounding the oocyte development in the ovary is HDL [8].

HDL can provide essential lipid nutrients to be cumulus cells or follicular oocytes for the synthesis of the membrane, the local steroid hormone production or other processes essential to the normal maturation of the oocyte. It could also play a role in the efflux of cholesterol from cells / oocyte cumulus; thereby, helping to maintain the balance of cellular cholesterol. Therefore, abnormal HDL metabolism affecting its structure, abundance or function could affect female fertility [9].

The main hormone secreted by the corpus luteum is progesterone. It comes from the transformation of blood LDL and HDL cholesterol. Lipoprotein receptors present on the luteal cell allow the entry of cholesterol into the cell. This is then converted to pregnenolone in mitochondria before being converted to progesterone by 3 β HSD cytoplasmic.

The mice with homozygous null mutations in the gene encoding the HDL receptor SR-BI (SR-BI KO) provide an opportunity to explore the potential role of abnormal lipoprotein metabolism in infertility [10]. Female, but not male, SR-BI KO mice are infertile, even if they have normal estrous cycles, ovulation and progesterone levels during pseudopregnancy. This infertility is due, at least in part, to the dysfunctional ovulation oocytes [11].

D. Transaminases

TGO and TGP

According to the result of our study we have observed a highly significant difference between the two women and population rates TGO and TGP are higher in obese infertile women (32.58 ± 0.79 IU / l, $p < 0.0001$) by the contribution woman fertile controls (16.05 ± 0.69 IU / l, $p < 0.0001$) for the TGO respectively (32.88 ± 0.93 IU / l, $p < 0.0001$), (17.75 ± 1.06 IU / l, $p < 0.0001$) for the TGP reveals the presence of liver disease in obese infertile women demonstrated with slightly elevated transaminases.

Clark et al. (2003) estimated at 4.6% of women in the United States have unexplained transaminase elevations thought to be secondary to NAFLD [12].

The clinical features of NASH, described for the first time by the pathologist Ludwig and colleagues in 1980 [13], is now one of the most common liver disease in the Western world, with an estimated prevalence approx. 3%. NASH is most readily found among people with obesity, hyperlipidemia and hyperglycemia, that is to say, under the so-called "metabolic syndrome". It is becoming increasingly evident that insulin resistance plays a central role as a pathogenetic factor in these patients.

CRP

The results of our study we have observed a significant difference between the two populations of women and CRP is elevated in obese infertile women (11.50 ± 1.77 mg / l, $p < 0.0001$) by providing fertile women witnesses (6.8 ± 0.80 mg / l, $p < 0.0001$).

An intrafollicular inflammatory process is present with increased CRP in obese patients. These alterations of the follicular environment most likely lead to changes in oocyte quality.

It has been shown by Naim Akhtar Khan, (2006) that the adipose tissue, except for the secretion of adipokines (leptin and adiponectin), also secrete proinflammatory cytokines, particularly TNF- α and IL-6 stimulates CRP secretion by adipocytes. However cholesterol, CRP decreases in response to weight reduction [14].

CRP values < 10 mg / L may indicate chronic inflammation in a large number of people and it can be especially if people with characteristics such as obesity and smoking, which are the most known risk factors of chronic inflammation. Some researchers have hypothesized that PCOS can also be a state of chronic low-grade inflammation [15]. There are data suggesting serum hs-CRP and adiponectin, an adipose tissue specific cytokine, can be modified in PCOS.

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IV. CONCLUSION

Serum levels of all biochemical parameters were measured namely the CH ($P < 0.0001$), TG ($P < 0.0001$), HDL ($P < 0.0001$), TGO ($P < 0.0001$), TGP ($P < 0.0001$), LDL ($p = 0.0017$) and CRP ($p = 0.02$) showed a significant increase in obese infertile patients compared with those of controls. The abnormally high levels of HDL in obese patients were among the factors responsible for infertility in women.

A positive and highly significant correlation between HDL and CRP ($r = 0.47$, $P = 0.02$) was found in obese women infertile. Serum LH showed a significant positive correlation ($r = 0.48$, $P = 0.02$) with age in the obese infertile group. A very highly significant positive correlation between leptin and FSH ($r = +0.78$, $P < 0.0001$), but not with LH ($r = 0.32$, $P = 0.13$) was found. A significant positive correlation was observed between the concentrations of LH and FSH in infertile obese women. The rate of prolactin is positively correlated with age in our patients and obese infertile this correlation is statistically significant ($r = 0.44$, $P = 0.03$).

According to our results, it is important to consider that our study was conducted in field conditions. C> is a preliminary study of 44 women, and for a period of 6 months.

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