Chapter 1

Epidemiology and Initial Assessment of the Infertile Patient

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1.1 Introduction

This chapter discusses the epidemiology of infertility and the importance of the initial assessment of people with infertility. Profound changes in society over the past two decades challenge previously agreed upon norms in our understanding of the nature of parenthood and family. Defining infertility in a contemporary context has thus also changed as the profile of those seeking advice has evolved. Nevertheless, it remains essential that efficient mechanisms for referral and investigation are established for those involved in the planning of fertility services. These must involve a good liaison between primary care providers and medical, nursing and diagnostic laboratory staff in specialist centres. Adherence to agreed upon protocols will facilitate appropriate and timely investigation along standardised paths, thereby minimising risk of delay and repetition of tests which those seeking assistance find particularly demoralising. Once a diagnosis is reached it should be possible to offer people with infertility an accurate prognosis and the opportunity to consider the issues relevant to treatment choices for their particular situation.

1.2 Epidemiology

The International Glossary on Infertility and Fertility Care (2017) [1] highlighted the importance of rigour in using terms and definitions relevant to fertility care. It is now acknowledged that infertility is a disease of the reproductive system which in some instances leads to significant disability. Acceptance of this has, in many countries, been a major driver in establishing equity of access to care, though in the United Kingdom this remains an as yet unmet challenge.

Fecundity is a term describing the natural capacity of a woman to have a live birth. Fecundability refers to the chance of a pregnancy being established during a single menstrual cycle, in a woman with adequate exposure to sperm and who is not using contraception, which leads to a live birth. In population studies fecundability is usually measured as a monthly probability.

The Total Fertility Rate (TFR) refers to the average number of live births a woman will have in the totality of her reproductive life. This may be determined in retrospect to an individual through observed data. If applied to a group of women, for example, all women in a certain year, it is referred to as a Cohort Total Fertility Rate (CTFR) and is determined after all women have completed their reproductive years. In England and Wales the TFR in 2017 was 1.76 births per woman. This represented the fifth year in succession in which the rate had declined. In 2012 the level was 1.94 (Figure 1.1).

The Age-Specific Fertility Rate (ASFR) describes the number of live births per woman in a particular age group in a specific calendar year expressed per 1,000 women in that age group. This has declined in every age group in recent years except for women older than 40 years, in whom there has been an increase, with levels now at their highest since 1949. Delaying childbirth and the impact of fertility treatments in older women are major influences on these interesting trends.

The TFR can also be estimated for a population of women over a defined period of time. The Period Total Fertility Rate (PTFR) is the number of children who would be born per woman (or per 1,000 women) if she/they were to pass through the childbearing years bearing children according to a current schedule of age-specific fertility rates. The figure is obtained by adding up the single-year ASFRs over the defined period.

Another concept which bears consideration is that of the TFR level required to sustain population levels in particular countries. This 'replacement fertility rate' in the developed world is of the order of 2.1, though in developing countries the figure may be much higher due to increased mortality rates, particularly among children.

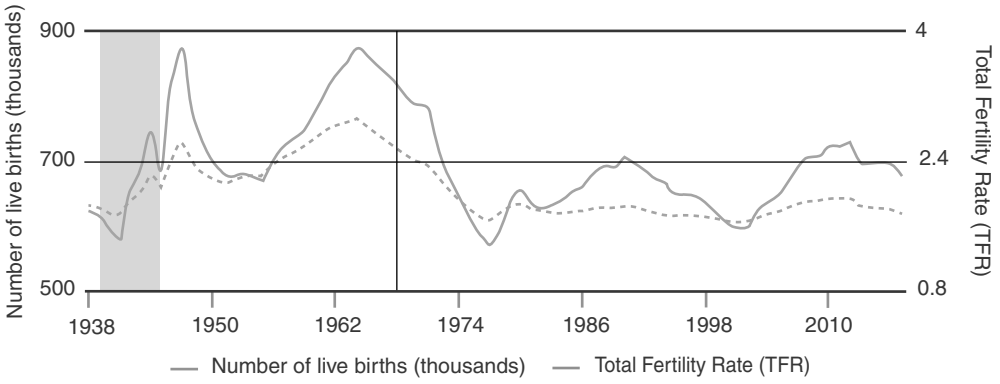

Figure 1.1 Number of live births and Total Fertility Rate (England and Wales) (1938–2017).
Data accessed from Office for National Statistics (UK)
www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthsummarytablesenglandandwales/2017

Analysis of global population trends shows a decline in TFR in many developed countries. In the United Kingdom in 2017 the rate was 1.7 whereas in 1950 this figure was 4.7. In sub-Saharan Africa the figures for TFR are higher, for example, Uganda 5.2. In many other areas of the world the TFR is very low and much below that required to sustain population levels. Three key factors are involved in these trends – fewer deaths in childhood mean women today have fewer babies; men and women have greater access to contraception; and more women are in education and working. Age at first birth is rising in many countries and in the United Kingdom is now approaching 30 years. Among women born in 1972 the average age at first birth is 31 years. For women born in 1945 the figure was 23–24 years. The consequence of these trends will have a significant effect on the demography of populations, with fewer young people available to resource the care of an increasingly aged population. Migration may to a degree mitigate against these trends but the problems for some countries will have very profound implications for society in the future.

In any population, not all women without children at the end of their reproductive life are infertile. Voluntary childlessness is not an uncommon lifestyle choice. Involuntary childlessness, however, may be a consequence of not establishing a life partnership with a member of the opposite sex, or where a person has had the misfortune of all children having died. A major cause of involuntary childlessness, however, is infertility. Same-sex relationships are an established societal norm in many parts of the world and thus infertility as a term now has to take account of the potential use of third-party reproductive techniques in assisting those seeking to have a child and where, after exposure to treatment over a defined period of time, pregnancy has failed to establish and no live birth has ensued.

In practice the term 'infertility' can be interchangeable with 'subfertility' although it is debatable as to whether the term subfertility is useful. Sterility should be regarded as a permanent state of infertility. The Glossary defines infertility as 'a disease characterised by the failure to establish a clinical pregnancy after 12 months of regular unprotected intercourse, or due to impairment in a person's capacity to reproduce either as an individual or with his/her partner'.

The use of the specific time frame is both necessary and based on sound epidemiological data. The length of exposure time considered is determined by the observation that in the general population, which would include a proportion of couples with infertility, one would expect the chance of a woman becoming pregnant in any individual cycle (fecundability) to be around 20%. By 1 year of exposure about 85% of couples would have established a pregnancy and by the time 2 years has elapsed this figure will have reached 92% [2]. For couples presenting with more than 4 years' unwanted childlessness the prospects for becoming pregnant without assistance are very low. In practical terms the failure to achieve pregnancy causes enormous distress to those affected. For people with fertility problems, using a definition of a year to describe infertility is usual and most will have sought medical advice or assistance by that time.

Age-specific fertility rates for women decline in association with increasing age, though in an ultimately fertile group of women it is not certain that their monthly fecundability (% chance of establishing a pregnancy leading to a live birth) is any less than in younger cohorts. It may be sensible to consider specialist referral of women over the age of 35 years in advance of 1 year. However, it should be recognised that in many instances pregnancy will be established without medical assistance in these cases, since it can be assumed that a proportion will not be infertile.

Infertility is often categorised as either primary or secondary. Primary female infertility refers to a woman who has never been diagnosed with a clinical pregnancy. Primary male infertility refers to a man who has never initiated a clinical pregnancy. In both instances women and men should meet the criteria for the definition of infertility. Secondary female infertility refers to a woman unable to establish a clinical pregnancy who has previously been diagnosed with a clinical pregnancy. Secondary male infertility refers to a man who has previously initiated a clinical pregnancy but is now unable to do so. A clinical pregnancy refers to a pregnancy diagnosed by ultrasonographic visualisation of one or more gestation sacs within the uterus or definitive clinical signs of pregnancy or a clinically documented ectopic pregnancy.

Estimates of the prevalence of infertility in the population are influenced by the duration of infertility used in the definition and the setting of the population studied, for example, primary care or hospital clinics. Community-based data will give the most accurate reflection of prevalence within the general population but these studies are few in number. Published prevalence studies suggest a range of lifetime risk of infertility varying from 6.6% to 32.6%. One population-based study in the north east of Scotland which took account also of pregnancies resulting in miscarriage and ectopic pregnancy found a prevalence of 14% using a 2-year definition.

In global terms the prevalence of infertility seems to have changed little in the last 20 years. In the United Kingdom setting a number of factors have been a matter of concern with respect to their potential impact on the prevalence of infertility. These include the incidence of sexually transmitted infection (STI) such as *Chlamydia trachomatis* in the young. In addition, there have been suggestions that environmental factors may affect male fertility. As alluded to earlier, profound questions have been raised about the effects on female fertility of delayed childbearing as determined by changes in lifestyle and working patterns. Despite these legitimate concerns, when the population-based study was repeated [3] the observed prevalence of infertility had not increased in north east Scotland in the succeeding 20 years.

Data from a review of worldwide prevalence studies, using a 5-year definition and live birth as the outcome, suggest that nearly 50 million couples worldwide are infertile. This includes 1.9% of couples wishing to have a first child who have primary infertility and 10.5% of those who have previously had a live birth experiencing secondary infertility. Regional variations were noted in this study in the overall prevalence, particularly in relation to secondary infertility with, in some Eastern European; South-East Asian; and West, Central and Southern African countries, more than 20% of couples affected (Figure 1.2). This is most likely due to the prevalence of infective complications following miscarriage, abortion or childbirth as well as the acquisition of sexually transmitted infections in these settings. A previous study using a shorter duration of infertility as the definition suggested the worldwide figure could be as high as 80 million couples. This review also suggested that the overall prevalence of infertility changed very little worldwide between 1990 and 2010.

A lack of observed change in prevalence should not encourage complacency in respect of public health responsibilities. Opportunities to prevent infertility are limited, and encouragement to the young to engage in safe sexual practices limiting exposure to risk of STI is clearly important. For teenage girls, rubella immunisation programmes should be in place. HPV vaccination programmes are now established. Education of the public about the known decline in fertility which occurs with age, particularly in women older than 35 years of age, is also important. Furthermore, the need for folic acid supplementation for women to reduce the risk of neural tube defect should be promoted as well as the need to make certain lifestyle adjustments on issues such as the potential need to moderate levels of smoking and alcohol consumption as well as achieving optimal weight. There is convincing evidence that smoking, active or passive, affects reproductive performance in women, and men, as well as increasing the risks in pregnancy of small for gestational age infants,

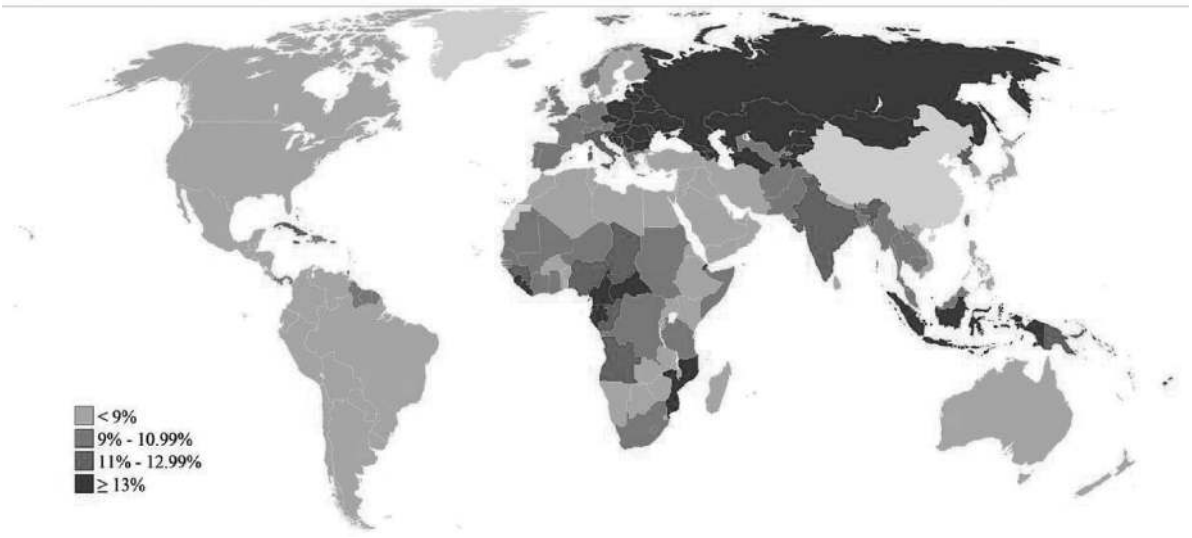

Figure 1.2 Prevalence of secondary infertility among women who have had a live birth previously and seek another, in 2010.
Data from: Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA.
National, Regional, and Global Trends in Infertility Prevalence since 1990:
A Systematic Analysis of 277 Health Surveys.
PLoS Med 2012;9(12): e1001356.

stillbirth and infant mortality. Referral to a smoking cessation programme to support efforts in stopping smoking should be available to those who find giving up the habit difficult. Chronic high stress may also have deleterious effects on the biology of reproduction in both men and women as well as have an impact on sexual frequency and performance.

Our public health responsibilities as reproductive medicine specialists thus lie not just in providing fertility care but also in providing people with information and support in planning families and avoiding pregnancy where wished. We also have a professional responsibility to ensure that women are provided with safe services in relation to unwanted pregnancy and miscarriage as well as safe care in pregnancy and childbirth.

1.3 Initial Assessment

1.3.1 Primary Care

In our UK setting the role of the general practitioner is crucial. Infertility represents a deeply personal problem, and many individuals will prefer to discuss intimate matters with someone they know and trust. The support that the GP can provide in terms of counselling and preliminary investigations is an excellent foundation for provision of care. Not infrequently the man and woman may be registered with different GPs. One should always consider that infertility is a problem affecting both parties and each may contribute to the pathogenesis. Once referral is made to a specialist clinic the stresses imposed on couples may increase, with demands on their time for attendance, the indignity of some of the investigations carried out and the invasion of privacy that occurs. Since it is well recognised that infertility investigation and treatment pose real threats to domestic stability, it is the GP, through knowledge of the couple and their families, who may be in the best position to provide support for those struggling to come to terms with continued disappointment.

All patients should be seen as couples in appropriate surroundings. Facilities should be available to permit examination of both partners and with sufficient time, usually half an hour, set aside to make an adequate overall assessment of the problem.

It may be helpful for the local fertility clinic to employ dedicated liaison staff to assist with the referral process and guideline dissemination. In some instances, tubal assessment might be organised in primary care, though before committing to intrusive investigation it would be wise to have information on

semen quality beforehand. This can be difficult where the male partner has a different GP than the female partner, but improved communication within primary care can resolve this issue. Bearing in mind the statutory requirement in offering licensed treatment to take account of the welfare of the potential child or existing children it is essential that GPs give this some thought at this early stage to avoid difficulties in later management.

1.3.2 Specialist Centre Care

This should be provided in a setting under the clinical direction of a consultant gynaecologist with a special interest in infertility. Patients should be seen in a dedicated infertility clinic with appropriate appointment times to permit thorough evaluation. A team system should be established involving medical, nursing, laboratory (endocrine and andrology) and counselling personnel to facilitate a consistent and co-ordinated approach to care. The level of treatment options available will depend on the expertise of, and the facilities available to, staff at each centre.

1.3.3 The Infertility Consultation

The point at which any couple might seek assistance will be influenced by a number of factors, not least the degree of anxiety which couples feel in confronting seemingly relentless monthly disappointments. Any couple worried about their fertility should thus be seen by their GP, regardless of the duration of their infertility. It is unusual for couples to present if this is less than a year but it may be apparent to individuals that they may be at risk of a fertility problem and seek advice at an early stage. For example, the man may have had a vasectomy, or undergone testicular surgery in childhood, for example, orchidopexy; either partner may be a survivor of childhood cancer and have undergone chemotherapy; or the woman may be aware of an association of absent or irregular periods with infertility. For some a concern through the high profile which infertility now attracts in the media may have eroded self-assurance about personal fecundity. Unless there is a clear need on the basis of history or examination of either partner, further investigation is usually unnecessary, if the duration of infertility is less than 1 year. Providing the couple with an outline of their excellent fertility potential may be all that is required to set their minds at rest. However, couples who present early may themselves have particular concerns or have problems which merit sympathetic discussion. A little more urgency may also be required in the investigation of couples where the female partner is over 35 years of age.

Three simple questions require to be addressed in the assessment of infertile individuals:

1. Are sperm available?
That is, is there evidence of normal sperm production and ejaculatory competence?

2. Are eggs available?
That is, is the woman ovulating?

3. Can the gametes meet?
That is, is female pelvic anatomy normal and is coital function adequate?

Steps in the process of investigation of infertility should be discussed at the outset with the couple in the expectation that all necessary tests would be complete within 4 months. The sequence with which tests are performed is, to some extent, standardised for all but may vary if history or examination findings suggest otherwise. Initial investigations are inexpensive, non-invasive and likely to yield useful information.

Points requiring particular attention in the history and examination of the couple are shown in Tables 1.1 and 1.2.

A psychological assessment of the impact of perceived infertility on individuals and the couple is an essential component of this initial encounter. Libido and consequently coital frequency may be profoundly influenced by the experience of infertility and thus affect prognosis.

1.4 Preliminary Investigations

1.4.1 Male

Semen analysis remains the most important means of assessment. It is desirable, in order to avoid unhelpful and frustrating duplication, for GP-referred assessments to take place in the same laboratory which serves the clinic to which the couple may ultimately be referred. Clear instructions on the provision of samples should be given: a period of abstinence of at least 3 days but no longer than 1 week is desirable; the sample should be kept at body temperature in transportation and should arrive at the laboratory if being provided off site within 1 hour of production. In most instances a single sample will suffice if the result is normal. If

Table 1.1 Initial assessment of female infertility: history and examination

Area of investigation	History	Area of investigation	Examination
Infertility	Duration of infertility Length and type of contraceptive use Fertility in previous relationships as well as in present liaison Previous investigation and treatment Fertility subsequently, if known, in any former partners Previous fertility investigations and treatment	General	Height, weight, BMI Fat and hair distribution (Ferriman–Gallwey score to quantify hirsutism) Note presence or absence of acne and galactorrhoea.
Medical	Menstrual history: • Menarche • Cycle length and duration of flow • Pain • Bouts of amenorrhoea • Menorrhagia • Intermenstrual bleeding Number of previous pregnancies including abortions, miscarriages and ectopic pregnancies Any associated sepsis Time to initiate previous pregnancies Drug history past and present: for example, agents which cause hyperprolactinaemia, past cytotoxic treatment or radiotherapy	Abdominal	Check for abdominal masses or tenderness.
Surgical	Previous abdominal or pelvic surgery in particular gynaecological procedures	Pelvis	Assess state of hymen. Assess normality of clitoris and labia. Assess vagina, looking for such problems as infection or vaginal septa, endometriotic deposits. Check for presence of cervical polyps. Assess accessibility of the cervix for insemination. Record uterine size, position, mobility and tenderness. Perform cervical smear if appropriate.
Occupational	Work patterns including separation from partner		
Sexual	Coital frequency and timing, including knowledge of the fertile period Dyspareunia Post-coital bleeding		

an abnormality is found then the sample should be repeated, usually after 1 month, though resolution of any transient insult leading to defects in sperm production may not be apparent for up to 3 months. If a gross abnormality is noted, for example, azoospermia, the sample may be repeated within a short time interval.

What constitutes a normal result is a matter of debate. Large laboratories may have their own local population based normal ranges, but in the absence of local information the World Health Organization values for definition of normality can be applied [5] (Table 1.3). Such definitions of normality as predictors of pregnancy are poor. More complex tests of sperm function, including their potential for movement, cervical mucus penetration, capacitation, zona recognition, the acrosome reaction and sperm–oocyte fusion, have been developed but in practice are rarely required. Further detailed discussion of the assessment and treatment of male factor infertility is given in Chapter 5.

Table 1.2 Initial assessment of male infertility: history and examination

Area of investigation	History	Area of investigation	Examination
Infertility	Duration of infertility Fertility in previous relationships as well as in present liaison Fertility subsequently, if known, in any former partners Previous fertility investigations and treatment	General	Height, weight, BMI Fat and hair distribution Evidence of hypoandrogenism or gynaecomastia
Medical	Sexually transmitted infection Epididymitis Mumps orchitis Testicular maldescent Chronic disease Drug/alcohol abuse Recent febrile illness Recurrent urinary tract infection	Groin	Exclude inguinal hernia (patient in upright position) Check for inguinal mass e.g. ectopic testicle
Surgical	Herniorrhaphy Testicular injury Torsion Orchidopexy Vasectomy and/or reversal	Genitalia	Note site of testicles in the scrotum an measure volume using an orchidometer Palpate epididymis for nodularity or tenderness Check presence and normality of the vasa deferentia Check for the presence of a varicocele Examine penis for any structural abnormality e.g. hypospadias
Occupational	Toxic substance exposure including chemicals, radiation Time away from home through work		
Sexual	Onset of puberty Coital habits Premature ejaculation Libido/impotence Use and knowledge of the fertile period		

Table 1.3 Laboratory reference range for semen characteristics

Semen parameter	Lower reference limit (5th centiles + 95% confidence intervals)
Semen volume (mL)	1.5 (1.4–1.7)
Total sperm number ($\times 10^6$ per ejaculate)	39 (33–46)
Sperm concentration ($\times 10^6$ per mL)	15 (12–16)
Total motility: progressive + non-progressive (%)	40 (38–42)
Progressive motility (%)	32 (31–34)
Sperm morphology (normal forms, %)	4 (3.0–4.0)

From WHO (2010).

1.4.2 Female

At the outset it is advisable to ensure that the woman has received rubella immunisation, and that she is taking folic acid (0.4 mg/day) to reduce the chance of the fetus developing a neural tube defect (NTD). There may be particular circumstances where a higher dose of folic acid (5 mg) is recommended, for example, patients taking anti-epileptic medication, obese individuals (BMI >30 kg/m^2), either partner or previous child with NTD, or women with diabetes, coeliac disease or thalassaemia. It is recommended that folic acid supplementation continue up to 12 weeks of gestation.

The preliminary investigation centres on the need to demonstrate that the woman is ovulating. This is almost certainly the case if she has a regular monthly cycle. Laboratory evidence may be obtained through

measurement of serum progesterone in the putative luteal phase of the menstrual cycle. Levels would be expected to be in excess of 30 nmol/L 7 days after ovulation but levels lower than this do not necessarily preclude the chance that ovulation is occurring. For this reason, sampling should be arranged for day 21 in the context of a 28-day cycle, with serial checks made beyond this point if the cycle is more prolonged or variable in length. Results should be interpreted only in relation to the onset of the subsequent period. If the level is below 20 nmol/L the test may be repeated in a subsequent cycle. In the absence of any clues in history or examination to suggest the possibility of an endocrine disorder these tests would be sufficient. If, however, there is a history of irregular menstruation, or periods of amenorrhoea, in particular if associated with galactorrhoea, hirsutism or obesity, then additional biochemical tests are appropriate. This might include measures of thyroid function, prolactin and androgen production. This will be discussed further in Chapter 2. Robust evidence to suggest that the use of temperature charts and luteinising hormone (LH) detection methods to time intercourse increases the chance of conception is lacking and their routine use should be discouraged.

Thyroid function screening is now routinely offered to all women with infertility. Subclinical hypothyroidism is thought to be associated with an increased risk of miscarriage. It is recommended that serum thyroid-stimulating hormone (TSH) levels should be <2.5 mU/L in women pre-pregnancy in order to prevent early pregnancy loss and optimise obstetric and perinatal outcomes. If levels are higher than this, then screening for thyroid autoantibodies should be carried out. If antibody testing is positive, then low-dose thyroxine replacement therapy (25–50 μg/day) should be initiated to achieve a serum TSH <2.5 mU/L. If autoantibody screening is negative, then it is suggested that repeat testing of TSH should be carried out in 6 months. If the serum TSH level is >4.0 mU/L at the outset of screening, then thyroxine should be initiated. The evidence base is presently not strong with regard to thyroxine administration in this way reducing miscarriages but current guidelines suggest this to be appropriate (Figure 1.3).

Chlamydia trachomatis is present in more than 10% of the young sexually active population. It is a major cause of pelvic infection and the sequelae of pain, ectopic pregnancy and tubal factor infertility are well recognised. The prevalence of *C. trachomatis* in infertile women is less than 2% but uterine instrumentation may lead to upper genital tract spread of endocervical colonisation. This may lead to pelvic infection and tubal compromise in women with or without pre-existing tubal disease. Screening for *C. trachomatis* should be integral to the workup of the infertile woman and, if positive, treatment should be administered and appropriate specialist genitourinary medicine clinic referral made. Bacterial vaginosis may also be detected through screening and should be treated in symptomatic women or where uterine instrumentation is required.

The investigations outlined in the foregoing can be initiated by the GP but they also provide the basis for hospital investigation. It may be helpful to send the couple a questionnaire to supplement the information provided in the GP's referral letter. Valuable time can be saved if progesterone monitoring, evidence of rubella immunisation, *Chlamydia* screening and semen analysis are performed in line with current guidelines before referral to the fertility clinic.

In the specialist clinic setting a pelvic ultrasound examination will be useful. It may reveal potentially significant pathology, for example, fibroids, intrauterine polyps and ovarian cysts, which might be missed in bimanual pelvic examination. Assessment of the antral follicle count should be carried out. This measure of ovarian reserve may be particularly useful in women who have irregular/short cycles occasionally associated with premature ovarian insufficiency (POI). If there is a suspicion of POI on ultrasound it may be appropriate to test this further through measurement of anti-mullerian hormone (AMH). Low levels will reinforce the suspicion of POI and may influence the pace at which fertility treatment may be offered. A polycystic appearance of the ovaries may be found in normally cycling women as well as those with classic features of infrequent periods and signs of androgen excess. Tests of ovarian reserve will be discussed in more detail in Chapters 2 and 7.

1.5 General Advice for Practitioners to Give to Patients

Table 1.4 gives a summary of lifestyle advice which health professionals should provide to infertile patients. There is reasonable evidence to support the suggestion that smoking reduces female fertility, while in men it is known that smoking may affect sperm quality.

In men there is evidence that high alcohol intake can influence reproductive function adversely, as well

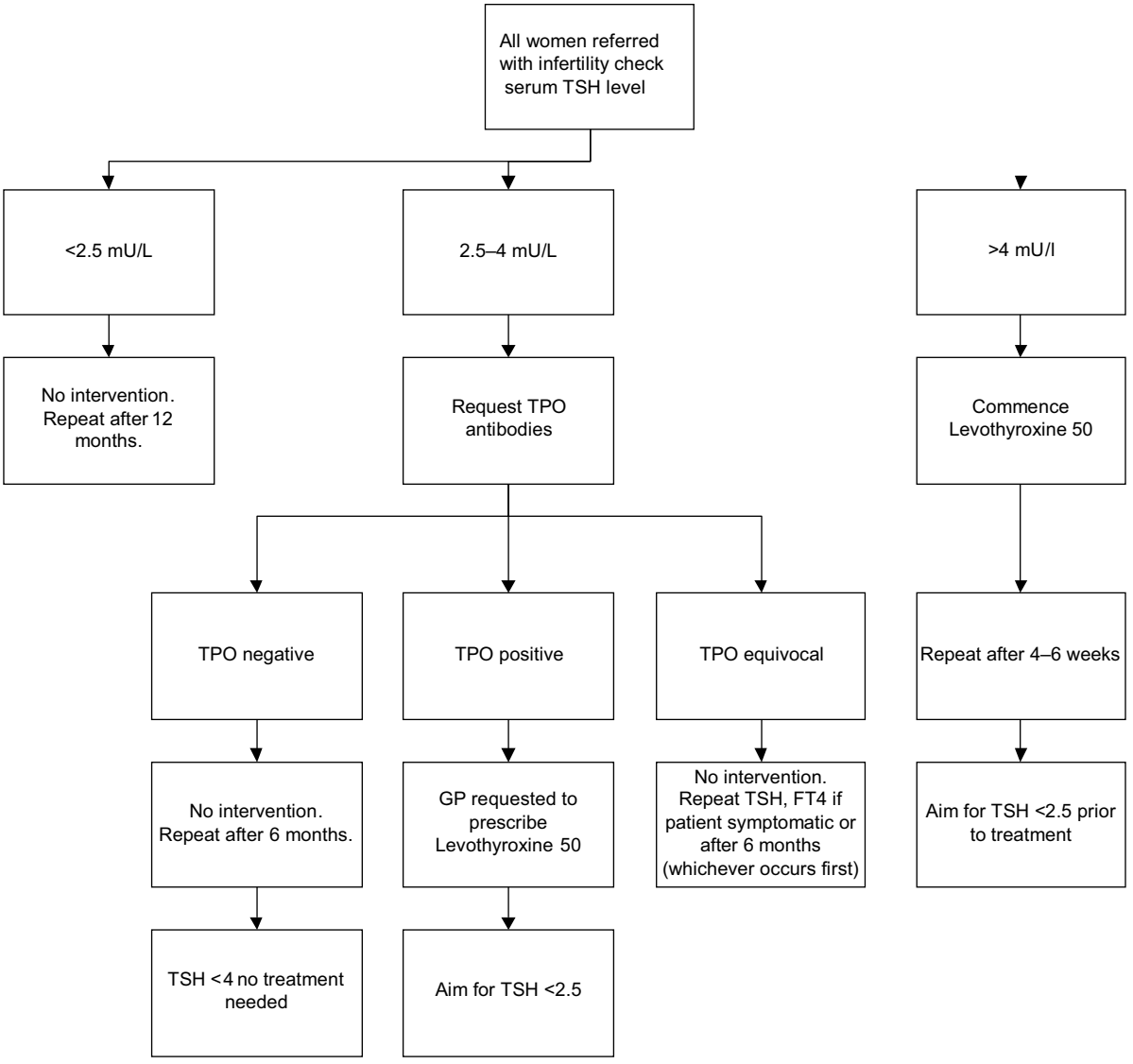

Figure 1.3 Thyroid function testing in infertility care.

as general health. A maximum of 3–4 units per day should be advised. There is less convincing evidence linking alcohol and female fertility, but intake in excess of 2 units per day of alcohol more than twice a week, as well as episodes of intoxication, should be discouraged.

There is no consistent evidence at the present time with respect to caffeine use and fertility in men and women. The use of recreational drugs including marijuana and cocaine may adversely affect ovulatory function and tubal function. Appropriate advice should be given.

Women with a body mass index in excess of 30 should be encouraged to lose weight as, in those with disturbed regulation of ovulation, this alone may restore normal function, or alternatively enhance the response to treatment where instituted.

While there is some evidence that sperm parameters may be adversely affected by very frequent ejaculation the evidence suggests that fertility potential is unaffected. Bearing in mind that sperm survival can be expected for up to 7 days within the female reproductive tract, couples should be advised to have intercourse every 2–3 days to optimise the chance of

Table 1.4 Summary of lifestyle advice given to patients

Advice	Action
Smoking	Advise both partners to stop.
Alcohol	Both partners need to limit alcohol intake if attempting to conceive.
BMI	Encourage women with a body mass index in excess of 30 to lose weight.
Sexual intercourse	Couples should be advised to have regular intercourse at least two or three times per week.

conception. Hyperthermia may adversely affect sperm quality and should be avoided.

1.6 Further Tests

1.6.1 Female

Where preliminary investigations suggest that the woman is ovulating and sperm production is satisfactory, pelvic assessment should be considered. For those with symptoms of painful periods or examination findings suggestive of pelvic pathology then laparoscopy and dye hydrotubation will be the investigation of choice. Endometriosis and peritubal adhesions may be found. If a suspicion of pelvic pathology is entertained before surgery then permission may be given for a 'see and treat' approach allowing simple measures, for example, ablation of endometriosis, adhesiolysis, ovarian cystectomy or tubal surgery, to be carried out during the 'diagnostic' procedure.

Hysterosalpingo-contrast sonography (HyCoSy) is an outpatient investigation which may be used to evaluate tubal patency. Similarly, an x-ray hysterosalpingogram (HSG) may also be used as a first-line examination in women with a low risk of pelvic pathology. Tubal assessment should not be carried out if the patient is menstruating. In addition, women should be advised to avoid conception in the cycle in which the procedure is carried out. If unprotected intercourse has occurred, then the examination should be deferred.

It is important to ensure that antibiotic treatment, for example, with azithromycin or doxycycline, is given at the time of uterine instrumentation to those women at risk of *Chlamydia* infection.

It is debatable whether assessment of tubal status is necessary in situations in which women present with long-standing, otherwise unexplained, infertility. Present evidence would suggest that minor abnormalities of the uterine cavity such as tubocornual polyps may be of little importance in the genesis of infertility. Saline infusion sonography can facilitate visualisation of intrauterine and tubal pathology. Prospective studies are also awaited to determine whether hysteroscopy may have a part to play in the routine investigation of infertile women, though in women with identified intrauterine abnormalities hysteroscopic surgery may be feasible.

1.6.2 Male

The capacity of sperm to fertilise an egg depends on a complex series of biological events including transport to the site of fertilisation, sperm–egg recognition, the acrosome reaction and fusion of the sperm to the oocyte. Dispute remains with respect to the value of the post-coital test (PCT) in providing information about sperm function in the man. Review of the literature would suggest that the test lacks validity for routine use. Nevertheless, if sexual dysfunction is suspected, or the male partner cannot or will not provide a semen sample for analysis, the PCT may have a place, even at an early stage in investigation. It is crucial that the test is done at the correct stage in the cycle, that is, at the time of maximal cervical mucus production prior to ovulation. Inappropriate timing of the test may provide misleading information and cause unnecessary concern. Ideally, mucus production should be assessed daily using an objective method. Occasionally, mucus production may be poor until the day of the beginning of the LH surge and this may indicate a functional problem within the cervix, an unusual situation even in cases in which there has been previous cervical surgery. This need for precise timing leads to a sex-on-demand approach to investigation which may produce additional strain and tension for an already overburdened couple trying to cope with the stress of their infertility and their associated loss of self-esteem.

Other tests of sperm function including computerised analysis of sperm-movement characteristics and sperm cervical mucus penetration tests, DNA fragmentation, are not recommended for routine use, nor are the testing for anti-sperm antibodies in semen. The place for such tests will be discussed in Chapter 5.

1.7 Reaching a Diagnosis

The management of people with infertility problems is largely dictated by the major diagnostic category into which they fit. Typical figures are shown in Table 1.5.