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IMPACT OF BODY MASS INDEX (BMI) AND AGE ON THE OUTCOME OF THE IVF PROCESS

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A b s t r a c t: Background: The goal of this study was to examine the impact of body mass index (BMI) and age on the outcome of the IVF process. Materials and Methods: This was a retrospective case – control study, of all patients undergoing IVF from 2008–2010 in the Re-Medika IVF Centre. A total of 1238 fresh, non-donor IVF cycles were analyzed, but to minimize the bias, only the first cycle for each patient in that period was analysed (N-920). The patients underwent standard protocols for COH and embryology treatment. In all retrieved oocytes, or in 100% of the cases, the process of fertilization was realized with the method of intracytoplasmic sperm insemination (ICSI). The primary end-point assessed was clinical pregnancy rate. Patients were initially grouped into four BMI categories. The data are presented as frequencies (qualitative data) and as mean ± SD (quantitative data). Preliminary comparisons between groups with different BMI were made by the Chi-square and one-way ANOVA test. Because fertility declines with age, there is a Pearson-correlation coefficient to see if BMI depends on age, and the resulting value $r = 0.15$ ($p < 0.05$) showed that BMI is age-dependent, the relationship between them showed multicollinearity. However, the calculated error tolerance of 0.9 indicates stability of the model. Furthermore, to adjust the known fertility decline with age, every response or outcome is analysed by the method of multiple linear (continuous data) or logistic (qualitative data) regression, where the independent variables are taken: BMI, age and BMI interaction × age. Results: Increased BMI significantly reduces the chance of clinical pregnancy (normal weight vs. overweight: clinical pregnancy rate: 49.2%, vs. 34.3%). Age, analysed as a single factor, significantly reduces clinical pregnancy rate. Interaction of BMI and age significantly affects clinical pregnancy rate. (BMI vs. BMI × Age vs. Age – p 0,01 vs. 0,001 vs. < 0,0001). Conclusion: Increased body mass of patients entering IVF has a negative impact on the final outcome and certainly reduces the success of the process resulting in reduced

clinical pregnancy. Interaction of BMI and age showed a strong significant impact on the outcome of IVF seen through the achievement of clinical pregnancy.

Key words: body mass index (BMI), Controlled ovarian hyperstimulation (COH), in vitro fertilization (IVF), clinical pregnancy rate, age, obesity.

Introduction

The incidence of people with increased body mass is on the rise in the world population. The World Health Organization (WHO) issued the fact that 1.6 billion people worldwide are overweight and 400 million are obese. It is interesting that the percentage of obese people in developing countries has increased three times over the past twenty years [1]. The formula that is universally used in medicine for showing pathology in body mass of the human body is the body mass index (BMI, Quetelet index) [2]. Body mass index is defined as the quotient of the weight of the individual expressed in kilograms and height in metres squared kg / m2.The initiation and maintenance of reproductive functions are related to an optimal body weight in women. Underweight (BMI under 19 kg/m2), as well as overweight (BMI over 25 kg/m2) and obesity (BMI over 30 kg/m2) are associated with an increased risk of certain disorders. The most common are: menstrual cycle disorders, the occurrence of an anovulatory infertility and a pathological condition during pregnancy [3, 4]. This pathology is the result of multiple endocrine and metabolic disorders that disrupt the balance through several mechanisms, directly and indirectly. It has been proven that fat tissue affects the secretion of sex hormones and their bio-availability. Indirectly, obesity exerts its effect via leptin, insulin and adipokines [5, 6, 7, 8, 9, 10]. Clinical observation on the effect of body weight during IVF are interesting and controversial. Overall, most studies have shown that overweight and obesity have a negative impact on the success of IVF [11, 12, 13, 9, 14, 15], but there are studies that have not found negative impact [16, 17, 18, 19, 20, 21]. Obesity has been reported to affect Controled Ovarian Hyperstimulation (COH) in women undergoing treatment. Reported effects include prolonged COH, increased dose requirement of gonadothrophin, increased incidence of follicular asynchrony and increasing cancelled cycles [20, 22, 23, 24, 25]. All this leads to a smaller percentage of clinical pregnancies and a lower percentage of births [9, 11, 12, 13, 14, 15]. Additionally, obese women who conceive following IVF have been found to be at increased risk of an early pregnancy loss [9, 12]. It is an interesting conclusion of the study which compares the increased body mass and age of the patient and their influence on the outcome of IVF,

concluding that age has a stronger impact than body mass [26]. The objective of this study was to examine the effects of body mass on the outcome of IVF. The age of the patient as an established influencing factor on the final score was analysed as an independent variable and with BMI to determine if these two factors have an independent or interdependent effect on IVF. The basic hypothesis was that overweight has a negative impact on the outcome of *in vitro* fertilisation as seen by a decreased clinical pregnancy rate, but it has a strong dependence on the age of the patient.

Material and methods

This was a retrospective case – control study, of all patients undergoing IVF from 2008–2010 in the Remedika IVF Centre. A total of 1238 fresh, non-donor, IVF cycles with COH were analysed, but to minimize the bias, only the first cycle for each patient in that period was analysed. This produced the selected group of respondents that was analyzed and the number was 920 subjects. The parameters were obtained from the medical documentation of each patient. The information on height and weight obtained from each patient was the basis for calculating BMI, as the quotient of weight and height in metres squared. The study was approved by the ethics committee of the institution.

Treatment

The patients underwent COH by two standard protocols: mid-luteal and short protocol. Female patients began pituitary down-regulation with a gonadotroping releasing hormone agonist (GnRh- agonist – buserelin acetate, Suprefact ®, Aventis Pharma). The third day of the spontaneous or deprivationed bleeding patients started with injectible FSH recombinant gonadotropin, beta folitropin (Puregon ® NVOrganon), or urinary gonadotropins: human menopausal gonadotropin or urofolitropin (Merional ®, Fostimon ®, IBSA Institut Biochimigue) at a dose of 150 to 600 UI depending on the patient's age and number of preantral follicles. Further investigations of circulating levels of E2, LH and quantitative measurement of the size of follicles were defined by the response of the ovaries to applied therapy. Criteria for application of human chorion gonadotropin (hCG, Pregnyl ®) as a trigger of maturation of oocites were at least two follicles larger than 18 mm, mean diameter. hCG was used at a dose of 10,000 UI. Transvaginal ultrasound guided oocyte retrieval was performed 32–36 h

after hCG injection in a short intravenous anaesthesia. The seed material was gathered from the husband the same day. In cases where azoospermia was detected, the material for further processing was received from previously performed or on the same day TESE procedure (testicular biopsy and sperm extraction) at the male factor. In all oocytes obtained, or in 100% of the cases, the process of fertilization was realized with the method of intracytoplasmic sperm insemination (ICSI), (Olympus Corporation, Tokyo, Japan, Narishige Co., Ltd, Tokyo, Japan) without considering the quality of seed. After 18 hours the first analysis was performed on the fertilized oocite with detection of pronucleus. The properties of the embryos were scored for 72 hours of fertilization and transfer of embryos selected depending on the scale, age and history of the patient was performed on the third or fifth day of development of the embryos. Progesterone supplementation was given with (Utrogestan ®) to all patients. Pregnancy tests were completed the 14th day after ET. Two weeks after the positive test was conducted there was a vaginal ultrasound examination for detection of clinical pregnancy.

Analysis

The primary end-point assessed was the clinical pregnancy rate. The secondary end-points included number of oocytes, number of mature oocytes, fertilization rate, early pregnancies lost and delivery. Definitions of terms: pregnancy, biochemical pregnancy, clinical pregnancy, early pregnancy loss are defined by the revised terminology dictionary for terms of assisted reproduction prepared by the International Committee for Monitoring Assisted Reproduction Technologies (ICMART) and the World Health Organization (WHO) [27]. Patients were initially grouped into four BMI categories [26]. The data presented in the tables below the numbers 1, 2, 3 and 4 are presented as frequencies (qualitative data) and as mean ± SD (quantitative data). Preliminary comparisons between groups with different BMI were made by Chi-square and one-way ANOVA tests. Because fertility declines with age, there is a Pearson-correlation coefficient to see if BMI depends on age, and the resulting value $r = 0{,}15$ ($p < 0.05$) showed that BMI is age dependent, the relationship between them showed multicollinearity. However, the calculated error tolerance of 0.9 indicates stability of the model. Furthermore, to adjust the known fertility decline with age, every response or outcome is analysed by the method of multiple linear (continuous data) or logistic (qualitative data) regression, where the independent variables are taken: BMI, age and BMI interaction × age (Table 3a and 4a). Sta-

tistical analysis was made using the SPSS 13,0 programme for Windows. In all analysis, $p < 0.05$ is considered statistically significant.

Results

A total of 920 respondents was analysed, with an average age of 33.3 ± 5.4 years. The patients were initially grouped in four BMI categories: MBI < 18.5 = Underweight, MBI >18.5–24.9 = Normal weight, MBI > 25–29.9 = Overweight and MBI > 30 = Obese. Respondents in each BMI group were similar with respect to primary diagnosis, type of infertility, basal hormonal profile, and differed in terms of age and years of sterility (Table 1). Respondents in each BMI group did not differ significantly in terms of protocol, type of inducer, the average number of days of giving inducers or gonadotropin in the COH (Table 2). The average time in days of COH, and the average number of vials provided was significantly greater in obese subjects compared to those with normal body mass and low body mass (Table 2). Obese subjects had signifycantly lower average values of estradiol in the first check-up compared to control subjects with normal and low body mass (Table 2). Respondents in each BMI group did not differ significantly in terms of number of follicles with a size of 18 mm, but differed significantly in terms of number of follicles sized from 14 to 17 mm. The average insignificant thickness of the endometrial differs between subjects with different BMI (Table 2). The number of embryos transferred did not depend significantly on BMI, as well as the interaction of MBI with age (Table 3). Analysed as a single factor, BMI insignificantly influences the likelyhood of a positive test for pregnancy, biochemical pregnancy and early pregnancy loss, but increased BMI significantly reduces the chance of clinical pregnancy and delivery (Table 4). Age analysed as a single factor significantly reduces the number of embryos transferred, and reduces the chance of a positive test for pregnancy, clinical pregnancy and delivery, and significantly increases the risk of early pregnancy loss, while it is a non-significant factor for biochemical pregnancy. Interaction of BMI and age significantly affect the positive test of pregnancy, the risk of early pregnancy loss and childbirth (Tables 4 and 4a), and significantly affects clinical pregnancy rate. (Fig 1).

Table 1

Baseline characteristic of women at the First IVF Fertilization Cycle Stratified by BMI

Variable	**BMI (body mass index) kg/m2**			
	< 18.5 Underweight	> 18.5 – 24.9 Normal	> 25–29.9 Overweight	> 30 Obese
Number of patient %	33(3.6%)	533(57.9%)	255(27,7%)	99(10.8%)
BMI ± SD	18.1 ± 0.8	22.4 ± 1.5	26.9 ± 1.4	33.7 ± 3.9
Age ± SD	32.4 ± 4.8	33.1 ± 5.4	34.3 ± 5.4	35.1 ± 5.6
Analysis of Variance p < 0.05				
Primary diagnosis n (%)				
Tubal factors	3 (9.1%)	92(17.3%)	50(19.6%)	17(17.2%)
Endometriosis		11(2.1%)	5(2.0%)	1(1.0%)
Male factor	13(39.4%)	202(37.9%)	86(33.7%)	46(46.5%)
Ovulation disorders PCO	0 (0%)	16(3.0%)	12(4.7%)	6(6.1%)
Ovarian hypofunction	0 (0%)	15(2.8%)	11(4.3%)	1(1.0%)
Unexplained	12(36.4%)	142(26.6%)	56(22.0%)	15(15.1%)
Male and female	5(15.1%)	55(10.3%)	35(13.7%)	13(13.1%)
Chi-square p > 0.05				
Type of infertility				
primary	27(81.8%)	463(86.9%)	207(81.2%)	79(79.8%)
secondary	6(18.2%)	70(13.1%)	48(18.8%)	20(20.2%)
Chi-square p>0.05				
Hormonal basal profile – 3 th day gonadothropins level cycles before KOS				
E2	40.7 ± 24.1	41.5 ± 30.5	40.7 ± 30.2	39.9 ± 25.0
FSH	8.3 ± 2.8	7.9 ± 3.3	7.6 ± 3.0	7.6 ± 3.5
LH	6.4 ± 4.9	6.1 ± 4.5	5.6 ± 2.9	5.1 ± 3.0
Analysis of Variance p > 0.05				
Ultrasound - Number of preantral follicles				
Until 5 foll.	7(21.2%)	116(21.8%)	68(26.7%)	35(35.3%)
5 – 10 foll.	25(75.8%)	392(73.5%)	170(66.7%)	56(56(6%)
> 10 foll.	1(3.0%)	25(4.7%)	17(6.6%)	8(8.1%)
Chi-square p > 0.05				
years of infertility	5.7 ± 3.2	6.5 ± 4.1	7.7 ± 4.8	7.8 ± 5.3
Analysis of Variance p < 0.05				

Table 2

Comparison of Controlled Ovarian Hyperstimulation Treatment Outcomes Measures Based on BMI

	BMI (body mass index)				**p-value**
	< 18.5 Underweight	> 18.5–24.9 Normal	> 25–29.9 Overweight	> 30 Obese	
Protocol COH					
Long lutheal	32(96.9%)	504(94.6%)	241(94.5%)	89(89.9%)	NS*
Short	1(3.1%)	29(5.4%)	14(5.5%)	10(10.1%)	
gonadothropin COH					
rFSH	22(66.7%)	286(53.7%)	135(52.9%)	49(49.5%)	NS*
µHMG	11(33.3%)	247(46.3%)	120(47.1%)	50(50.5%)	
Duration of COH (days)	10.0 ± 1.9	10.1 ± 1.9	10.2 ± 1.9	10.7 ± 2.5	0.039**
Number of ampoules	30.9 ± 11.6	32.1 ± 11.5	34.3 ± 10.5	37.3 ± 11.7	< 0.0001**
E2 - 6 st day COH	370.8 ± 376.6	300.9 ± 285.9	282.7 ± 273.9	212.5 ± 202.1	0.012***
E2 – day of HCG	1733.3 ± 1045	1452.8 ± 867	1383.3 ± 889	1096.1 ± 648.9	0.0002***
Number of follicles >18mm	rang 1–20 median = 5	rang 1–28 mediana –5	rang 1–25 median = 5	rang 1–24 median = 5	NS**
Number of foll14-17mm	rang 1–25 median = 5	rang 1–29 median = 5	rang 1–20 median = 4	rang 1–25 median = 3	0.0002**
Endometrial(kvant)	9.89 ± 1.7	9.92 ± 2.0	9.78 ± 1.8	9.67 ± 1.8	NS**

• Chi-square; ** Analysis of Variance ; *** Kruskal-Wallis

Table 3

Comparison of In Vitro Fertilization Treatment Outcomes Measures Based on BMI – embryology part

Variable	**BMI (body mass index)**			
	< 18.5 Underweight	> 18.5–24.9 Normal	> 25–29.9 Overweight	> 30 Obese
Embryo transfer				
With ET	30(90.9%)	500(93.8%)	239(93.7%)	87(87.9%)
Cancelled	2(6.1%)	13(2.4%)	12(4.7%)	5(5.0%)
Without ET	1(3.0%)	20(3.8%)	4(1.6%)	7(7.1%)
Retrieved oocites	13.0 ± 9.6	10.7 ± 6.8	9.9 ± 6.5	7.7 ± 5.3
Mature oocites	10.7 ± 8.5	8.8 ± 5.7	8.3 ± 5.7	6.3 ± 4.2
Fertilized oocytes	8.2 ± 6.2	6.5 ± 4.4	6.0 ± 4.1	4.6 ± 3.0
Fertilization rate	81.0 ± 18.6	76.7 ± 19.7	76.3 ± 20.1	79..0 ± 19.9
Top quality transferred embryos	2.0 ± 1.1	2.1 ± 1.0	2.0 ± 0.9	2.0 ± 1.1

Table 3a

Multiple regression of different variables – BMI, Age and BMI x Age on embryology outcomes

Variable	**P by Multiple regression**			
	Type of Multiple regression	BMI	BMI × Age	Age
Without ET	logistic	NS	NS	0.001
Retrieved oocites	linear	< 0.000	< 0.000	< 0.0001
Mature oocites	linear	0.01	0.001	< 0.0001
Fertilized oocytes	linear	0.001	0.001	< 0.0001
Fertilization rate	linear	NS	NS	< 0.0001
Top quality transferred embryos	linear	NS	NS	< 0.0001

Table 4

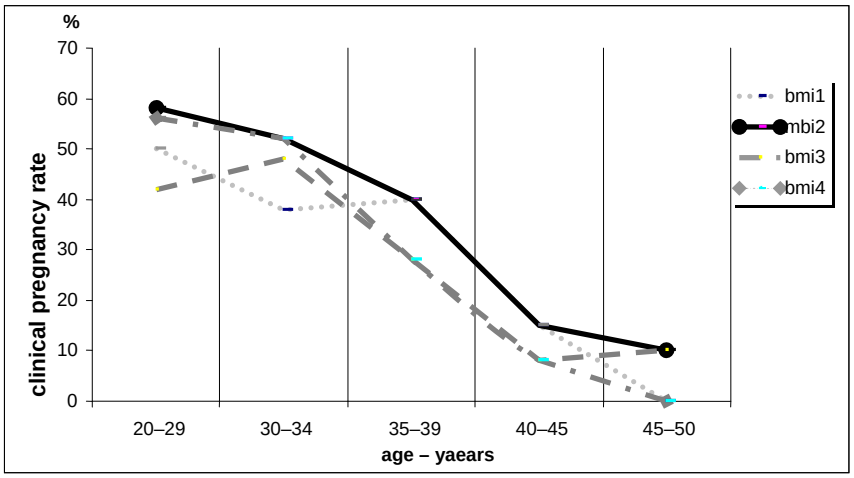
Comparison of Controlled Ovarian Hiperstimulation Treatment Outcomes Measures Based on BMI – Clinical outcomes

Variable	**BMI (body mass index)**			
	< 18.5 Underweight	> 18.5–24.9 Normal	> 25–29.9 Overweight	> 30 Obese
No.of embryos transferred	2.3 ± 0.8	2.5 ± 0.7	2.4 ± 0.7	2.3 ± 0.9
pregnancy – positive HCG	13(43.3%)	271(54.2%)	102(42.7%)	39(44.8%)
Clinical pregnancy	12(40%)	246(49.2%)	82(34.3%)	34(39.1%)
Biochemical pregnancy	1(3.3%)	25(5%)	20(8.4%)	5(5.75%)
Early pregnancy loss	0	36(7.2%)	12(5.0%)	5(5.7%)
Delivery	12(40%)	212(42.4%)	70(29.3%)	29(33.3%)

Table 4a

Multiple regression of different variables – BMI, Age and BMI x Age on clinical outcomes

Variable	**P by Multiple regression**			
	Type of Multiple regression	BMI	BMI×Age	Age
No.of embryos transferred	linear	NS	NS	< 0.0001
pregnancy – positive HCG	logistic	NS	0.046	< 0.0001
Clinical pregnancy	logistic	0.01	0.001	< 0.0001
Biochemical pregnancy	logistic	NS	NS	NS
Early pregnancy loss	logistic	NS	0.01	< 0.0001
Delivery	logistic	0.04	0.006	< 0.0001



BMI 1 – underweight, BMI 2 – normal weight, MBI 3 – overweight, MBI 4 – obese

Fig. 1 – The effect of Age and BMI on clinical pregnancy rate

Discussion

Success in IVF depends directly on the optimization of the controlled ovarian hyperstimulation. The end result is to obtain oocytes and embryos of excellent quality. On the other hand, we must not neglect, nor it is necessary to minimize the medical complications of the process. Three main factors affect the process of induction of ovulation. These are: patient age, ovarian reserve and the endocrine status of the patient. Overweight and obesity through certain pathological mechanisms affect the endocrine status of the patient, follicular synchrony and response to COH, resulting in a reduced chance of clinical pregnancy. The study shows the negative impact of overweight and obesity on the outcome of COH and the success of IVF. Interaction of BMI and age showed a strongly significant impact on the outcome of IVF seen through the achievement of clinical pregnancy and delivery. The reduced response to COH in terms of weight gain that we detected is noted in other studies. This disorder is seen in the increased dose requirement of gonadotrophin, prolonged ovarian stimulation, and decreased serum estradiol concentrations [9, 17, 20, 22, 23, 24, 25]. One of the factors may be responsible for increased dose requirement in obese women; obesity has been associated with a relative gonadotrophin resistance [28, 29, 31]. The pathological mechanism goes through elevated intrafollicular leptin concentrations that are associated with relative resistance to the applied

gonadotrophins through a postulated inhibitory effect upon stimulated synthesis by granulosa cells [32, 33, 34]. On the other hand, high doses of gonadotropins that are applied to compensate this relative gonadotrophin resistance induced by obesity, may have a detrimental impact on the quality of an egg, embryonic development and implantation capacity, and of course affect the uterine recaptivity system. The result is a low pregnancy rate and higher early pregnancy loss rate [28]**.** The results show that increasing BMI significantly reduces the number of oocytes, mature oocytes and fertilized oocites. After taking into account the age, increased BMI still significantly affects the number of oocytes, mature and fertilizirated oocytes (Tables 3 and 3a). This confirms the findings of the possibility of obesity being an independent factor in the disorder of maturation of the oocytes which is found in several studies [17, 21, 25]. Disruption of the maturity of oocites or a decrease in the number of mature oocytes is the result of lower values of intrafolicular human horion gonadrophin which is found in some studies. It has been suggested that a reduction in delivery of hCG to the follicles may be related to the impaired oocite maturation (metaphase II oocites) seen in obese women [35]**,** but another recent large retrospective study has not found a decreased number or reduced oocyte quality and maturation. [36]. The fertilization rate is also of concern to some studies which concluded that overweight and obesity reduces fertilization rate [20, 37]. In our study, elevated body mass had no influence on the fertilization rate, several other studies have come to the same conclusion [9, 15, 17, 21, 25, 36]. Analysed as a single factor, increased BMI significantly reduces the chance of clinical pregnancy and delivery. Age analysed as a single stronger factor significantly reduces the chance of clinical pregnancy and delivery, and significantly increases the risk of early pregnancy loss. Interaction of MBI and age significantly affects clinical pregnancy, and the risk of early pregnancy loss. The results of this study confirmed the findings of some studies about the negative impact of the rise in overweight and obesity on clinical pregnancy rate compared with those with normal body mass [9, 11, 12, 14, 26]. But some studies have not found a negative impact on the pregnancy rate in overweight and obese women [16, 17, 18, 19, 20, 21], some of them even found a smaller number oocytes in the overweight but not reduced clinical pregnancy [17, 19, 20]. In contrast, some studies found an increased number of follicles on ultrasound during COH, an increased number of oocytes, a smaller number of vials of inducers and a smaller number of days of COH [18]. Some authors suggested that obese women who conceive following IVF have been found to be at increased risk of early pregnancy loss associated with the reduction in the oocyte quality, which in turn brings the potential of the worse for his embryo implantation and development [38], others talk about obesity and its impact on endocrine and biochemical processes, reduction of endometrial receptivity, disrupted and disturbed growth of the early embryo [39]. In our study, analysed as a single factor BMI insignificantly influ-

enced the result of early pregnancy loss, but the interaction of BMI and age significantly increased the risk of early pregnancy loss. The latter is confirmed by several studies [9, 12]. But there are also quite the opposite, finding that increased weight does not affect the early pregnancy [20, 26, 40, 41, 42]. Modifications of lifestyle which include a minimum intake of calories and exercises that should produce a negative energy balance bring some improvement in reproductive function [43, 44]. Bariatric surgery is used to treat morbid obesity that has been unable to achieve adequate weight loss through diet, And is proven make to some positive changes such as stabilizing the menstrual cycle [45].

Conclusion

This study attempted to answer the question of whether body weight, especially overweight, affects the outcome of IVF. The fact that the total numbers of IVF procedures are realized in one laboratory with a small compact team, with the same protocols on specific points of the process, all fertilized oocytes were by ICSI, makes this study free from some impact of a certain group of respondents. With this, the impact of body mass and age of the result of IVF is certainly better perceived. Increased body mass of patients entering IVF has a negative impact on the final outcome and certainly reduces the success of the process resulting in reduced clinical pregnancy. Interaction of BMI and age showed a strongly significant impact on the outcome of IVF seen through the achievement of clinical pregnancy and delivery. Reduction of body mass at a younger age brings some progress mainly through the mechanism of improvement of endocrine function and certainly a better response to COH. With older patients with an increased BMI it was necessary to look for an adequate solution that leads to successful IVF.

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Резиме

ВЛИЈАНИЕТО НА ИНДЕКСОТ НА ТЕЛЕСНАТА МАСА (BMI) И ВОЗРАСТА НА ИСХОДОТ ОД ВОНТЕЛЕСНОТО ОПЛОДУВАЊЕ

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Целта на оваа студија беше да го испита влијанието на индексот на телесната маса (BMI) и возраста врз исходот од процесот на ин витро фертилизација, односно вонтелесно оплодување.

Методи: Ретроспективна case control студија, кај пациентки кои реализираа ин витро фертилизација во Центарот за вонтелесно оплодување кој е дел од Првата приватна општа болница – Ре-Медика, во период од 2008 до 2010 година. Вкупниот број на пациенти кои реализираа ин витро фертилизација во наведениот период беше 1.238 пациентки. Заради избегнување на влијание на повторување на податоци во поглед на основните параметри на пациентите во студијата влегоа пациенти кои во тој период направиле само еден, и тоа само првиот обид за ин витро фертилизација во нашата установа во горенаведениот период. Со таа селекција се дојде до групата на испитаници која беше анализирана а чиј број изнесуваше 920 испитаници. Кај сите беше реализирана контролирана оваријална хиперстимулација и вонтелесно (ин витро) оплодување. Вонтелесното оплодување кај сите пациенти беше направено со методот на интерцитоплазматска инсеминација на еден сперматозоид (ICSI). Примарен заклучок за успехот од ин витро фертилизацијата беше клиничката бременост. Пациентите се иницијално групирани во четири MBI категории. Податоците се прикажани како фреквенции (квалитативни податоци), и како mean ± SD (квантитативни податоци). Прелиминарните компарации меѓу групите со различен BMI се направени со Chi-square и one-way ANOVA тестот. Бидејќи плодноста опаѓа со возраста, направена е корелација со Pearson-овиот коефициент за да се види дали BMI зависи од возраста, и од добиената вредност $r = 0,15$ ($p < 0,05$). Се покажа дека BMI зависи од возраста, односно меѓу нив постои мултиколинеарност. Но, сепак, пресметаните грешки на толерантност од 0,9 покажуваат стабилност на моделот.

Понатаму, за да се прилагоди познатиот пад на плодноста со возраста, секој одговор или исход е анализиран со методот на Мултипла линеарна (континуирани податоци) или логистичка (квалитативни податоци) регресија, во кои како независни варијабли се земаат BMI, возраста и интеракцијата BMI × возраст. Зголемениот BMI значително ја намалува шансата за клиничка бременост. Стапката на клиничката бременост кај пациентките со нормална телесна маса изнесуваше 49,2%, за разлика кај оние со покачена телесна маса каде што беше 34,3%.

Возраста анализирана како единечен фактор сигнификантно ја намалува стапката на клиничка бременост. Интеракцијата на BMI и возраста сигнификантно влијае на стапката на клиничка бременост (BMI vs BMI × Age vs Age – p 0,01 vs. 0,001 vs. < 0,0001).

Заклучок: Студијата го покажува негативното влијание од зголемената телесна маса и од здебелеността врз исходот од контролираната оваријална хиперстимулација и успехот од вонтелесното оплодување гледано преку намалената стапка на клиничка бременост. `

Интеракцијата на BMI и возраста покажа силно сигнификантно влијание на исходот од вонтелесното оплодување, гледана преку постигнување на клиничката бременост и породувањето.

Клучни зборови: индекс на телесна маса, контролирана оваријална хиперстимулација, вонтелесно оплодување, стапка на клиничка бременост, возраст, обезитет.

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