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Title Page

Male factor infertility and lack of openness about infertility as risk factors for depressive symptoms in males undergoing assisted reproductive technology treatment in Italy

Running Head: Depression in infertile males

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Capsule Summary:

The current research found that the association of male factor infertility with lack of openness about infertility was a risk factor for depression among Italian males undergoing ART treatment.

Male factor infertility and lack of openness about infertility as risk factors for depressive symptoms in males undergoing assisted reproductive technology treatment in Italy

Structured Abstract

Objective: To investigate the association between male factor infertility and openness to discussing assisted reproductive technology (ART) treatment with levels of depression among men undergoing infertility treatment.

Design: Cross-sectional.

Setting: two Italian Services for Assisted Reproductive Technology located in medium-sized cities.

Patient(s): 340 participants (170 men and their partners) undergoing ART treatments.

Intervention(s): Administration of a set of questionnaires.

Main Outcome Measure(s): Depressive symptoms were detected by means of the Zung Depressive Self-Rating Scale (SDS; Zung, 1965). Participants' willingness to share their infertility treatment experience with other people was assessed by means of self-report questionnaires.

Results: In this study, 51.8% of males chose not to discuss their ART treatments with people other than their partner. In addition, the decision to discuss or not discuss the ART treatments with others was significantly associated with men's depressive symptoms. Male factor infertility was significantly associated with depression when considered together with the decision not to discuss ART treatments with others. A general disposition characterised by a lack of openness with others seemed to be a significant predictor of depression.

Conclusion: There is a need for routine fertility care to pay greater attention to men's emotional needs. Prior to commencing reproductive treatment, male patients may benefit from undergoing routine screening for variables (i.e. male factor infertility and openness to others about ART) that may increase their risk of depression.

Keywords

Introduction

Infertility, defined as a failure to conceive after 12 months of regular, unprotected sexual intercourse (1, 2), is an increasingly prevalent health problem, which affects approximately 15% of couples in developing countries, with 56% of those couples seeking medical care (3-6). As consistently demonstrated, a diagnosis of infertility has a negative impact on both the individual's well-being and couples' well-being, with manifestations of depression, anxiety, frustration, isolation and low self-esteem (7). Couples undergoing fertility treatment often describe infertility as the most upsetting event in their life (8), with subsequent disruptions of relationships with friends and family (9).

Most infertility studies have focused on women (10). However, in recent years, there seems to have been an increase in studies on men's experiences of infertility, although women's experiences continue to be disproportionately over-represented in the scientific literature (11, 12). Men undergoing assisted reproductive technology (ART) treatment have been described as being less open about their feelings as compared to their female partners (13) and as having a lower tendency to discuss their infertility with others (14). Men's difficulty to open up to others about their ART treatment requires a more detailed investigation, as it could play a role in distress associated with such treatment.

Thus far, to our knowledge, this issue has not been explored in depth, although a few studies reported a positive link between general personality traits (e.g. sociability and extraversion) and fertility in both genders (15) or only among men (16). For both men and women, infertility-related distress was reported to be negatively associated with seeking social support, which was defined as talking to friends or professionals about infertility, without distinguishing between friends and professionals and excluding members of the family (17). However the above-cited studies did not

specifically address the decision to share or not share the experiences of ART treatments with others.

Another variable that may play a role in psychological distress among infertile men is the cause of the infertility, with causal factors classified as male, female, mixed or unexplained (idiopathic).

Male factor infertility is involved in up to 50% of cases (18, 19). Previous studies of its effects on men have reported inconsistent results (10). Some studies did not detect a difference in male well-being according to the infertility diagnoses. For example, a study of 166 men (65 diagnosed with male infertility and 101 with infertility due to other factors) found no evidence to support the hypothesis that male infertility affected men more negatively than other diagnoses of infertility (i.e. female, mixed or unexplained) (20). A study of 256 men with infertility due to different causes found no differences in the mental and physical health or psychological and social stress levels of the men (21). Other research found that men with male factor infertility, when compared with men where infertility was attributed to female, mixed or unexplained infertility diagnoses, reported increased self-blame, social isolation, a sense of loss, stigma and lower levels of self-esteem (22, 23). A recent study found that men with male factor infertility had significantly higher depression scores than men who had fathered healthy babies without ART treatment (24).

Depression, which can be a major problem among infertile couples (25), may develop after a diagnosis of infertility due to several factors, such as uncertainty about the duration of treatment and its outcome, pressure from family and friends and financial worries (26). A prospective study, which reported a higher prevalence of depression among men during the course of ART treatment when compared with that of the general population, suggested that males' psychological needs should be taken into account, alongside those of their partners (8). Starting from this premise, the general aim of the present study was to conduct a detailed exploration of depressive symptoms among males undergoing ART protocols, including their prevalence and possible risk factors. More specifically, this study aimed to evaluate whether male factor infertility and the decision not to discuss ART treatment with others may be associated with levels of depressive symptoms.

With these aims in mind, this study investigated men's choice to share their ART treatment with others or hide the fact of the ART treatment, evaluating differences in this regard according to gender. Levels of depression among the men according to different infertility diagnoses (i.e. male, female, mixed or unexplained) were then compared. Given the inconsistent results of previous research on this topic, hypotheses were not formulated on the direction of these differences. Subsequently, the associations of these variables (i.e. male factor/other factor infertility and discussing/not discussing their ART treatment with others) with depression were analysed. Finally, this study explored whether a general disposition of openness towards others may predict depressive levels in men.

Materials and Methods

Subjects and settings

This cross-sectional study was carried out in two Italian centres providing ART: (I) a functional genetic unit of a public university located in a medium-sized city and (II) a Department of Reproductive Medicine and Gynaecology of a public hospital in a medium-sized city. All couples availing of ART services from October 2014 to March 2015 were asked to participate. In total, 170 men and their partners completed questionnaires. No differences were observed in the response rates at the two ART centres: ($\chi^2_{(1)} = 0.47; p > .05$).

Procedures

An information letter containing detailed information on the study main aims and rationale was given to all the couples attending the ART centres. The letter also stressed that participation to the study was voluntary. Written informed consent was obtained from every participant. Questionnaires were alphanumerically coded in order to guarantee anonymity. Immediately after a medical examination, each member of the couple completed, independently from her/his partner, a set of questionnaires. The Psychological Review Board of our Department examined all the

questionnaires and provide certification that all of them were in full compliance with the Ethics Code of the Italian Board of Psychology, the regulatory Authority that provides the national guidelines for research and clinical practice.

Measures

Questionnaire data

In the questionnaires, general information (e.g. age, education level and occupation) was obtained, in addition to personal information on the couple (e.g. length of the relationship and marital status), information on previous experiences of miscarriage or fertility treatments and background information on the couple's desire for a child (e.g. the length of time they had been trying to conceive and which partner first expressed a desire for a child).

Depression

Depressive levels were evaluated using 20 items of the well-established Zung Depression Self-Rating Scale (27). Several studies found this scale as a reliable and valid instrument for measuring depressive symptoms (28, 29). In the current research the reliability was good (Cronbach's $\alpha = .82$). Each item (e.g. 'I feel hopeful about the future', or 'I get tired for no reason') was graded on a 4-point Likert scale, ranging from 1 to 4, with a total score of between 20 and 80. Higher scores signalled higher levels of depressive symptomatology.

Discussing vs. not discussing infertility treatment with others

The willingness of men and women to discuss the infertility treatment with others, in addition to their partners, was assessed by the following question: 'With whom did you decide to share the information about undertaking ART treatment?'. There were six options: mother, father, siblings, friends, colleagues, and nobody, with the respondent allowed to choose more than one answer. In the first step of the analysis, eight possible ways of sharing were observed: (I) only with the mother,

(II) only with the father, (III) only with siblings, (IV) only with friends, (V) only with colleagues, (VI) with several family members, (VII) with family and friends, and (VIII) with no one. In subsequent analyses, these options were merged into two macro-groups: discussing (options I–VII) or not discussing ART treatment with others (option VIII).

Openness with others

Openness with others was estimated using eight items (sample items: ‘I think that if I say how I really feel, I could demoralize my partner’; ‘I have no difficulty sharing all my problems with my friends’), which aimed to evaluate if and to what extent the person relied on his/her partner and/or people outside the couple as confidants. The items were graded on a 4-point Likert scale (range 1–4), with the total score ranging between 8 and 32. Lower scores indicated lower levels of openness with others.

Statistical Analyses

The data were analysed using Statistical Package for the Social Sciences (SPSS, v. 19.0) software. First, descriptive statistics were performed. To test for gender differences, the χ^2 test was conducted. A two-way analysis of variance (ANOVA) was carried out to test the effect of causes of infertility (male factor vs. other factors) and sharing with others the experience of the ART treatment (sharing vs. not sharing) on levels of depression in males. Finally, associations between depressive scores and openness with others were investigated using a linear regression analysis. A value of $p < .05$ was accepted as indicating statistical significance in all the analyses.

Results

Sociodemographic characteristics

In total, 234 couples who met the inclusion criterion (i.e. a diagnosis of infertility) attended the two infertility services in the designated period. Of these, 178 men (76%) and 186 women (79%)

completed and returned the sets of questionnaire. No gender differences were observed in the response rate ($\chi^2_{(1)} = 0.791; p > .05$). In the present study, only men where both members of the couple agreed to participate were included. Therefore, the final sample consisted of 170 males and their partners.

The average age was 39.37 (SD = 5.75) years for males and 36.59 (SD = 4.37) years for females, and the mean length of the couple's relationship was 5.19 (SD = 3.90) years. Most couples had no children either together (95.8%) or from previous relationships (91.6%). More than half of the male sample (50.9%) had completed a secondary education, and less than one-third (29%) had obtained a university degree. The remainder had a middle school (18.9%) or primary school education (1.2%).

Experiences of infertility

At the time of the administration of the questionnaires, 118 (69.4%) males were undergoing their first ART treatment. The remaining 52 (30.6%) men had previous ART experiences, with the first treatment carried out less than six months earlier (12/52, 23.1%), between six months and one year earlier (11/52, 21.1%), between one and two years earlier (12/52, 23.1%) and more than two years earlier (17/52, 32.7%). The univariate ANOVA revealed no differences between the depressive levels of the males undergoing their first treatment vs. those with previous ART treatments ($F_{(1, 168)} = .452; p > .05$) or among males with different lengths of ART treatments ($F_{(4, 165)} = 1.831; p > .05$). With regard to the diagnoses of the causes of each couple's infertility, according to the men's answers, the infertility was attributed to male factor (25.2%), female factor (22.7%), mixed factor (10.4%) and unexplained (41.7%). The diagnoses provided by the men were not significantly different from those reported by their partners ($\chi^2_{(3)} = .253; p = .969$).

The findings on the decision to share or not share experiences of ART treatments with others are summarized in Table I.

Table I. Share with others vs. not share with others the experience of ART treatment.

	Males N (%/gender)	Females N (%/gender)	$\chi^2_{(1)}$	P-value
1. Share only with mother	10 (5.8)	18 (10.6)	2.49	.15
2. Share only with father	3 (1.8)	1 (0.6)	1.01	.25
3. Share only with siblings	4 (2.4)	16 (9.4)	7.65	.01
4. Share only with friends	5 (2.9)	14 (8.2)	4.52	.03
5. Share only with colleagues	1 (0.6)	1 (0.6)	0	1
6. Share with several family members	32 (18.8)	39 (22.9)	.87	.40
7. Share with the family and with extra-familial persons	20 (11.8)	35 (20.6)	4.88	.03
8. Share with no one	88 (51.8)	42 (24.7)	26.35	< .000
Not respond	7 (4.1)	4 (2.4)	.85	.40
Total	170 (100)	170 (100)		

Overall comparison between males and females: $\chi^2_{(7)} = 35.782$, $p = .000$

As can be seen from the table, more than half the male sample (51.8%) chose not to discuss their ART treatment with others. This percentage was twice that of females (24.7%), and this difference reached statistical significance ($\chi^2_{(1)} = 26.35$; $p < .000$). The results also revealed significant differences in the decision to share with siblings, friends and both family and extra-familial persons. In all these cases, women were more open than men about the ART treatments. No gender difference was detected in the decision to discuss ART treatment with mother, father, colleagues and several family members. According to findings, both men and women preferred to share this experience within their family than with their friends.

Factors associated with depressive symptoms in males

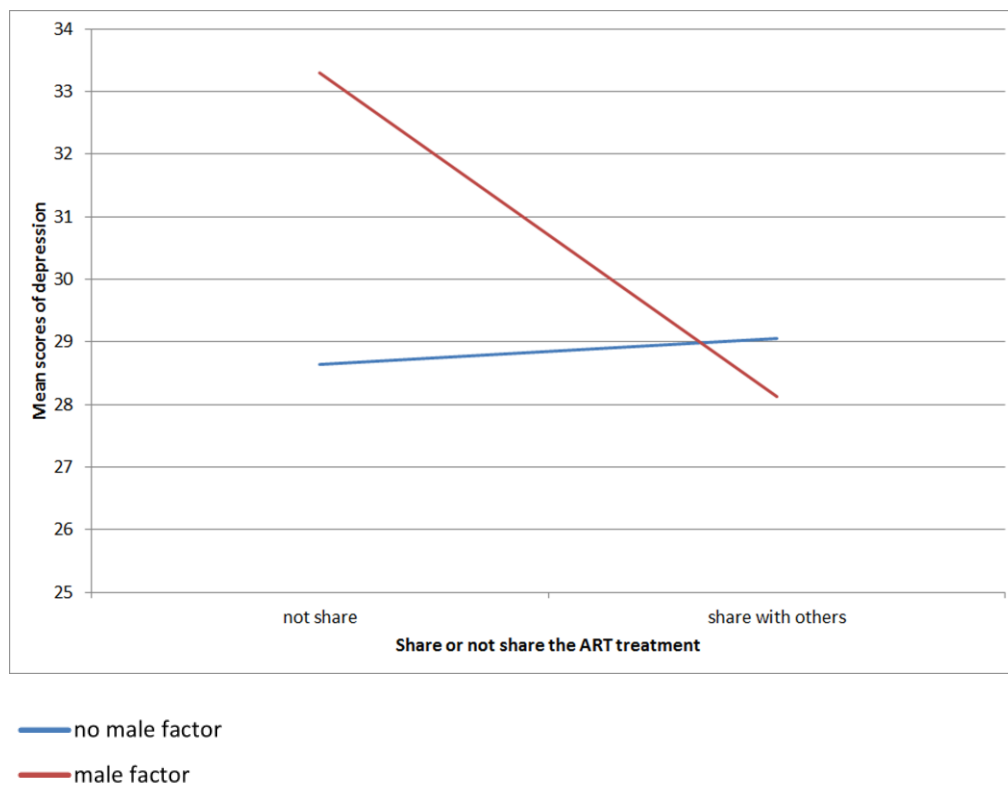
The results revealed that men with a diagnosis of male factor infertility had slightly higher levels of depressive symptoms ($N = 41$; mean = 30.73; SD = 7.00) than men in couples where the infertility was attributed to female ($N = 37$; mean = 28.65; SD = 5.91), mixed ($N = 17$; mean = 28.29; SD = 5.32) or unexplained ($N = 68$; mean = 29.04; SD = 5.45) causes. However these differences were not statistically significant ($F_{(3, 159)} = 1.137$; $p > .05$).

Subsequently, the men were divided into two groups according to the diagnosis of infertility: men with male factor infertility ($n = 41$) and men in couples with all other infertility diagnoses ($n = 122$).

The men were also divided into two groups based on their choice to share or not share the

experience of their ART treatments with others: men who shared their experience of ART treatment with others ($n = 75$) and men who did not share their experience of ART treatment with others ($n = 88$). Depressive symptoms among males were significantly associated with the decision to not share experiences of ART treatments with others ($F_{(1, 162)} = 5.115$; $p < .05$), but not with male factor infertility vs. other factors (female/mixed/unexplained) ($F_{(1, 162)} = 3.145$; $p > .05$). In addition, there was a statistically significant interaction effect between these two variables ($F_{(1, 162)} = 7.058$; $p < .01$) on depressive levels. This interaction is plotted in Figure 1.

Figure 1: Levels of depression associated with infertility diagnosis (male factor vs. other factors) and share or not share experiences of ART treatments with others



To test whether a general disposition towards openness with others predicted depressive levels, a linear regression analysis was conducted. The results revealed that less openness with others significantly predicted higher levels of depression ($\beta = -.348$ $t_{(162)} = -4.711$, $p < .001$).

Discussion

The current study focused on the so-called ‘second sex’ in reproduction research (11).

Notwithstanding the growing body of infertility literature addressing males’ experiences (10), men continue to be under-represented and understudied when compared with women. Thus, the general aim of the present study was to explore aspects of men’s experiences of infertility, with a particular focus on risk factors associated with depressive symptoms.

Three main findings emerged from the present research. First, most men involved in ART treatment chose not to share this experience with people other than their partners. Men were significantly less likely to talk to other people about their experience of reproductive technology, in comparison with their female partners. This result is consistent with some previous research (e.g. 14, 30) but inconsistent with that of the study by Peterson et al. (17). They found that seeking social support was the most frequent method used by both men and women to cope with infertility-related stress. However, with regard to social support, their definition made no distinction between friends and professionals. This may explain the high frequency of social support reported in their study.

A second finding was that male factor infertility was not associated with higher depressive scores when compared with other causal factors (female, mixed or idiopathic); however the interaction between male factor infertility and the decision not to discuss ART treatments was associated with depression. Previous studies of the influence of male factor infertility on men’s well-being during ART treatment reported mixed results. Some authors (e.g. 20, 21) did not find support for the hypothesis that male factor infertility affected men more negatively than other infertility diagnoses. However, other authors (e.g. 22-24) found more negative emotional responses, such as anxiety and depression, among men with male factor infertility when compared with infertility attributed to female, mixed or idiopathic factors. The data in the present study cast new light on prior inconsistent results. Based on the findings, it can be hypothesized that male infertility factor alone does not account for increased levels of distress among men but that it becomes a crucial variable when associated with other elements, such as choosing not to discuss the ART treatment, as shown

in the current sample. This finding is particularly interesting as it could explain previous mixed findings on the association between male factor infertility and distress: prior research investigated the influence of this variable, without examining its interaction with other variables. Additional studies are needed to further explore this hypothesis and determine which variables play a role in increasing stress levels among infertile men.

A third finding of the current study was that a general disposition characterised by a lack of openness with others seemed to be a predictor of depression. These data seem to be consistent with the previous one: men who were less inclined to talk about and share their experiences with others had a higher risk of depression.

Given the findings of the present study, it is worthwhile speculating about the reasons why men wish to conceal their experience of reproductive technology. Based on the literature on gender differences, one hypothesis posits that the perceived link between the ability to procreate and virility may influence men's reactions to infertility, to the extent that males may perceive the incapacity to father a child as a threat to their self-image of masculinity (11). As Thorsby and Gill (31) stated, 'fertility problems in men were often consciously or unconsciously equated with impotence – a profoundly traumatic experience for most men' (p. 336), that could lead to an attitude called "self-stigma", i.e. a reduction of the individual's self-worth given by self-considering as someone who is socially unacceptable (32, 33). Fisher and Hammarberg (34) reached a similar conclusion in a recent review, which highlighted an overlap between infertility, virility and sexual impotence in men, potentially leading them to conceal the receipt of ART treatment from other people. Males' lack of openness with regard to ART may be linked to their desire to appear strong for their partners and be a source of support for them (13, 27, 35). Men play this role by setting aside and denying their own affective needs for the benefit of their partners. In this regard, previous studies highlighted that men are less likely than women to seek psychological help (36) because of the prescription of the traditional male gender role that includes independency, self-control and self-sufficiency (37). However, as Malik and Coulson (13) underlined in their research on online

infertility support groups for men, infertile males experienced a wide range of negative emotions and complained about the scarcity of resources specifically tailored to men. As a result, they turned to anonymous online support groups to share their fears and anguish, ask for advice and seek reassurance from other men experiencing the same fertility problems.

These data seem to underline the need for a shift in routine fertility care, with a major focus on men's emotional needs. Consistent with this idea, in their review of the literature, Furman et al. (38) concluded that men seemed to be more likely to seek emotional support from fertility staff rather than from friends, mental health professionals outside the ART centre or self-help groups. This finding is in line with the conclusion reached by Hammarberg et al. (39) who stated that clinical staff constituted an important source of emotional support for men. Therefore, the previous data and results of the present study point to the need to provide psychological support within the ART unit, not only for women but also for men. Hence, the fertility care units, that currently focus almost exclusively on women, should be reorganized in order to involve also men, with a "male-friendly" approach (40) and the use of a language consistent with traditional gender role (32). Clinical psychologists with a deep knowledge about ART treatments should routinely attend all the initial medical visits in order to detect patients (both males and females) with an increased risk of psychological distress. This approach implies that the clinical intervention should be specifically tailored to the different needs of men and women. However, although the present research confirmed the need to widen psychological care within ART treatment to include men, it also highlighted that not all men required such care. Overall, the findings suggested that before commencing reproductive treatment, male patients would benefit from undergoing routine screening for variables that may increase their risk of depression. In the current study, these variables included male factor infertility and a lack of openness with others about ART. To ensure that the males most in need receive appropriate psychosocial support, they should undergo screening to detect these risk factors. Clinical psychologists facing men with male factor infertility might explore in depth how they live and experience this issue and whether they share it with

people other than their wives. In addition, as the findings of previous research (13, 31) highlighted men's desire to appear strong in front of their partners, it might be appropriate to provide individual counselling rather than couples' counselling, with gender-specific psychological interventions.

Some potential methodological weakness of this study should be mentioned. Its cross-sectional nature precludes conclusions about cause and effect relationships among the variables. Second, the diagnosis of depression was based exclusively on self-report questionnaires rather than a clinical assessment of depression. In addition, the limited number of subjects and a self-selection effect could have reduced the generalisability of the findings. Despite these limitations, the satisfactory response rate when compared with that of previous studies (e.g., 12, 39), involvement of both members of the couple and reference to an Italian sample, with most previous studies based on American or Northern European samples, are strengths of the current research.

In conclusion, men pursuing fertility treatments may experience distress that currently may be overlooked by health professionals. A greater understanding of the factors that contribute to psychological distress among males before starting ART treatment could help health professionals to identify those patients in greater need of psychological support and plan an adequate therapeutic strategy.

Authors' roles

A.B. designed the study, collected data, performed statistical analyses and wrote the manuscript.

L.S. designed the study, carried out genetic counselling and supervised data. C.T. collected data and revised the manuscript. C.C. supervised the data collection and revised the manuscript. I.A.

designed the study, collected data, carried out genetic counselling and revised the manuscript. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that they have no competing interests

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