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DIAGNOSED HEALTH PROBLEMS, PERCEIVED HEALTH AND ATTACHMENT TO THE FETUS IN PREGNANT WOMEN AFTER NATURAL VS. ASSISTED CONCEPTION

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Aim. The study is aimed to explore health and attachment to fetus in pregnant women with natural conception (NC) vs. in-vitro fertilization (IVF). **Hypotheses.** (1) There are average differences in diagnosed health problems between women with IVF pregnancy and women with NC pregnancy; (2) There are average differences in perceived health between women with IVF pregnancy and women with NC pregnancy; (3) There is a moderate association between diagnosed health problems and perceived health; (4) Women with IVF pregnancy on average report greater attachment to fetus than women with NC pregnancy; (5) Diagnosed health problems are negatively related to attachment to the fetus; and this link is partially mediated by perceived health. **Methods.** The study was a part of an ongoing prospective longitudinal project in Russia, with the sample including 244 women with NC and 105 women with IVF pregnancy. Data were collected from medical records and questionnaires completed during the first and third trimesters of pregnancy. The measures included perceived health; a detailed measure of reproductive and general health; and a comprehensive measure of attachment to the fetus. Pregnant women completed the questionnaires during the first and third trimesters of pregnancy. In total, 46 questions were related to different health problems. In addition, medical information was obtained from antenatal records stored in the databases of partner clinics. On the bases of combined questionnaire and medical records data, 2 general health indexes were created: Reproductive Health Index (RHI – a measure of reproductive health), Physical Health Index (PHI – a measure of physical health, excluding reproductive). Statistical data analysis was performed with IBM SPSS Statistics 22 software package (descriptive statistics, Chi square test, Mann-Whitney U test, Spearman nonparametric correlation criterion, multiple regression analysis). Data were checked for normal distribution using Kolmogorov-Smirnov criterion. **Conclusion.** Despite the poorer state of health in terms of reproductive and some somatic indicators, the self-rated health of women with induced pregnancy was not worse than perceived health of women whose pregnancy occurred naturally. Attachment to the fetus was slightly greater for women in the IVF group than in the NC group. Diagnosed and perceived heath was not significantly related to attachment to the fetus.

Keywords: health; perceived health; reproductive health; general health; health indicator; in vitro fertilization; pregnancy; attachment to fetus.

Introduction

Mothers' attachment to the fetus is an important element of maternal behavior during pregnancy which is associated with long term child outcomes [1, 2] and includes behaviors and actions that indicate an emotional connection between the mother and the fetus [3]. Attachment in pregnancy affects proper nutrition, sleep and exercise, abstinence from alcohol and drugs [3, 4]. Moreover, attachment is related to the desire to communicate with the fetus during pregnancy; and development of responsiveness and sensitivity necessary for further motherhood [3].

Previous research suggested that formation of attachment to the fetus is influenced by many factors, including level of education [5]; relationships with own parents [6]; marital status [5]; relationship with spouse during pregnancy [7]; social support in general [8]; personality characteristics [9]; the woman's age [10]; gestational age [11]; number of children in the family [3].

Beyond these social and psychological factors, physical health can be important for attachment and long term child outcomes. Indeed, a wealth of research demonstrated that mother's general health during pregnancy is associated with child development outcomes [12]; with health problems associated with delayed or reduced attachment to the fetus [13].

One important aspect of mothers' health is reproductive health – a complex interplay of factors impacted by and impacting overall health. For example, some infertility results from reproductive disorders (endometriosis, adenomyosis, polycystic ovary syndrome and uterine fibroids) [14]. About 5–10% of infertile women may have genetic abnormalities (chromosome aberrations, single or multiple gene mutations) [15]; in other cases infertility may be explained by exposure to environmental factors, as well as gene-environment interplay [16]. Different mechanisms of infertility development have been described, including endocrine disruptions and hormonal imbalances [14]. Women with infertility or infertility-associated diagnoses may be predisposed to develop other somatic health problems, such as breast cancer, ovarian cancer, endometrial cancer, cardiovascular disease, and metabolic dysfunction [17].

Beyond objectively measured health, perceived health can also play a role in pregnancy and child outcomes. Perceived health is a dynamic representation of overall health that includes the person's knowledge of past medical problems, current problems, and health changes over time [18]. Perceived health may also reflect mental health, personality and other personal characteristics, whereby people with similar objective health parameters may perceive and rate themselves as more or less healthy. Research has suggested that effects of physical health on the course of pregnancy and child outcomes may be partly mediated by mothers' perceptions of their general health (perceived health) [19].

A number of studies demonstrated a positive link between perceived health and objective indicators of health [20]. For example, four studies examined perceive and physical health of mothers during pregnancy and after childbirth [21–24]. Mothers were asked, "How do you generally assess your health?" The choices

were excellent, very good, good, fair, or poor. During pregnancy [22] and after childbirth at 2–4 weeks postpartum [23], at 1 year after childbirth [21]; at one day postpartum, one week postpartum, one month postpartum [24] poor perceived health was associated with such factors as hypertension, infections and anemia, bleeding during the pregnancy and after childbirth, giving birth by caesarean section [23]. In another study, low perceived health was also a predictor of preterm delivery and low birth weight [25]. However, as health variables were not controlled, it is not possible to disentangle the effects of health and perceived health.

A number of studies found that women experience a decrease in their perceived health during pregnancy and in the first year after childbirth [21]. The decrease in perceived health can be long-term, observed throughout the entire period of early childhood of their offspring [22].

One approach to the study of the links between health, perceived health and attachment to the fetus is to examine potential group differences between women with natural pregnancy vs. pregnancy resulting from assisted reproductive technologies (ART). The use of ART, including IVF (in-vitro fertilization), has enabled many women to overcome their reproductive problems and give birth. A growing body of research suggests that there are some average differences between these women and naturally conceiving (NC) women. For example, IVF pregnancy can be complicated and associated with different problems (a history of abortion, miscarriage, etc.) [26]. In addition, women undergoing ART treatment are on average older at the time of first pregnancy than women with natural conception. One study found that most women using ART were in their mid-30s and had higher incidence of previous comorbidities that are associated with age (gestational diabetes, prior c-section, chronic hypertension and obesity), compared to the reference group of women < 30 years [27]. Moreover, studies found that maternal age was an independent risk factor for gestational diabetes and early-onset preeclampsia [28]. One review indicated that maternal age of 40–45 years increased rates of pre-existing hypertension and pregnancy complications, such as gestational diabetes, gestational hypertension, pre-eclampsia and caesarian section [29].

The aim of the current study is to investigate potential differences in health, perceived health and attachment between women with IVF pregnancy and natural conception pregnancy. Several studies investigated attachment to the fetus in future mothers with IVF pregnancies vs. natural conception pregnancies, with mixed results [30]. Some studies found similar levels of prenatal attachment in these groups [31]; whereas other research suggested higher level of attachment in IVF group of mothers [32]. The strength of the current study is inclusion of a measure of perceived health, a detailed measure of general health (reproductive and other physical), as well as a comprehensive measure of attachment to the fetus, as part of an ongoing prospective longitudinal project. The current study tested four hypotheses:

(1) There are average differences in *diagnosed health problems* between women with IVF pregnancy and women with natural conception;

(2) There are average differences in *perceived health* between women with IVF pregnancy and women with natural conception;

(3) There is a moderate association between diagnosed health problems and perceived health;

(4) Women with IVF pregnancy on average report slightly greater attachment to fetus than women with NC pregnancy;

(5) Diagnosed health problems are negatively related to attachment to the fetus; and this link is partially mediated by perceived health.

Methods

Participants

The sample included 244 women with natural conception (NC) (mean age 29 ± 4.22 years) and 105 women with IVF pregnancy (IVF) (mean age 33 ± 4.81 years). The mean age of two groups had statistically significant differences ($U = 14569{,}00$ at $p = 0.00$). All respondents are participants of the "Prospective Longitudinal Interdisciplinary Study - PLIS", conducted in Russia. Data collection was carried out in 4 obstetrics, gynecology and perinatology human reproduction centers/clinics.

Ethics

The study received approval from the Interdisciplinary Ethics Committee, Tomsk State University (date of approval 15 April 2015). Participants provided written informed consent for participation and for access to their medical records.

Methods

General Health Problems. Health problems were assessed with the questionnaire «Waiting for Motherhood» based on the Cardiff study of child development [33], adapted for the Russian study. Pregnant women filled out the questionnaires during the first and third trimesters of pregnancy. In total, 46 questions related to different health problems. In addition, medical information was also obtained from antenatal records stored in the databases of partner clinics. On the bases of combined questionnaire and medical records data, 2 general health indexes were created:

(1) Reproductive Health Index (RHI) (0-16 points) is a measure of reproductive health, with maximum health score of 16 (absence of any reproductive health problems). One point is deducted for each reported pathological condition of reproductive health before pregnancy and in the third trimester of the current pregnancy (see Table 1).

(2) Physical Health Index (PHI) (0-30) is a measure of physical health (excluding reproductive), with maximum health score of 30. One point is deducted for each disorder or somatic condition before pregnancy and in the third trimester of the current pregnancy (see Table 2).

Perceived Health. Perceived health (PH) was assessed using the following question: "How can you describe your general health during pregnancy so far?". The answers were given on a 4-point scale, where 1 point corresponded to poor health, 2 points – to satisfactory, 3 points – to good, and 4 points – to excellent

health level [34]. The women completed this question in the third trimester of pregnancy.

Attitude to the fetus. Attitude to the fetus was measured with the Maternal-Fetal Attachment Scale [35]. The questionnaire consists of 24 items, with five possible answers ranging from 1 to 5 points, with 1 ("Always no") to 5 ("Always yes"). The scale is divided into five subscales: Interaction with fetus (INTR) (items 1, 7, 17, 20, 24); Giving of self (GIVE) (items 2, 11, 15, 22 (reverse), 23); Differentiation of self from the fetus (DIFF) (items 3, 5, 10, 13); Role-taking (RLTK) (items 4, 8, 18, 19); Attributing characteristics to fetus (ATTC) (items 6, 9, 12, 14, 16 and 21). The Total scale score of attachment to the fetus is calculated as a sum of all subscales, with 120 points indicating strong attachment to the fetus and 24 points indicating a delay in the formation of attachment [36]. Higher scores mean a better bond between mother and fetus. In our study, the Total scale score was taken as attachment to the fetus index (AFI) for calculating the relationship between health indexes.

Statistical data analysis was performed with IBM SPSS Statistics 22 software package (descriptive statistics, Chi square test, Mann-Whitney U test, Spearman nonparametric correlation criterion, multiple regression analysis). Data were checked for normal distribution using Kolmogorov-Smirnov criterion.

Results

Differences in reproductive health. All reproductive health problems and complications assessed in the current study were reported by women in both groups. The exception was 4 or more births, which was not reported by any of the participants. Table 1 presents frequencies of reproductive health problems and complications, as well as results of Chi square tests of differences between NC and IVF groups. There were significant group differences: eleven (R1, R3, R5, R7, R9-14, R16) reproductive health issues were more common in the IVF pregnancy group; and 1 (R2) was more prevalent in the NC group. Six of the differences were significant after correction for multiple testing.

Table 1

Descriptive statistics of reproductive health for NC and IVF women

Parameters	Frequency		χ^2	p
	IVF	NC		
1. Ectopic pregnancy (R1)	21.4	1.4	39.28	.000***
2. Medical abortion (R2)	17.3	28.8	4.92	.017
3. Spontaneous abortion (miscarriage) (R3)	26.7	9.6	17.35	.000***
4. Stillbirth (R4)	1.8	.6	1.62	.339
5. Infertility (R5)	91.4	5.7	249.78	.000***
6. Number of births 4 or more (R6)	–	–	–	–
7. Uterine abnormalities (R7)	1.85	0	4.54	.033
8. Diseases of the cervix (R8)	1.4	1.2	1.34	.247
9. Chronic hypoxia (fetoplacental insufficiency, blood flow disorders in dopplerometry) (R9)	18.3	8.7	7.02	.008
10. Threat of spontaneous miscarriage in the 1st trimester (R10)	43.3	29.4	6.78	.007

The end of the table 1

Parameters	Frequency		χ^2	p
	IVF	NC		
11. Threat of spontaneous miscarriage in the 2nd trimester (R11)	37.5	23.3	7.92	.004
12. Threat of spontaneous miscarriage in the 3rd trimester (R12)	36.7	15.2	2.96	.000***
13. Gestosis (R13)	15.1	2.6	19.19	.000***
14. Bleeding (R14)	6.9	3.6	1.35	.025
15. Oligoamnios (R15)	2.3	2.6	.00	.843
16. Premature rupture of membrane membranes (R16)	2.3	4.9	2.49	.000***

Note. ***Significant after correction for multiple testing: .05/16 = .003.

The Reproductive Health Index (see Table 1) in the group of women with induced pregnancy was significantly higher (U = 8699.00 at p = 0.00) than in the group of women with NC (Table 1).

Differences in physical health. Table 2 presents frequencies of physical health disorders and complications, as well as results of Chi square tests of differences. Seven (P18, P20, P23, P28, P31, P32, P34, P46) physical health problems were more common in the IVF group; although only one difference was significant after correction for multiple comparisons.

Table 2

Descriptive statistics of physical health for NC and IVF women

Parameters	Frequency		χ^2	P
	NC	IVF		
1. Musculoskeletal and connective tissue diseases (P1)	59.4	5.02	1.12	.290
2. Respiratory diseases (P2)	51.6	58	3.49	.042
3. Diseases of the genitourinary system (P3)	44.6	33.4	3.69	.055
4. Diseases of the eye and adnexa (P4)	37.4	48	4.61	.032
5. Diseases of the ear and mastoid process (P5)	1.9	1.2	.03	.855
6. Digestive diseases (P6)	33.5	38	1.25	.263
7. Endocrine and metabolic diseases (P7)	28.4	5.06	5.67	.003
8. Circulatory system diseases (P8)	27.1	24.7	.92	.337
9. Nervous system diseases (P9)	21.9	16	3.48	.062
10. Diseases of the skin and subcutaneous tissue (P10)	11	11.1	.00	.966
11. Body mass index (P11)	2.1	18.3	.23	.364
12. Gestational diabetes (P12)	6.2	9.5	5.18	.023
13. Arterial hypertension (P13)	22	18	.73	.393
14. Low blood pressure (arterial hypotension) (P14)	23.2	28.8	1.27	.260
15. Anemia (P15)	51.1	61.5	3.48	.042
16. Thyroid disease (P16)	13.9	31.9	16.04	.000***
17. Hemorrhoids(P17)	19.9	21.6	.14	.713
18. Severe constipation (P18)	12.8	23.5	4.07	.043
19. Pain in the stomach (P19)	22	14.4	2.77	.096
20. Thigh pain (P20)	34.4	33.3	.04*	.839
21. Pelvic pain (P21)	51	45	1.09	.296
22. Back pain (P22)	34.4	41.1	3.05	.081
23. Swelling of the arms or legs (P23)	19.1	26.1	2.25	.134

The end of the table 2

Parameters	Frequency		χ^2	P
	NC	IVF		
24. Varicose veins / venous mesh (P24)	46.9	52.3	.88	.349
25. Leg cramps (P25)	58.1	58.6	.01	.934
26. Heartburn (P26)	4.1	.09	2.65	.104
27. Renal infection (P27)	5.8	1.8	2.81	.094
28.Bladder infections (P28)	3.7	3.6	.00	.952
29. Recurrent Urinary Tract Infections (P29)	–	–	–	–
30. Absence for more than 2 weeks at work / educational institution due to illness during the past 2 years (except for pregnancy and related symptoms) (P30)	3.07	47.1	4.70	.024

Note. ***Significant after correction for multiple testing: 05/30 = .002.
Physical Health Index (see Table 2) did not statistically differ between the groups.

Differences in perceived health

Next, we explored perceived health during the pregnancy. Many women of both groups were sufficiently satisfied with their health, with no significant differences between the groups (U = 19860.00 at p = 0.08) (see Table 3).

Table 3

Descriptive statistics of Reproductive Health Index, Physical Health Indexes, Perceived Health, and Attachment to the fetus scales in NC and IVF women

	Groups	Percentiles %			Min	Max	U	p
		25	50 (Me)	75				
Reproductive Health Index	NC	12	13	14	4	16	4638.0	.000***
	IVF	9	11	12	3	16		
Physical Health Index	NC	20	23	25	5	30	17831.0	.909
	IVF	20	22	25	3	23		
Perceived Health	NC	3	3	3	2	4	19860.0	.080
	IVF	3	3	3	1	4		
Interaction with the fetus	NC	19	22	24	5	25	4507.0	.017
	IVF	20	23	24	10	25		
Giving of self	NC	19	21	24	5	25	3612.0	.000***
	IVF	22	23	25	10	25		
Differentiation of self from the fetus	NC	15	18	20	4	20	4407.5	.001***
	IVF	16	19	20	9	20		
Role-taking	NC	16	18	19	4	20	4833.5	.009
	IVF	17	19	20	5	20		
Attributing characteristics to the fetus	NC	21	24	27	7	30	4370.0	.002***
	IVF	23	26	28	14	30		
Total scale score	NC	95	103	109	30	120	3291.0	.000***
	IVF	101	108	113	50	119		

Note. ***Significant after correction for multiple testing: 05/9 = .006.

Association between diagnosed health problems and perceived health

Table 4 presents correlation analyses for both groups. The results showed that in the NC group, all correlations for physical, reproductive and perceived health were moderate and significant. In the IVF group, only the correlation between reproductive health and perceived health was significant. The differences in the correlations between the two groups were statistically significant.

Table 4

Correlation between Reproductive Health Index, Physical Health Index and Perceived Health for women with natural conception (NC) and with use of IVF (IVF)

Correlation relationships	Groups		Differences of correlations	
	NC	IVF	Z	P (lev. of sign.)
Reproductive Health Index – Physical Health Index	.474***	.170	3.11	0.0019*
Reproductive Health Index – Perceived Health	.357***	.235*	1.21	0.2263
Physical Health Index – Perceived Health	.401***	.097	2.96	0.007*

Note. * significant at .05;** significant at .01; *** significant at .00. Correlation is significant when adjusted for multiple comparisons (0.05/3 = 0.017)

Differences in attitude to the fetus

For both groups, the scores for attachment subscales were in the normal range. The Mann-Whitney U test showed significant statistical differences in attachment to the fetus between the NC and IVF groups (see Table 3), with IVF group showing on average greater attachment. After correction for multiple comparisons, 4 differences remained significant: the Total scale score, Giving of Self; Differentiation of Self from the Fetus; and Attributing characteristics to the Fetus.

Reproductive and physical health, perceived health and attitude to the fetus

First, we explored the associations among individual attachment scales (see Tables 5 and 6). Giving of self and Differentiation of self from the fetus were not significantly correlated. All other scales showed significant modest to strong associations with each other.

Table 5

Correlation between attachment to the fetus scales among women of NC and IVF group

Attachment to the fetus scales	INTR	GIVE	ATTC	RLTK	DIFF	TOTAL
INTR	1	.340**	.510**	.387**	.255**	.716**
GIVE	.296**	1	.289**	.234**	.093	.578**
ATTC	.596**	.268**	1	.503**	.291**	.780**
RLTK	.332**	.231*	.428**	1	.375**	.697**
DIFF	.296**	-.021	.273**	.284**	1	.558**
TOTAL	.773**	.475**	.812**	.620**	.511**	1

Note. * significant at the 0.05 level (2-tailed). ** significant at the 0.01 level (2-tailed). Interaction with the fetus scale – INTR; Giving of self – GIVE; Differentiation of self from the fetus scale – DIFF; Role-taking scale – RLTK; Attributing characteristics to fetus scale – ATTC; Total scale score – TOTAL. Above the diagonal are the results of a sample of women with IVF pregnancy, below the diagonal are the results of a sample of women with natural conception.

Next, we examined correlations between Attachment to the fetus Index and Reproductive Health Index, Physical Health Index and Perceived Health (see Table 6). The results showed no significant correlations among these Indexes.

Table 6

Correlation between Attachment to the fetus Index, Reproductive Health Index, Physical Health Index and Perceived Health for women with natural conception (NC) and with use of IVF (IVF)

Correlation relationships	Groups	
	NC	IVF
Attachment to the fetus Index - Reproductive Health Index	.109	–.100
Attachment to the fetus Index – Physical Health Index	.025	–.029
Attachment to the fetus Index – Perceived Health	.078	.010

Individual scales of maternal-fetal attachment also did not correlate with the Health indexes, with one exception. In the NC group, Giving of Self scale was significantly correlated with Perceived Health Index (r=.226, p=.000). We also performed a series of multiple regression analyses, with each scale of maternal attachment to the fetus as separate outcomes, and all indexes (RHI, PHI, PH) as predictors. No significant models were identified. We also performed a multiple regression predicting five scales of maternal-fetal attachment from the three health indexes. The only significant model emerged in the NC group, with Perceived Health explaining 4% of the variance in the Giving of Self scale (F = 10.808 at p = 0.001 adjusted R2 = 0,039). These results are available from the authors.

As attachment was not associated with health and perceived health, the 4th hypothesis (about the mediating role of perceived health) could not be tested.

Discussion

This study examined the relationship between diagnosed and perceived health, as well as their association to maternal attachment to the unborn child during pregnancy. This is the first study to examine these associations in the two groups of Russian women: natural conception vs. in-vitro fertilization pregnancy. The two groups significantly differed in some aspects of the reproductive and somatic health. Significantly more women with IVF pregnancy had reproductive problems than women with natural pregnancy, which is in line with previous studies in the Russian samples [37, 38]; as well as in other populations [39, 40]. Specifically, after correcting for multiple testing, IVF group had on average more ectopic pregnancy, spontaneous abortion (miscarriage), infertility, threat of spontaneous miscarriage in the three trimesters, gestosis, premature rupture of membranes; in contrast, medical abortion was more prevalent in the NC group.

In terms of physical health, the only significant difference was for Thyroid gland disease, with greater frequency in the IVF group. This is consistent with some previous research, which found greater frequency of endocrine (as well as respiratory and metabolic) disorders in women with induced pregnancy [41]. As these conditions are observed already before pregnancy, they may be among the factors that contribute to infertility in these women.

Next, we examined group differences in perceived health, which has been identified as an important factor that may influence the course of pregnancy and pregnancy outcomes. No differences in perceived health were observed between

women with natural and induced conception. Our data suggests that most women of both groups are satisfied with their health. This is in line with previous studies [42, 43]. The absence of group differences in perceived health, despite significant differences in aspects of reproductive and physical health, is interesting. For women with IVF pregnancy, successful pregnancy may create a psychological buffer against adverse impact of infertility and other health problems on perceived health, wellbeing and life satisfaction [44]. Research of Rostad et al., is consistent with this interpretation. For example, one population-based study compared the association between infertility and health and life satisfaction in 3 groups: fertile women, infertile women with a child; and infertise women without a child [43]. On average, fertile women reported better wellbeing than both groups of women with infertility. However, infertile women with a child reported greater health and life satisfaction, which suggests that having a child can lessen the adverse impact of infertility on health and life satisfaction.

Based on previous studies [45], we expected a moderate relationship between physical and reproductive health. This expectation was supported in the group with natural pregnancy. However, in the IVF group, physical and reproductive health were not correlated. The difference in correlations between the two groups may have resulted in differences in frequency of health problems. Specifically, women in IVF group reported greater frequency of reproductive problems but mostly the same frequency of physical problems to that in the NC group.

As expected, associations between diagnosed (reproductive and physical) and perceived health, were moderate in the NC group [46]. However, not all previous studies found this association. For example, a study with women (with vs. without reproductive problems) from Malawi did not find a connection between health and perceived health [42]. One potential explanation for the absence of the link in the Malawian sample is the poor socio-economic conditions, including lack of education and medical provisions, leading to lack of awareness of some medical problems. Malawi is one of the world's least developed countries, with GDP approximately 100 times lower than in Russia. The Malawian sample included 915 women (average age 26 years), with 36% completing only 4 classes of schooling; 73% reporting a monthly income less than 52 U.S. dollars. Up 20% of the sample experienced a variety of gynecological problems, including infertility; and almost 60% of women reported depressive symptoms. Women reporting infertility had lower overall socio-economic status (fewer years of education, more hungry episodes), more gynecological problems and more depressive symptoms - than women without infertility. Similar results were also found in another representative sample of Malawian women [47].

In contrast to the Malawian sample, women in the current study had much better socio-economic conditions and were much better educated (almost 85% had higher education). Moreover, they were better informed on their health status, as they were all attending maternity clinics and undergoing comprehensive health evaluations and consultations. This combination of factors provides greater insight into one's health, leading to associations between health and perceived health.

Interestingly, in the current study, perceived health was related to reproductive but not physical health in the IVF group. The difference in diagnosed-perceived health associations between the NC and IVF groups, observed in the current study, requires further exploration. Why is perceived health associated with both physical and reproductive health in the NC group, but only with reproductive health in the IVF group? It is possible that for women, who experience infertility, reproductive health becomes the focus of their attention, whereas other aspects of health are outside of their focus. This emphasis on fertility may partly reflect specifics of the culture. In many cultures, including that of Russia, a predominant view is that having children is a woman's primary role. Therefore, for women in the IVF group their preoccupation with reproductive health may have overshadowed any other worries; and has manifested in the association with perceived health

Finally, we explored attachment to the fetus in the NC and IVF groups. In most women of both groups, the level of attachment to the fetus was within the normal range, which is in line with previous studies [30, 48]. On average, women with induced pregnancy showed greater attachment than women in the NC group. Significant differences emerged for the total Attachment Index, as well as for 3 out 5 individual scales (Giving of self; Differentiation of self from the fetus; Attributing characteristics to the fetus). Similar results were found in previous study [49]. The observed group differences are likely due to the long-awaited motherhood, and greatly valued pregnancy by women in the IVF programs.

An interesting result was the lack of correlation between the Giving of self and Differentiation of self from the fetus (subscales of the attachment scale). Giving of self includes items such as "I feel all the trouble of being pregnant is worth it", "I do things to try to stay healthy that I would not do if I were not pregnant", "I eat meat and vegetables to be sure my baby gets a nutritious diet", "I feel my body is ugly", "I give up doing certain things because I want to help my baby". Differentiation of self from the fetus includes items such as "I enjoy watching my tummy jiggle as the baby kicks inside", "I'm really looking forward to seeing what the baby looks like", "I have decided on a name for a baby girl", "I have decided on a name for a baby boy". The absence of an association between these two subscales suggests that willingness to adjust lifestyle to the needs of pregnancy and fetus is independent of fetus-focused attitudes and perceptions of the fetus as an independent organism.

In this study, against our expectation, health indexes were not significant predictors of attachment, with one exception. Perceived health explained 4% of the variance in Giving of self in the NC group. These results suggest that mother's attachment to the fetus is not significantly affected by mother's health – despite established links between physical health, psychological states and pregnancy outcomes. Perhaps this result is due to the fact that the study involved women, most of whose pregnancy was planned. Therefore, the women were psychologically ready for pregnancy and motherhood and this readiness was largely independent of factors of physical and reproductive health. In contrast, previous research indicated that unplanned pregnancy is related to physical health. For

example, in one study women with unplanned pregnancy were 5.42 times more likely to have health complications (poor health) [50].

Limitations

This study has a number of limitations. The present study was based on an opportunistic sample of families recruited through family-planning clinics. Therefore, the participants in the two groups were not specifically matched on any socio-demographic parameters. However, all families came from clinics in the same general area of Russia, and were largely comparable. The IVF and NC groups differed in sample size. The sample is part of an ongoing longitudinal study and is gradually growing. Future research will evaluate potential effects of sample size differences on results.

Conclusion

Despite the poorer state of health in terms of reproductive and some somatic indicators, the self-rated health of women with induced pregnancy is not worse than perceived health of women whose pregnancy occurred naturally. Attachment to the fetus is slightly greater for women in the IVF group than in the NC group. Diagnosed and perceived heath is not significantly associated to attachment to the fetus.

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Диагностированные проблемы со здоровьем, самооценка состояния здоровья и привязанность к плоду у беременных женщин с естественным зачатием и с беременностью посредством ЭКО

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Резюме

Цель исследования – изучение здоровья и привязанности к плоду у женщин с естественным зачатием и с беременностью посредством экстракорпорального оплодотворения. **Гипотезы.** (1) Показатели состояния общего здоровья женщин с зачатием с помощью ЭКО имеют различия по сравнению с показателями здоровья женщин с естественным зачатием. (2) Показатели самооценки состояния здоровья у женщин с разным типом зачатия имеют статитически значимые различия. (3) Существует связь между нарушениями здоровья и воспринимаемым здоровьем. (4) Привязанность к внутриутробному ребенку у женщин с беременностью посредством ЭКО более выражена, чем у женщин с естественным зачатием. (5) Нарушения здоровья отрицательно связаны с привязанностью к плоду, и эта связь частично опосредована самооценкой состояния здоровья. **Методы.** Данное исследование являлось частью продолжающегося проспективного лонгитюдного исследования в России. **Выборка** включала 244 женщины с естественным зачатием и 105 женщин с беременностью посредством ЭКО. Данные были собраны из медицинских карт и анкет, заполненных в течение первого и третьего триместров беременности. Измерения включали самооценку состояния здоровья (воспринимаемое здоровье), показатели репродуктивного и общего здоровья, оценку привязанности к плоду. Анкета состояла из 46 вопросов, направленных на выявление различных проблем со здоровьем. Кроме того, медицинская информация была получена из медицинских карт женщин, хранящихся в базах данных клиник-партнеров. На основе данных анкетирования и медицинских карт было сформировано 2 индекса здоровья: Индекс репродуктив-

ного здоровья (ИРЗ – показатель репродуктивного здоровья); Индекс физического здоровья (ИФЗ – показатель физического здоровья, за исключением репродуктивного). Статистический анализ данных выполнен с помощью пакета прикладных программ IBM SPSS Statistics 22 (описательная статистика, критерий $\chi 2$ Пирсона для выявления различий в частоте встречаемости признака в независимых выборках, U-критерий Манна–Уитни, коэффициент ранговой корреляции Спирмена, множественный регрессионный анализ). Данные были проверены на нормальность распределения с использованием критерия Колмогорова–Смирнова. **Заключение.** Несмотря на худшее состояние репродуктивного и физического здоровья, самооценка состояния здоровья женщин с индуцированной беременностью не имела значимых различий с таковой у женщин с естественным зачатием. Привязанность к плоду у женщин с беременностью посредством ЭКО была более выражена по сравнению с женщинами с естественным зачатием. Нарушения здоровья и самооценка состояния здоровья не имели значимых связей с показателями привязанности к внутриутробному ребенку.

Ключевые слова: здоровье; воспринимаемое здоровье; репродуктивное здоровье; общее здоровье; показатель здоровья; экстракорпоральное оплодотворение; беременность; привязанность к плоду.

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