In your role as a midwife, you will need to have a sound knowledge and understanding of the anatomy of the female pelvis in order to be able to competently assess a woman’s progress in labour. This involves you being able to identify the relationship between the position and descent of the woman’s fetus and the relevant landmarks of her pelvis. Where you are able to do this competently, you should then be able to recognise any deviations from what is recognised as normal physiology and acceptable labour progress and, where there is an indication, facilitate appropriate referral to a medical practitioner (obstetrician), or emergency procedure.

So what does the human pelvis do?

Primarily, the pelvis acts as the main support for the upper part of our body. It transmits our body’s weight to our legs, which enables mobility – walking and running - and flexibility of movement when we stand in an upright posture. There are distinct differences between the types of pelvis that characterise each gender – male and female - in particular reflecting the female function of reproduction and childbirth.

The information in this section is designed to provide you with a brief introduction to the anatomy of the female bony pelvis. It should therefore, be read in conjunction with more detailed information that is available from specific anatomy and physiology textbooks.

The gender differences

The female pelvis differs from the male pelvis, being overall broader with a rounded brim that is conducive to its specific role in childbearing. The female pelvis also acts as a protective structure for the reproductive organs – the uterus and ovaries - as well as the bladder and rectum and, to a much lesser extent, the organs in the lower abdomen. The physiological changes that take place during the course of pregnancy cause alterations in the composition of the pelvis, its shape, and the plane of inclination and internal dimensions of the true pelvis. All of these changes serve to support the pregnant uterus throughout the term of pregnancy and assist with the normal mechanisms of childbirth.
The distinct differences between the female and male pelvis are as follows (see Fig 1):

- The female pelvis is broader than the male pelvis and the female pelvic bones, including a woman’s neck of femur, are more slender than those of a man.
- The outline of the male pelvic brim is heart-shaped and the brim is widest towards the back of the pelvis, whereas the female pelvic brim is transversely oval with its widest diameters further forwards. This is due to the female sacral promontory being less prominent.
- The female pelvis is designed for childbirth; therefore, the pelvic cavity is much roomier with sufficient space to carry a baby. The outlet is also wider than that of the male pelvis to facilitate vaginal birth.
- The male supra-pubic angle is acute, often likened to the shape of a Gothic-style arch, whereas in the female pelvis, it is more rounded like a Roman-style arch.

The composition of the bony pelvis

The human pelvis comprises four bones - two innominate (or ‘hip’) bones, the sacrum (which forms the rear of the pelvis) and the coccyx (which forms the base of the spine and pelvis); together, these bones enclose the pelvic cavity. The sacrum is wedged between the two innominate (hip) bones; these innominate bones are joined in the front (anteriorly) at the symphysis pubis (Fig 2).

These four bones connect at four joints, all of which, allow varying degrees of movement:

- Two sacroiliac joints, which have some movement.
- The symphysis pubis, which has some movement.
- The sacrococcygeal joint, which allows free movement.

Each innominate bone has three components:

- Ilium
- Ischium
- Pubis (or pubic bone)

The Ilium

This is the large broad bone, the top of which (the ‘iliac crest’ or ‘crest of ilium’) is felt when a woman rests her hands upon her hips. Anterior to the iliac crest, at its uppermost point, is a bony prominence; this is called the anterior superior iliac spine, and just below it is the anterior inferior iliac spine. To the back of the iliac crest are two similar points – the posterior superior and posterior inferior iliac spines. The large shallow depression that forms much of the inner surface of the ilium above the pelvic brim is called the iliac fossa. There is a ridge beneath the iliac fossa; this is the iliopectineal line which is a significant landmark in midwifery and obstetrics, as it separates the false pelvis from the true pelvis (described later in this section). The iliopectineal line has a prominence at the juncture where the ilium and pubis fuse – this is known as the iliopectineal eminence.
The female pelvis

The Ischium

This forms the lower part of the pelvis and is a much smaller, but broader and thicker L-shaped bone that connects to the ilium at the back (posteriorly) and the pubis anteriorly. It has a large, thickened area of bone (prominence), known as the ischial tuberosity, which is the structure that the body rests on when a person is in a seated position. The tuberosities can be easily felt through the muscle of the buttocks. Behind the ischial tuberosity and a short distance above it, is an inward projection; this is called the ischial spine. When assessing a woman’s progress in labour and the descent of the fetus through the pelvis, ‘the station’ or level of the presenting part (cephalic or breech) is estimated in relation to the level of the ischial spines (Fig 3). Where the ischial spines are noticeably prominent, this can indicate that the space available for the fetus to pass through is reduced, which may influence the mode of delivery.

The Pubis (or pubic bone)

The pubis, also commonly referred to as the pubic bone, is a much smaller bone that forms the front, or anterior aspect of the pelvis. It has a main body and two arm-like structures which protrude out; these structures are called rami and are positioned on either side. They are referred to as the superior (upper) ramus and the inferior (lower) ramus. The inferior ramus attaches to the ischium and the superior ramus attaches to the ileum at the iliopectineal eminence. It forms one-fifth of the acetabulum. The two pubic bones meet at the symphysis pubis and the two inferior rami form the pubic arch, combining with a similar ramus on the ischium. The suprapubic angle needs to be at least 90° in order to allow the baby to pass underneath it during a vaginal birth. The triangular-shaped space enclosed by the body of the pubic bone, rami and ischium is known as the obturator foramen.

Each innominate bone has a large cup-shaped socket on its surface – the acetabulum - it is with this that the head of the femur (or ‘thigh’ bone) articulates to form a person’s hip joint.

On the lower aspect of the innominate bone can be found two curves; the greater sciatic notch is wide and rounded, extending from the posterior inferior iliac spine up to the ischial spine. The size of the notch can be used in assessing the overall shape and size of the maternal pelvis. The lesser sciatic notch lies between the ischial spine and the ischial tuberosity (Fig 4).
The female pelvis

The Sacrum

The sacrum forms the back wall of the pelvis and comprises five vertebrae that are fused together to form a wedge-shaped bone. The first vertebra has a protrusion at its upper margin, known as the sacral promontory; where this is too pronounced, it can impede fetal descent through the pelvis. On each side of this first sacral vertebra are widened wings of bone that are referred to as the sacral alae. The sacral bone is perforated by four sets of foramina (holes) and it is through these perforations that the four sacral nerves pass. The anterior surface of the sacrum is concave and is a distinctive feature of the rounded pelvic cavity through which the fetus descends during labour and birth. The sacrum also has an important role in guiding the baby through the maternal pelvis and as part of this navigating around the curve of Carus.

The Coccyx

This is a small triangular-shaped bone, comprising four fused vertebrae that form a non-functional tail that articulates with the lower end of the sacrum. During childbirth, the coccyx moves backwards to help enlarge the pelvic outlet, which assists the baby’s passage to facilitate a vaginal birth. The coccyx also provides attachment points for pelvic ligaments, the muscle fibres of the anal sphincter, and the ischiococcygeus muscle of the pelvic floor.

The true pelvis

The ‘true pelvis’ refers to the bony canal that the fetus needs to pass through during the normal mechanism of childbirth. It comprises a brim, cavity and an outlet.

The pelvic brim

The pelvic brim separates the ‘false’ pelvis which lies above, from the ‘true’ pelvis that is below. The brim is a round shape, with the exception of the sacral promontory which protrudes into it posteriorly. The pubic bones form the anterior border of the pelvic brim; the iliac bones, its lateral borders and the posterior border is formed by the promontory and the sacral alae. It is important that health care professionals are aware of the various landmarks of the pelvis, the fixed parts of the pelvic brim and their significance. These are as follows (Fig 5):

- Sacral promontory (1)
- Sacral ala (2)
- Sacroiliac joint (3)
- Iliopectineal line (4)
- Iliopectineal eminence (5)
- Superior ramus of the pubic bone (6)
- Upper inner border of the body of the pubic bone (7)
- Upper inner border of the symphysis pubis (8)
The female pelvis

**The pelvic cavity**
This extends from the pelvic brim to the pelvic outlet. It forms the curve of Carus, which the fetus has to navigate in order to be born and has no specific landmarks.

**The pelvic outlet**
This is either an ovoid or diamond-shaped space; its perimeter is partially comprised of ligaments. The landmarks of the pelvic outlet are as follows:
- Lower border of the symphysis pubis
- Pubic arch
- Ischial spines and ischial tuberosities
- Sacrotuberous and sacrospinous ligaments
- Lower aspect of the sacrum and the coccyx

**The diameters of the pelvis**
The major obstetric interest in the female bony pelvis is that it is not distensible, with only minor degrees of movement being possible at the symphysis pubis and sacroiliac joints. The various dimensions of the pelvis are therefore particularly significant in the context of childbirth and the successful passage of the fetus through the bony pelvic structure. The most common type of female pelvis (gynaecoid) is considered to be the optimal shape and size for childbirth; this is providing the fetus isn’t above average size and the pelvis isn’t smaller than average, or where there is a combination of both factors.

**The pelvic brim**
There are three diameters that are measured and, as a midwifery student, you will frequently hear these being referred to:
- Anterior-posterior diameter
- Oblique diameter (left and right)
- Transverse diameter

The diagrams presented here (Fig 6) show the points from where these measurements are taken and the associated table (Fig 7) gives a clear format for the measurement of the pelvic canal in centimetres.
The female pelvis

The pelvic planes

The pelvic planes refer to hypothetical flat surfaces on the pelvis, which are located at the brim, cavity and pelvic outlet. Taking the pelvic brim as our landmark, the plane of the brim is an angle of 55° to the horizontal, while the plane at the outlet is 15°. This is due to the difference in the length of the walls of the pelvis anteriorly and posteriorly. The curve of Carus is formed by an imaginary line that is drawn at right angles of these planes.

Pelvic shapes

The shape of the female pelvis determines the availability of pelvic diameters during childbirth. There are four basic pelvic shapes that you are likely to encounter during your midwifery practice; these are as follows:

1. **Gynaecoid** – this is the classical female pelvis with the inlet transversely oval and a roomier, shallow pelvic cavity with a broad well-curved sacrum. The gynaecoid pelvis has a sub-pubic angle of 90° and blunt ischial spines. It is the ideal pelvic shape for childbirth and is commonly seen in women who are of average height and build, with a shoe size of four (EU 37) or greater.

2. **Android** – this type of pelvis is more masculine in its shape and diameters, hence its name. This pelvis is characterised by a heart-shaped inlet and a funnel-shaped, deep cavity; the sacrum is straight rather than curved which results in a contracted pelvic outlet. The sub-pubic arch has an angle that is less than 90° and the ischial spines are prominent, which can hinder internal rotation of the fetal head and ultimately, leads to a deep transverse arrest. Women with this type of pelvis tend to be of shorter stature, often quite heavily built, who tend to present with a baby in the occipito-posterior (OP) position. This category of pelvis is the least favourable for achieving a vaginal birth.

3. **Anthropoid** – this type of pelvis results from high assimilation, ie the sacral body is assimilated to the fifth lumbar vertebra. The pelvic brim is long, narrow and oval in shape, and the anterior-posterior diameter is greater than the transverse diameter. The side walls of the cavity digress and the sacrum is long and profoundly concave. The sub-pubic angle is very wide and the ischial spines are not prominent, so although their pelvic shape tends to predispose them to either a direct occipito-anterior (OA) or direct occipito-posterior (OP) position, on the whole, the labours of women with this shaped pelvis tend to be unproblematic. This pelvic shape tends to be seen in women of above average height with narrow shoulders.

4. **Platypelloid** – this is a wide pelvis that is characteristically flattened at the brim with the promontory of the sacrum pushed forward. This forms a distinctive kidney-shaped pelvic brim. The side walls of the pelvis digress; the sacrum is flat and the pelvic cavity shallow. As a result, the transverse diameter is greater than the anterior-posterior, which means the fetal head needs to engage with the sagittal suture in the transverse diameter. The sub-pubic angle is greater than 90° and the ischial spines are blunt, which means that fetal descent through the cavity is usually unproblematic.