
Estimation of the prevalence and causes of infertility in Western Siberia

O.S. Philippov,¹ A.A. Radionchenko,² V.P. Bolotova,³ N.I. Voronovskaya,⁴ & T.V. Potemkina⁵

The study examined the epidemiology and causes of infertility in Tomsk, Western Siberia, using methodological approaches recommended by WHO and was based on the findings for a randomly selected sample of 2000 married women aged 18–45 years. Among the respondents, 333 couples were considered infertile since they had not conceived after 12 months or more of unprotected intercourse. This group of infertile couples was offered comprehensive clinical investigations but only 186 couples completed them.

The infertility rate in Tomsk was 16.7%, being caused by diseases of the female reproduction system in 52.7% of the couples and by male reproductive diseases in 6.4%. In 38.7% of couples, both spouses suffered from infertility, while in 2.2% of cases the cause of infertility was not determined. Among the causes of female infertility, secondary infertility dominated (12.9% of all the women questioned), while primary infertility affected 3.8% of the women. The most frequent causes of female infertility were disturbances to tubal patency (36.5%) and pelvic adhesions (23.6%). Endocrine pathology was found in 32.8% of cases. The most frequent cause of male infertility was inflammatory disease of male accessory glands (12.9%). In 8.6% of cases infection resulted in obstructive azoospermia. Varicocele was registered in 11.3% of cases, and idiopathic pathospermia in 20.9%. Inflammatory complications among females were 4.2 times more frequent than among males.

Introduction

In recent years the prevalence of infertility has increased significantly in some countries. In the Russian Federation, for example, the birth rate over the period from 1987 to 1994 fell from 17.1 per 1000 to 10.8 per 1000 and since 1992 the reduction in the population has clearly been discernible (1). There is therefore an urgent need to carry out a detailed investigation of the factors that influence birth rate and, in particular, the infertile couple. The extent of infertility varies considerably among countries. According to WHO data, infertility becomes a public health problem when its frequency exceeds 15% (2),

and the organization has developed guidelines for the study of the prevalence and causes of infertility (3).

Such investigations have never been carried out in the Russian Federation. One study of infertility that was carried out at the All-Union Institute of Obstetrics and Gynecology in Moscow, based on the *WHO manual for the standardized investigation and diagnosis of the infertile couple* (4), involved only patients attending a clinic; the results therefore did not reflect the true frequency of causes of the infertility in the general population.

The aim of the present study was to estimate and analyse the causes of infertility in Western Siberia using the methodological approaches recommended by WHO. This study is the first comprehensive investigation describing the reproductive function of the couple at the population level in the Russian Federation.

Materials and methods

The investigation was carried out in Tomsk — a representative city in Western Siberia — and was executed in two stages: the first involved selective epidemiological investigation followed by data processing; the second consisted of clinical evaluation of the infertile couple.

¹ Assistant, Department of Obstetrics and Gynecology, Siberian Medical University, Tomsk, Russian Federation.

² Professor and Head, Department of Obstetrics and Gynecology, Siberian Medical University, Moskovsky Trakt 2, Tomsk 50, 634 050 Russian Federation. Requests for reprints should be sent to Professor Radionchenko at this address.

³ Senior Lecturer, Department of Obstetrics and Gynecology, Siberian Medical University, Tomsk, Russian Federation.

⁴ Head of Gynecological Clinics, and Assistant, Department of Obstetrics and Gynecology, Siberian Medical University, Tomsk, Russian Federation.

⁵ Software specialist, Russian-German Centre for Training and Scientific Research, Tomsk Polytechnical University, Tomsk, Russian Federation.

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In the first stage we interviewed 2000 married women aged 18–45 years using questionnaires developed by WHO. Women from the general population were chosen randomly from polling station lists of the electorate in order not to influence the representativeness of the selection. There are about 2000–3000 voters registered at each polling station, of which about 30–40% are female. Every seventh woman was included in the selection and was requested to answer a questionnaire dealing with general medical, menstrual, reproduction, and contraception histories. In this way, the fertile status of every participating woman was defined.

In accordance with the recommendations of workers who have investigated the prevalence of infertility in other countries (5), 3500 married women aged 18–45 years were included in the sample population. Of these, only 2000 answered all the questions on the form. The remaining 1500 women refused to answer some questions and were excluded from further analysis. A total of 333 couples (16.7%) were considered to be infertile since they had not conceived after 12 months or more of unprotected intercourse.

For the second stage of the investigation, the infertile couples were offered a comprehensive medical investigation at the gynaecological clinic of the Siberian Medical University and Regional Centre for Human Reproduction in accordance with the *WHO manual for the standardized investigation and diagnosis of the infertile couple* (4). For 254 couples, both partners agreed to undergo the comprehensive medical investigation but only 186 couples completed it. In the other 68 cases the investigation remained incomplete as one or other of the partners refused or the couple moved away from the area; these couples were excluded from further analysis. In the diagnosis of the causes of infertility, the following investigations were carried out: semen analysis in accordance with WHO recommendations; and tests of tubal patency by laparoscopy, ovulation, and endocrine profile in accordance with WHO guidelines for the radioimmunoassay of hormones (6).

Results

Epidemiology of infertility

The overall infertility rate in Tomsk was 16.7%, which exceeds the 15% critical level. A total of 3.8% of all couples investigated suffered from primary infertility, while 12.9% of all couples had secondary infertility. The duration of infertility was from 1 year to 18 years. On average, couples with primary infertility had lived in Tomsk for 13 years; the average for

Table 1: Description of the menstrual function of the infertile study women, by infertility category

Sign	Primary infertility	Secondary infertility
Average age at menarche (years)	13	13
% with irregular menstruation	20	10
% with painful menstruation	17.3	18.6

couples with secondary infertility was 11 years. Among couples with primary infertility the average age of females was 28 years and of males, 32 years; for those with secondary infertility the comparable ages were 33 years and 34 years.

Data on the menstrual function of the infertile women are given in Table 1. Twice as many women with primary infertility had irregular menstruation as did those with secondary infertility.

For the 2000 women questioned, the total number of pregnancies recorded was 7852. Analysis of the reproductive function of women with secondary infertility indicated that the cumulative number of gestations for this group was 1043, of which 17.8% were from previous marriages. The outcomes of the last pregnancy of these women were as follows: viable birth (32.3%), stillbirth (2.3%), spontaneous abortion (8.2%), ectopic pregnancy (3.5%), and induced abortion (53.7%). A total of 24.1% of women with secondary infertility had complications during or after birth or abortion; 12.5% of these complications were inflammatory.

The contraceptive methods used by the study women are presented in Table 2. It should be noted that the distribution of the methods used is not optimum.

Among women who never used a contraceptive method because they wanted to become pregnant, 38.6% had primary and 22% secondary infertility; among women not using contraception because they lacked the relevant information, the corresponding proportions were 4% and 6.2%. A total of 8.1% of women with secondary infertility did not use con-

Table 2: Contraceptive methods used by the study women, by infertility category

Method	Primary infertility (%)	Secondary infertility (%)
Hormonal contraception (pills)	9.3	4.6
IUD	2.6	10.8
Condoms and cervix diaphragms	12	12.4
Calendar method	8	10
Interrupted coitus	1	1

Table 3: Distribution of the causes of infertility among the study women

Diagnosis	No. of cases	% of all cases identified	% of women
Hyperprolactinaemia	2	0.8	1.1
Amenorrhoea with low endogenous estrogen	1	0.4	0.5
Oligomenorrhoea	15	5.7	8.2
Irregular menses or ovulation	18	6.9	9.7
Anovulation with regular cycles	21	8	11.3
Congenital abnormalities	8	3	4.3
Bilateral tubal occlusion	24	9.2	12.9
Pelvic adhesions	44	16.8	23.6
Endometriosis	6	2.3	3.2
Acquired uterine or cervical lesions	6	2.3	3.2
Acquired tubal lesions	44	16.8	23.6
Acquired ovarian lesions (cysts, polycysts)	22	8.4	11.8
Endometrial tuberculosis	1	0.4	0.5
Systemic causes	4	1.5	2.2
Abnormal postcoital test	30	11.4	16.1
No demonstrable cause	16	6.1	8.6
Total	262	100.0	140.8

traception because of fear of side-effects. Other respondents could not formulate the causes of their disinclination to use contraception.

For women with primary infertility, 35.2% reported that they had intense pain in the lower abdomen; 46% of women with secondary infertility also reported such pain. A total of 20% of women with primary and 44.5% with secondary infertility had not only such pains but also excessive vaginal discharge. Less than half of all these women had received appropriate treatment.

Clinical investigation of infertility causes among the study women

Thorough clinical investigation identified the causes of infertility in both partners for 38.7% of the 168 couples studied, in the female partner only for 52.7% of couples, and in the male partner only for 6.4% of couples. In 2.2% of the cases, the cause of infertility could not be determined. The distribution of causes of infertility in women according to the diagnostic categories contained in the *WHO manual for the standardized investigation and diagnosis of the infertile couple* is shown in Table 3. The total number of occurrences of infertility (262) is greater than the number of infertile women examined clinically (186) because of the presence of more than one cause of infertility in 80 (43%) of the women (Table 4).

The most frequent causes for female infertility (Table 3) were disturbances to tubal patency (bilateral tubal occlusions and acquired tubal lesions, 36.5%) and pelvic adhesions (23.6%). Investigation

of the causes of disturbances to tubal patency indicated that 25.3% of women had chronic salpingitis and 8.6% had sactosalpinx. The most frequent etiology was mycoplasma (18.6%). In 5.4% of cases, adhesions were due to postoperational complications (tubectomy recorded in the medical history).

Clinical investigation of infertility causes among the study men

Among the males investigated, 45.7% had identifiable defects upon semen analysis, while 54.3% had no demonstrable cause of infertility. In 9.1% of cases no spermatozoa were found (obstructive azoospermia and idiopathic infertility with azoospermia). In the remaining 36.6% of cases, there were different variants of pathospermia. The distribution of male infertility causes according to the diagnostic cate-

Table 4: Distribution of number of causes of infertility per female patient

No. of distinct causes of infertility present	No. of patients
One	90 (48.4)*
Two	68 (36.6)
Three	9 (4.8)
Four	3 (1.6)
No diagnosis made	16 (8.6)
Total	186 (100.0)

* Figures in parentheses are percentages.

Table 5: Distribution of causes of infertility among the study men

Diagnosis	No. of cases identified	% of all cases identified	% of men affected
No demonstrable cause	102	52.9	54.3
Isolated seminal fluid abnormalities	1	0.5	0.5
Congenital abnormalities	1	0.5	0.5
Acquired testicular damage	1	0.5	0.5
Varicocele	21	10.9	11.3
Male accessory gland infection	8	4.1	4.3
Immunological causes	3	1.5	1.6
Endocrine causes (hypoandrogenism)	1	0.5	0.5
Idiopathic infertility with oligozoospermia	20	10.4	10.7
Idiopathic infertility with asthenozoospermia	14	7.3	7.5
Idiopathic infertility with teratozoospermia	4	2.1	2.2
Obstructive azoospermia	16	8.3	8.6
Idiopathic infertility with azoospermia	1	0.5	0.5
Total	193	100.0	103.0

gories in WHO guidelines is shown in Table 5. The most frequent causes of male infertility were idiopathic infertility or pathospermia (20.9% in total) and varicocele (11.3%).

Discussion

Comparison of the present data with the results of WHO investigations made in 33 centres in 25 countries (7) indicates that there are a number of anomalies in the nature and causes of infertility in Western Siberia. In particular, the female infertility level was higher (52.7% vs 31%) than in developed countries and the male infertility level was lower (6.4% vs 22%), relative to the WHO data. This discrepancy probably arises because of the different risk factors and the intensity of their effects on both sexes. Notably, a high frequency of artificial abortions (in 53.7% of women with secondary infertility the last gestation ended with an induced abortion) and a high rate (24.1%) of complications after birth and abortion were found in this study. The cumulative number of pregnancies among the epidemiological group was 7852, 1043 of which involved couples with secondary infertility; thus every seventh gestation in Tomsk results in infertility.

According to our investigations, no obvious cause of infertility was found for 2.2% of couples. The diagnosis "no demonstrable cause of infertility" according to WHO criteria occurred in 3–14% of cases in different geographical regions, but was more frequent in developed than in developing countries. Our data on the distribution of infertility causes in women are comparable to those of the WHO multicentre study (4). According to WHO findings the most prevalent disorders (36%) are occlusive

tubal diseases resulting primarily from inflammation. Infections constitute the most important and most preventable cause of infertility. Primary infertility among women is generally the result of infection with sexually transmissible diseases (STDs); secondary infertility is probably the result of postabortal or postpartum infection, with a smaller contribution from STDs. In certain parts of the world, and particularly in Siberia, the prevalence of pelvic infection and the lack of an efficient programme for its prevention and treatment have led to high levels of infertility with serious social consequences. Endometriosis as a cause of infertility was revealed less frequently in the present study (3.2%).

The distribution of causes of infertility among males was not remarkable but genital infection played a lesser role in the development of infertility among males than among females, and only in 8.6% of cases did it result in obstructive azoospermia. Therefore, inflammatory complications among women were 4.2 times more frequent than among men, probably as a result of anatomic and physiological differences.

Idiopathic disturbances of gonad function in men accounted for 20.9% of the infertility causes. These data confirm that understanding about male reproductive function is fragmentary and insufficiently studied in many respects, and that fundamental studies are needed in this area.

It should be underlined that the frequency of infertility in Western Siberia (16.7%) exceeds the 15% critical level defined by WHO. In this regard, infertility can be considered a leading factor that affects demographic indices in the region. The present study testifies to the need to elaborate a programme to prevent and treat this pathology in the region.

Résumé

Estimation de la prévalence et des causes de la stérilité en Sibérie occidentale

Cette étude examine l'épidémiologie et les causes de la stérilité à Tomsk (Sibérie occidentale), en utilisant les approches méthodologiques recommandées par l'OMS. Pour estimer l'incidence de la stérilité, nous avons interrogé 2000 femmes mariées de 18–45 ans, sélectionnées par tirage au sort. À partir des réponses fournies par les personnes interrogées, 333 couples ont été considérés comme stériles, aucune conception n'ayant eu lieu après 12 mois ou plus de rapports sexuels non protégés. Ce groupe de couples stériles s'est vu proposer des investigations cliniques poussées, mais seuls 186 d'entre eux ont utilisé cette possibilité.

Le taux de stérilité était de 16,7% à Tomsk, soit une valeur supérieure au taux critique de 15% défini par l'OMS. La stérilité était due à des affections de l'appareil reproducteur féminin chez 52,7% des couples et à des affections de l'appareil reproducteur masculin chez 6,4% des couples. Chez 38,7% des couples, les deux conjoints souffraient de stérilité, et dans 2,2% des cas la cause de la stérilité était inconnue.

Chez les femmes, la stérilité secondaire était prédominante (12,9% de l'ensemble des femmes interrogées), une stérilité primaire étant observée dans 3,8% des cas. La stérilité était le plus souvent due à des troubles de la perméabilité tubaire (36,5%) et à des synéchies utérines (23,6%), consécutifs à une inflammation des voies génitales hautes. Une pathologie endocrinienne a été trouvée dans 32,8% des cas. La stérilité masculine était le plus souvent due à une maladie inflammatoire des glandes sexuelles annexes (12,9%). Dans 8,6% des cas, l'infection entraînait une azoospermie par

obstruction du tractus génital. Un varicocèle était observé dans 11,3% des cas et des anomalies idiopathiques de la spermatogénèse dans 20,9% des cas. Les complications inflammatoires étaient 4,2 fois plus fréquentes chez les femmes que chez les hommes.

Les causes de la stérilité ont pu être identifiées chez 97,8% des couples stériles après une investigation complète pratiquée chez les deux conjoints conformément aux lignes directrices de l'OMS. Les résultats obtenus peuvent être utilisés comme point de départ de programmes de protection de la santé reproductive dans la population.

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