International Journal of Medical, Medicine and Health Sciences
ISSN: 2517-9969
Vol:7, No:12, 2013

The Incidence of Metabolic Syndrome in Women with Impaired Reproductive Function According to Astana, Kazakhstan

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***Abstract*—**This work presents the results of a study the incidence of metabolic syndrome (MetS) in women with impaired reproductive function (IRF) according to the data of Astana, Kazakhstan. The anthropometric, biochemical and instrumental studies were conducted among 515 women, of which 53 patients with MetS according to IDF criteria, 2006, were selected. The frequency of occurrence of the IRF, due to MetS is 10.3% of cases according to the data of Astana. In women of childbearing age with IRF and the MetS, blood pressure (BP), indicators of carbohydrate and lipid metabolism were significantly higher and the level of high density lipoprotein (HDL) significantly lower compared to the same in women with the IRF without MetS. The hyperandrogenism, the hyperestrogenemia, the hyperprolactinemia and the hypoprogesteronemia were found in the patients with MetS and IRF, indicating the impact of MetS on the development of the polycystic ovary syndrome in 28% of cases and hyperplastic processes of the myometrium in 20% of cases.

***Keywords*—**Dyslipidemia, insulin resistance, metabolic syndrome, reproductive disorders, obesity.

I. Introduction

METABOLIC syndrome (MetS) as one of the most acute problems of modern therapy, is a cluster of metabolic and hormonal disorders, united by a common pathophysiological mechanism - insulin resistance (IR) [1]. The contribution of MetS in disturbance of the reproductive function is obvious and proven. It is a disturbance of ovarian function, early pregnancy loss, the formation of polycystic ovary syndrome (PCOS), i.e., endocrine infertility. The frequency of this disease is approximately 30-35% of the reproductive disorders and up to 70% of patients with recurrent endometrial hyperplasia; the rate of early pregnancy loss increases to 40-50% [2].

The purpose of our study was to determine the incidence of metabolic syndrome as the cause of reproductive disorders in women of childbearing age according tothe data of Astana, Kazakhstan.

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II. Materials and Methods

The studies were conducted on the base of Women's Consultation in PVCSCE "Perinatal Center № 1" in the department of family planning and reproduction. In this study we examined 515 women with IRF (violations of ovarian-menstrual cycle (VOMC) and primary and secondary infertility. As a result of screening 53 patients (10.3%) with MetS were selected to the main group. Patients with incomplete MetS were excluded. The comparison group included women with fertility disorders without the presence of MetS. Age group of studied patients ranged from 23 to 47 years.

The main group consisted of 53 people (women of reproductive age – 34.3±1.75 years) who were diagnosed with MetS in the presence of the following International Diabetes Federation (IDF) criteria, 2006 [3]:

1. General obesity – the body mass index (BMI)> 30 kg/m^2 [3], [4];
2. Abdominal obesity – the index of waist to hip ratio (WHR)> 0.85 [3], [4];
3. Dyslipidemia: triglycerides (THL) > 1.7mmol/l and high density lipoprotein(HDL)<1.29 mmol/l [3], [4];
4. Increased blood pressure (BP)– systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg [3], [4];
5. Increased glucose in fasting plasma ≥ 5.6mmol/l [3], [4];
6. IR – an index HOMA-IR> 2.77 [3], [4].
7. ELISA blood tests for hormones (analyzer «Stat Fax», USA, 2001), pelvic ultrasound (machine «Vivid 3", USA, 2004) were also carried out.

The comparison group included 51 women of reproductive age. The average age was 33.0±2.25 years. The criteria for inclusion in the comparison group were:

- Reproductive disorders (infertility primary / secondary, VOMC),
- The absence of overweight/obesity,
- WHR< 0.8,
- Normal levels of the blood pressure, carbohydrate and lipid metabolism.

Data analysis was performed using the program IBM SPSS Statistics 20. All data are presented as mean ± standard deviation.

III. Results and Discussion

We found the first-degree obesity in the main group (34.58±1.08 kg/m^2), in the comparison group the BMI was

normal (24.5±1.11 kg/m^2). Estimating visceral obesity on the basis of the WHR: high level was established in the main group – 0.87±0.01 and the normal range was found in the comparison group – 0.80±0.02.

In the main group hypertension was significantly established: systolic BP 160.23±3.65 and diastolic BP 91.46±1.75 mm Hg. In the control group these figures were normal: systolic BP 97.0±1.89 and diastolic BP 68.69±1.68 mm Hg.

Hyperglycemia was found in the main group – 6.41±0.33 mmol/l, and in the control group the blood glucose level was established in the normal range – 4.86±0.17 mmol/l.

Hyperinsulinemia (24.95±1.95 uU/l) and increasing the index HOMA-IR (7.26±0.83) have been registered in the main group as the presence of IR at these patients. Improving level of insulin (8.42±1.25 uU/l), abnormal HOMA-IR (2.01±0.05) are not determined for patients in the control group.

In conditions of insulin resistance and excess free fatty acids, lipid metabolism is disturbed and atherogenic dyslipidemia develops [5]. So biochemically in the main group high values of LDL cholesterol – 4.28±0.05 mmol/l, THL – 2.08±0.13 mmol/l, total cholesterol – 207.78±7.65 mg/dl and low levels of HDL cholesterol – 1.01±0.04 were determined. In these figures comparison group remained within normal limits: LDL - 2.59±0.13 mmol/l, THL – 1.36±0.06 mmol/l, total cholesterol - 171.72±7.95 mg/dl, HDL – 1.34±0.1mmol/l.

Thus, the presence of the MetS (five criteria according to IDF, 2006) in patients with IRF was confirmed in the main group [1].

In the analysis of the hormonal spectrum high index of luteinizing hormone /follicle-stimulating hormone (LH/FSH) – 2.01±0.14 was revealed in the main group, indicating a high risk of developing PCOS, which is confirmed by high values of DHEA-S – 4.02±0.25 ug/ml, conditional in this syndrome of hyperandrogenism (Fig. 1).

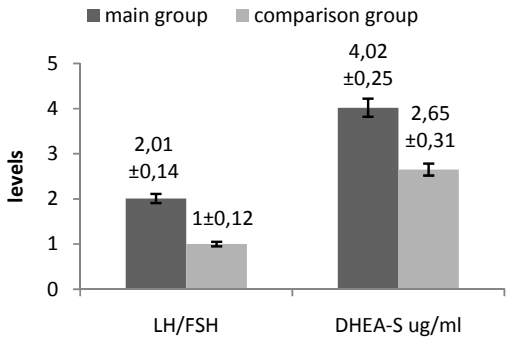

Fig. 1 Changes in LH/FSH and DHEA-S levels in women with MetS

Hyperprolactinemia in the main group – 754.03±39.24 mU/l, is a functional one at PCOS due to the weakening of dopaminergic influences. High rates of estradiol (158.33±37.68 pg/ml) were determined in the main group (Fig. 2), due to the additional synthesis in adipocytes of the adipose tissue estrogen, which is the risk of cancer (uterine fibroids, endometriosis, fibrocystic disease of the breast). As a result of ovarian dysfunction, hypoprogesteronemia – 5.97±1.92 nmol/l was observed in the main group that is shown in Fig. 3.

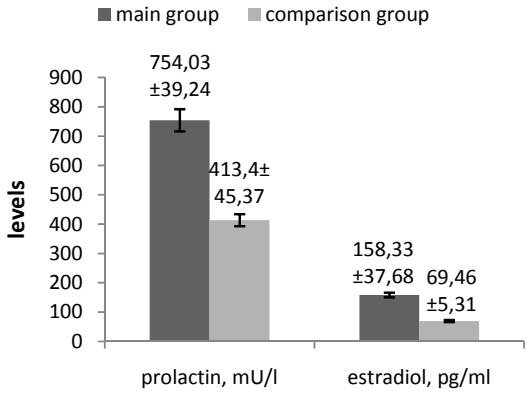

Fig. 2 Changes in prolactin and estradiol levels

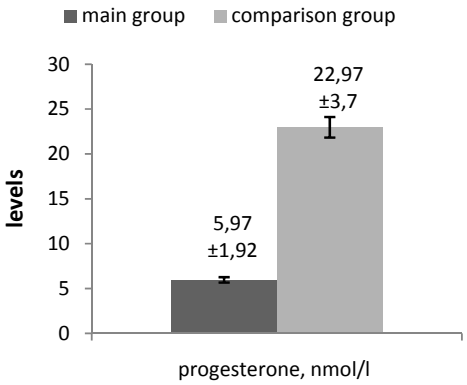

Fig. 3 Changes in progesterone levels

These indicators in the control group remained in the normal range: LH/FSH – 1.0±0.12, DHEA-S – 2.65±0.31 ug/ml, prolactin – 413.4±45.37 mU/l, estradiol – 69.46±5.31 pg/ml progesterone – 22.97±3.7 nmol/l ($p \leq 0.01$).

In the analysis of the ultrasound data of the pelvic organs and VOMC in the main group the prevalence of PCOS (28%), and cystic formation in the ovaries (12%) was revealed, characterized by hyperandrogenism, contributing to further follicular atresia, anovulation (due to high levels of estradiol and low - progesterone) and rhythm disturbances of the menstrual cycle - opsomenorrhea 47%, oligomenorrhea 10%, hypomenorrhea 4% and 7% of secondary amenorrhea. These changes in the comparison group were: PCOS (18%), cystic formation in the ovaries (15%), accompanied by the following VOMC – opsomenorrhea (10%), hypomenorrhea (8%), secondary amenorrhea in 16% of cases. As a consequence of hyperestrogenemia in the main group uterine cancer was found in 20% of cases, endometrial hyperplasia was observed in 2%, in contrast to the comparison group wherein

hysteromyoma was in 18% of cases [6]. Menstrual disorders in this condition due to hyperestrogenemia and hypoprogesteronemia were: in the main group polymenorrhea of 8%, 4% of dysfunctional uterine bleeding in contrast to the comparison group - 20% and 6%, respectively. Also on ultrasound data of the pelvic organs in the main group the presence of chronic adnexitis had established in 18% of cases, most often accompanied by algomenorrhea of 20%. In the comparison group chronic adnexitis was revealed in 35%, algomenorrheain40% of all cases. The absence of the pathology in the study of ultrasound data was found: in the main group in 20% of cases and in the comparison group - 14%.

Thus, these results indicate a predominant influence of MetS the formation of the IRF in women of childbearing age according to Astana, Kazakhstan.

IV. Conclusion

The results of the study are: the frequency of occurrence of the IRF due to MetS was 10.3% of cases according to Astana. The hormonal study showed hyperandrogenism, hyperestrogenemia, hyperprolactinemia and low levels of progesterone, which indicates the impact of MetS on the development of PCOS (28%), hyperplastic processes of the myometrium (in 20% of uterine fibroids), i.e. on the formation of endocrine infertility according to Astana, Kazakhstan.

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