

Course Name :An Overview on Maternal Health Antenatal, Intranatal and Postnatal Care

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Placentation (normal and abnormal)

Welcome you all students. We are here for yet another session for the NPTEL online certified course on the topic an overview on maternal health, the antenatal, intranatal and postnatal care. I am Dr. Barnali Ghosh an obstetrician and gynecologist working at B.C.Roy Medical College and Research Center, IIT Kharagpur. Today our topic of discussion is placenta the normal and the abnormal forms. Concepts covered in today's class are formation of placenta, structure of placenta, placental circulation, grading of placenta, the abnormal types of placentation and a short discussion regarding the tumours of placenta.

Key words being placenta, structure of placenta, after birth and abnormal placentation. So coming to the topic proper this is a picture of you know the fetus in utero within the womb of the mother and it is attached to the placenta through the umbilical cord right. So in this picture, this picture the placenta the type of placenta shown here this is attached to the posterior wall of the uterus. So this is a posterior placenta in the upper uterine segment and the insertion of the cord is more or less at the center of the placenta.

So coming to the development of placenta in the previous class we have discussed regarding fertilization, the formation of zygote and ultimately the implantation of the blastocyst on the decidua of the uterine cavity right. So we will again draw that picture. This is the uterus and the uterine cavity and here the zygote reaches the uterine cavity at the stage of morula on day 4 of fertilization and on day 5 this morula changes to this is the 16 cell structure and this morula will change to blastocyst and there will be shading of the zona pellucida called as hatching on fifth day of fertilization. On day 6 implantation starts that means the blastocyst now rests on the decidua. So this blastocyst or the growing embryo will now gradually implant or invade the decidua and this type of implantation is called as interstitial implantation which means that the decidua will surround the developing embryo on all its sides right.

So if we show this as the decidua, this decidua will surround the embryo on all its sides right and depending upon this location of the decidua it has been given different names. The part of the decidua on which the blastocyst gets implanted is called as the decidua basalis and the part

which surrounds the embryo as a capsule is called as the decidua capsularis and part of the decidua which is lining the opposite uterine wall this is called as the decidua parietalis. So we get that this is the decidua basalis. Now coming to the developing embryo the blastocyst divides the cells of the morula into two parts that is the inner cell mass and the outer cell mass and we have learned that the inner cell mass will form the embryo proper whereas, the outer cell mass will be giving you know ultimately forming structures of placenta and the membranes. This outer cell mass also called as the tropho ectodermal cell will divide into cytotrophoblast inside and the syncytiotrophoblast outside and they will form chorionic villi.

So they will form you know these are the chorionic I will draw it with another color say we will take this color and these will be the chorionic villi right. So the chorionic villi which are developing towards the decidua basalis these are called as chorionic frondosum and the chorionic villi which develops towards the decidua capsularis these are called as the chorionic villi right. So as the embryo grows as the embryo grows and the you know this embryo grows and the capsularis will gradually gradually you know push towards the decidua parietalis and at it at one time point of time these decidua capsularis will merge with decidua parietalis thereby obliterating the uterine cavity and as pregnancy progresses this decidua villi will degenerate and there will be further development of this chorionic frondosum. So what happens I will draw it for better understanding this is the you know inner cell mass which forms the embryo and the outer cell mass will be dividing into cytotrophoblast which are distinct cells with nuclei and cell membrane and these are the cytotrophoblast and outside is the syncytiotrophoblast which are multi nucleated syncytium without any designated you know cell membrane and they will form extensions called as the chorionic villi all around and the part of the decidua a chorionic villi which will be towards the decidua basalis this part is called as the chorionic frondosum and the part which is towards the decidua capsularis is called as the chorionic villi. So, these are the chorionic villi and these are the chorionic frondosum this magnified picture of this is drawn here right.

So, what I am going to say is this region or this part which consists of the chorionic frondosum and the decidua basalis these part will form the placenta in the future. So, placenta is developed mainly from chorionic frondosum which is the of fetal origin and the decidua basalis which is of maternal origin. According to this picture is the same picture just we need to label it. So, this is the growing embryo and these are the outer I mean the fimbria sorry fimbria like extensions from the embryo these are the chorionic villi and this is the decidua basalis with the chorionic villi towards the decidua basalis they are called as the chorionic frondosum. This is the chorionic villi, this is the uterine you know other walls of the uterus and this is the uterine cavity right.

This is the decidua capsularis and this part is the decidua basalis. So, ultimately formation of placenta will be from these two structures. So, this will ultimately form the placenta. So, it has

two components number one is the fetal component which is formed by chorionic frondosum and number two is the maternal component which is formed from the decidua basalis. At term the fetal component will be four-fifth of the total placental mass and if the maternal component will be one-fifth of the total placental mass right.

So, this will be at term. Now discussing about term placenta, placenta at term pregnancy this is the placenta which has been you know obtained after the delivery of a term pregnancy and we can see this as a discoid structure a disc like structure and the surface which on to which we are looking at this is a glistening surface it is covered by a glistening membrane underneath the membrane we can see blood vessels these are the blood vessels. They are traversing from the center this is the umbilical cord and the umbilical cord is attached more or less at the center of the placenta and these fetal blood vessels are traversing from the center towards the periphery of the placenta. Now, what I need to know stress this is the diameter of the placenta it has a diameter it has some thickness there are two surfaces of the placenta and there is a thickness intervening thickness. So, this part this part is the thickness of the placenta right.

So, coming to the shape, shape of the placenta is discoid in shape. Diameter of human placenta is more or less 50 to 20 centimeters, thickness the thickness of placenta it varies this is maximum at the center and it gradually becomes less you know at the periphery. So, thickness at the center is more or less 2.5 centimeter on an average. If this thickness is more than 4 centimeter it is called as placentomegaly.

This is a USG finding we when we do antenatal scans we measure the diameter or the thickness of the placenta and if the thickness of the placenta comes out to be more than 4 centimeter it is called as placentomegaly which is seen in some you know known conditions like it can be due to infections placenta you know maternal infections syphilis in diabetes there can be placentomegaly right in erythroblastosis fetalis or RH incompatibility, RH incompatibility there can be placentomegaly in infections there can be placentomegaly right. So, seeing a placentomegaly we need to be cautious and look into the cause of the placentomegaly. According to the weight of the fetus at term placenta at term the weight is 500 grams. The area occupied by the placenta percentage of the area of the uterine wall occupied by the placenta is nearly 30 percent, one third of the uterine wall is occupied by the placenta. This is the placenta approximately one third of the uterine wall is occupied by placenta.

Proportion to the weight of the fetus. So, what is a weight of the placenta we have known it is 500 gram weight of the fetus is 3 kg at term. So, the ratio between the weight of placenta is to weight of fetus comes out to be 1 500 by 3000 gram 500 gram by 3000 gram it comes out to be 1 is to 6 right. Next fetal weight is equal sorry placental weight is equal to fetal weight when. So, there is a point when the weight of the placenta becomes equal to the weight of the fetus and it occurs at 17 weeks of gestation.

At 17 weeks the weight of placenta equals the weight of the fetus and after that the fetus grows and the fetal weight increases and at term the fetal weight is approximately you know 6 times the weight of the placenta. Now coming to placental window what is placental window it is you know from the start of the development of placenta to the end of the development of placenta. So, placenta starts to develop from 6 weeks of gestation and it ends or placenta is fully formed by 12 weeks of gestation this period is called as the placental window. Now coming to Hofbauer cells what are Hofbauer cells they are nothing, but phagocytes within the placenta they help in you know immunological activities macrophages they are macrophages and they help in giving immunity during pregnancy. So, these are the phagocytic cells in the placenta.

Now coming to the surfaces of placenta. So, this is the placenta right and this is the umbilical cord which is attached to the fetus. Now this placenta according to the location of placenta this is fundal right. So, this is the cervix. So, this is the fundus.

So, this is fundal placenta and you know if this is anterior this is posterior it is fundoposterior in location and it has two surface this is one surface which is the fetal surface and the opposite surface which is towards the decidua basalis this is the maternal surface. Here we see this is the maternal surface and this is the fetal surface which is identified by the attachment of the umbilical cord. So, this is the decidua basalis. So, this surface is called as the maternal surface or the basal plate right and on the fetal surface this is the fetal surface here these fetal surface they will give projections or chorionic villi which are formed from the tropho ectodermal cells mainly by the syncytiotrophoblast and the cytotrophoblast. So, these are the chorionic villi these are the chorionic villi or finger like projections which develop from the outer cell mass of the developing embryo.

So, this is you know depicts this is the fetal surface and this layer or this fetal surface is also called as the chorionic plate. So, fetal surface fetal surface is glistening it is covered by amnion with umbilical cord attached at or near the center. Umbilical vessels are visible the fetal vessels are visible beneath the amnion traversing from the center to the periphery and this amnion can be peeled off right it can be separated this membrane can be peeled off from the underlying structures except at the point of insertion of the cord where these two layers fuse and at term we have learned that placenta is four fifth of the placenta is of fetal origin. So, this is the fetal surface which is glistening covered by the amnion with the attachment of the cord and fetal blood vessels traversing beneath the amnion. Coming to the maternal surface, maternal surface is rough it is spongy dull red in color and is thin grayish saggy layer why because this contains a part of the decidua basalis during separation of the placenta a part of the decidua basalis also gets separated and comes along with the placenta.

So, these maternal surface is rough and dull and dirty looking right and there are no there are

certain you know cotyledons on the maternal surface approximately 15 to 20 convex polygonal shaped cotyledons are seen on the maternal surface. This picture shows the maternal surface these are the cotyledons they are approximately 15 to 20 in number and you know in between there can be blood clots right. So, this is the fetal surface glistening with the attachment of the umbilical cord with the fetal blood vessels and this is the maternal surface with the cotyledons. Now coming to human placenta, human placenta is also known as you know to be discoid, deciduate and hemochoroidal coming one by one discoid is you know from the shape of the placenta it is disc shaped. So, this is called as a discoid placenta right why deciduate? We have just now learned that this is the placenta say this is the placenta and during the separation of placenta when this placenta gets separated this is the decidua basalis on which the first the blastocyst got implanted and these you know chorionic frondosum will be penetrating the decidua basalis.

So, during separation of placenta the placenta will get separated and also a part of the decidua will also be shed off this full portion is shed off following delivery of the baby during placental separation. So, as this decidua is also an integral part of the placenta human placenta is called as deciduate. And number 3 is hemochoroidal why? Hemo means blood, blood that is maternal blood, maternal blood is coming in direct contact with choroidal means chorionic tissue. So, maternal blood coming in direct contact with the chorionic tissue. So, this is called in the placenta.

So, human placenta is also hemochoroidal. So, here we can see these are the chorionic villi these structures you know these structures are finger like projections are the chorionic villi right and this is the interval space. This is the interval space and this interval space contains maternal blood. So, maternal blood is actually coming in contact with the chorionic villi, maternal blood coming with contact with the chorionic villi. There is no direct connection between the this is these are the fetal blood vessels containing fetal blood.

There is no direct connection between the fetal blood vessels and the maternal blood right, but the maternal blood is in direct contact with the chorionic tissue. So, outer this green layer is the site is in cytotrophoblast which is outside and this inner portion this is the cytotrophoblast right. So, you can understand from here that this maternal blood in the interval space they comes in contact with the chorionic tissue or the sin cytotrophoblast of the chorionic villi and so, this is called as hemochoroidal placenta. Now coming to placental hemodynamics or placental circulation this is very important because through this circulation there is transfer of nutrients from the mother to the fetus as well as there is transfer of waste products from the fetus to the mother. So, the nutrients the bloods the oxygen supply you know the glucose supply and all the essential components required for the fetal development will come through this placental circulation.

So, this was the previous picture right. So, this is the placenta this part no this part is actually forming the placenta this part is forming the placenta this is the chorionic frondosum and the decidua basalis. Now you see these are the chorions or the finger like projections which develop from the outer cell mass or the tropho ectodermal cells these are the chorionic villi and in between the chorionic villi these are the interval space and they are filled with maternal blood. So, this is the enlarged section of this region where we see that yes this is the umbilical cord and this umbilical cord will be carrying the umbilical vein and the umbilical artery. This is the umbilical vein and the umbilical artery true umbilical arteries and one umbilical vein are present in the umbilical cord.

So, this is the insertion of the cord and this is the fetal surface of the placenta which is covered by amnion and then just you know on the fetal surface there will be the chorionic villi right. So, these are the chorionic villi and they are you know actually given the name of tertiary villi why because these are vascular. These are vascular they from outside to inside they contain the syncytiotrophoblast then the cytotrophoblast then the inner white this layer this is the mesoderm. So, this is the mesoderm and within the mesoderm is the blood vessels which will enter the villi. So, these are tertiary villi and in between two villi the intervilla space contains maternal blood which are actually extravasation from the spiral arteries.

This is the decidua basalis and this is the muscular layer of the uterine wall right. So, in the decidua basalis these are the spiral artery which are nothing, but branches from the uterine artery. These spiral artery will penetrate through the decidua basalis or the basal plate of the placenta they will penetrate and they will enter into the intervilla space and there will they will drain into the intervilla space right. Now, that same thing in placental circulation we can see this is the cord umbilical cord right from this attachment you can very well say that this is the fetal surface this is the amnion and these are the umbilical vein and the umbilical artery right. No sorry umbilical vein this umbilical vein is actually carrying you know oxygenated blood and umbilical artery will be carrying the deoxygenated blood.

So, if we depict the deoxygenated blood by blue color. So, this is the umbilical vein sorry artery will be carrying the deoxygenated blood this is umbilical artery. So, anyway so, this will come to that portion in fetal circulation. So, these are the you know umbilical artery and vein which will give to fetal capillaries and they will enter into the villi right. So, these are the villi and these villi we have already talked about outer layer is the syncytiotrophoblast.

The outer layer will be the syncytiotrophoblast and the inner layer I will draw only in this portion inner layer will be of the syncytiotrophoblast right and inside inside is the sorry inside will be the mesoderm this is the mesoderm and within the mesoderm are the fetal capillaries. So, this is a structure of tertiary villi and some of the villi will pass through and will adhere to the decidua basalis this is the decidual layer this is the maternal site and this is the decidual plate

containing the decidua basalis right. So, this is the decidua basalis decidua basalis. So, this is called as the anchoring villi right when which pass from the fetal surface and will adhere to the maternal surface. So, these are the anchoring villi and these are the tertiary villi.

Now you see this decidual plate will you know will give projections these are the septa these are the placental septa. The chorionic villi will penetrate into the chorionic villi they will penetrate into the decidual layer or the decidua basalis layer of the mother and they will you know they will go inside they will invade the basal plate at places they cannot invade and these places will form the placental septa. So, this area of placenta which is present in between two placental septa this is called as lobe or cotyledon right. There are approximately 15 to 20 lobes or cotyledon in a placenta. So, this is the basal plate and in the basal plate we can see these are the spiral arteries which will open into the inter villus space these are the inter villus space right this is the inter villus space and these you know spiral arteries they open into the inter villus space and there is maternal blood in the inter villus space.

So, this is filled with this portion is filled with maternal blood right this is maternal in origin and this will fill and they will then come through this spiral veins venules these are the spiral venules and they will then drain into the uterine vein. So, this is the circulation of placenta. Coming to the inter villus space what happens within these two villus this is the inter villus space. So, blood from the spiral arterioles they come to the inter villus space and ultimately will drain outside through the spiral venules into the uterine vein. Thus blood within the inter villus space is blood inside the inter villus space is 500 ml of which 350 ml blood sorry the blood inside placenta at a point of time is 500 ml of which 350 ml will be in the villi.

So, in the villi this amount of blood is 350 ml and the blood which is present in the inter villus space is 150 ml in inter villus space here it is 150 ml and this blood in the inter villus space it gets replaced blood in inter villus space gets replaced gets replaced every 3 to 4 minutes. So, this is important right. Now, that is all for the inter villus space. Now, there are transfer of nutrients what happens in the inter villus space. So, this is the you know different villi, this is the fetal surface with the umbilical cord attachment and this is the basal surface, basal plate and this is the chorionic plate and these are the villi with the blood vessels, these are the fetal blood vessels they are actually branches from the umbilical artery.

Now, transfer means there here these are the spiral arterioles which will open into the inter villus space right. So, these spiral arterioles open into the inter villus space this is maternal and this is fetal. Now, transfer of you know nutrients what happens O₂, O₂ from maternal blood to the fetal circulation, CO₂ from fetus to the mother, then others like water and electrolytes they will pass to the fetal circulation and the excretory products like urea, uric acid, creatinine these will all be you know transfer will all be by passive transport along the concentration gradient. Number 2 is active transport what are they? They are the actually the you know ions the

minerals iron, calcium, amino acids, vitamins these are actually transported inside the in into the fetal circulation and these transferred is by active transport against the concentration gradient. That means, even if the mother is deficient in iron the mother has anemia or osteoporosis deficiency in calcium, then also there will be transfer of iron and calcium into the fetal circulation thereby you know prioritizing the fetal development at the expense of the mother right.

Another thing is transport of glucose this glucose is transported by GLUT1 transporter protein with this health of this protein and this type of transfer is called as facilitated diffusion. So, this is you know the talk of transfer of nutrients across the placenta. Now, coming to the summary now intervillous hemodynamics right what happens? So, this is we have talked that you know the in the blood in the placenta at a point of time is 500 ml of which 500 ml of which 350 ml is in the in within the villi and in the intervillous space is 150 ml this is the intervillous blood right. Now the pressure gradient what is the pressure gradient? The in the uterine artery at the placental site the pressure is 70 to 80 millimeter of 8 g this is the uterine artery pressure. In the intervillous space intervillous space the pressure becomes to be you know at you know uterine contraction at uterine contraction the pressure comes to be 50 30 to 50 millimeter of 8 g and during uterine relaxation it decreases to 10 to 15 millimeter of 8 g during uterine relaxation right.

And pressure in the umbilical arteries is 60 millimeter of 8 g and pressure in umbilical vein is 10 millimeter of 8 g. So, pressure in the fetal capillaries is 20 to 40 millimeter of 8 g. So, you can see that this pressure is always more than the fetal capillary pressure. So, the pressure due to pressure gradient there will be flow of blood from the maternal site into the intervillous space. In the intervillous space with release of that you know release of blood into the intervillous space there is slight decrease in pressure, but during uterine contraction the 50 millimeter pressure is more than the fetal capillary pressure.

So, there will be more transfer of nutrients and more blood in the intervillous space during uterine contraction during relaxation there is less pressure in the intervillous space and so, the blood you know the transfer of the nutrients through this intervillous space will be decreased during uterine relaxation right. So, these are all regarding the hemodynamics. Now coming to the structure of the villi we know villi is a fetal in origin. It has three parts, three types primary villus where this is the villus and this is the syncytiotrophos. This is the syncytiotrophoblast outside and inside is the cytotrophoblast this is the cytotrophoblast.

So, this is a primary villi, primary villi is formed by thirteenth day of fertilization. Coming to the secondary villi what happens to the secondary villi the syncytium is present outside inside is the cytotrophoblast and within the cytotrophoblast there is invagination of mesoderm this is the mesoderm. So, this is called as secondary villi which forms by day 16 of fertilization and lastly

is the tertiary villi where this mesoderm is present and then through the mesoderm there is invagination of blood vessels. So, these blood vessels will now run through the mesoderm this is called as tertiary villi and this tertiary villi. So, this is the mesoderm you can see now outer is the syncytiotrophoblast, then is the cytotrophoblast, then is the extra embryonic mesoderm and inside these are the blood vessels this is the structure of tertiary villi it occurs at day 21 of fertilization.

Now what is the placental barrier? So, here this is the maternal blood. This is the maternal blood in the intervillous space and this maternal blood is separated from the fetal blood. So, say fetal blood I draw it like this, this is the fetal blood and this fetal blood is separated from the maternal blood by this intervening structure by this intervening structure. So, this part is called as the placental barrier which separates the maternal blood from the fetal blood. What is the structure from outside to inside? You can now say this is the syncytiotrophoblast, then the cytotrophoblast, then the mesoderm and then the endothelium of the fetal blood vessels.

So, same picture it has been shown here this is the maternal blood in the intervillous space and then coming to the structure of the villi from outside syncytiotrophoblast, then the connective tissue stroma of the villus or the mesoderm and then this is the endothelium of the fetal blood vessels, endothelium with the basement membrane and this is the fetal blood inside the fetal capillaries. So, these four structures will be forming the placental barrier. This whole thickness you know this is the placental barrier, now this thickness is approximately 0.025 millimeter. So, as a summary this is a placenta, we have the umbilical vein with the umbilical artery, two umbilical artery and one umbilical vein and these umbilical vein will you know segregate into capillaries which will enter into the you know these are the villi which will in these capillaries will enter into the villi structures which are fetal in origin developing from the tropho ectodermal cells.

So, this forms the chorionic part and the maternal part is derived from the basalis decidua basalis and decidua basalis decidua basalis and the you know the maternal blood vessels these spiral arterioles will cross will penetrate the decidua basalis and they will drain into the intervilla space in this is the intervilla space and through this maternal blood in the intervillous space there will be exchange of nutrients between the maternal blood in the intervilla space and the fetal blood in the fetal capillaries across the placental barrier right. So, this is what we call as placental circulation leading to transfer of nutrients. Now coming to a USG picture of a normal placenta. So, you can see here this is the placenta, this is a placenta right. So, this is the placenta, this is the attachment of the umbilical cord.

So, this is the fetal side or the you know the fetal side or the amnion you know the glistening surface the fetal surface right or the chorionic plate and this is the maternal base you know basal plate and just behind the placenta this part this part this is the hypoechoic area and this part is

called as the retro placental hypoechoic area. The presence of this retro placental hypoechoic area signifies that it is normal if this hypoechoic area say is obliterated this is not present then it is not normal the obliteration of the hypoechoic area will create a suspicion for the presence of know adherent placenta if lost is lost in adherent placenta. As we will see to it which is placenta accreta, increta and percreta. So, this is the basal plate, this is the chorionic plate and this is the normal placenta showing the retro placenta hypoechoic area. Now types of placental separation there are two types of placental separation number one is you know Sull's method and number two is Matthew Duncan method right.

So, these are the two methods what happens in this method the fetal surface this is the fetal surface the glistening fetal surface and with the attachment of the umbilical cord this comes out as an inverted umbrella. Fetal surface comes out as an inverted umbrella and the shiny surface comes out first and how this is the formation of you know retro placental clot and this clot formation starts from the center. So, this is also called as central separation of placenta. This is more common occurs approximately in 80 percent of cases and there is less blood loss in this type of separation of placenta right.

So, this is Sull's method, Sull's comes as shiny. Now Matthew Duncan what happens there is peripheral separation of placenta peripheral separation of placenta what happens which part comes you know first this is the maternal surface. So, dirty maternal surface comes out first maternal surface containing the cotyledons. So, the it is dirty surface coming out first right D for Duncan and it is less common seen in 20 percent of cases and there here the blood loss is more during placental separation right. So, these are the two types of placental separation. Now coming to the gradings of the placenta just an overview we come we need we know the grading of the placenta from USG there are four grades, grade 0, 1, 2 and 3 and the grades are seen in the you know USG like this is the chorionic plate if a smooth chorionic plate and homogeneous placenta this is grade 0 it is seen mostly you know early second trimester, first trimester and early second trimester.

From late second trimester and early third that means, 18 to 28 weeks we see grade 1 placenta where there are subtle indentation on the chorionic plate and some echogenicity happens at echogenicity in the placental substance. From then grade 2 this you know occurs from 30 weeks to the delivery you know this placenta is seen which is called as grade 2 where these indentations will now become more prominent and they are comma shaped indentation on the chorionic plate and on the basal plate there are you know echogenicity. So, these are basal echogenicity towards the basal plate and this is grade 2 placenta what is grade 3 the indentations now go deep and they form cotyledons right. So, these are you know cotyledons and showing calcifications irregular densities and they are seen 39 weeks onwards. So, you can see here these are the cotyledons with you know hyper ecoic areas these are the calcifications there are vaculations you know there are irregular opacities this is grade 3 placenta.

Why this grading is important because in USG when we see a fetus and measure the various lengths of the fetus the biparietal diameter the femur length you know the head circumference and we come out you know diagnosis that this is maybe say 33 34 weeks in fetus, but the placenta shows grade 3 placenta. So, that means, the placenta is more mature compared to the fetus, fetus the length the measurements are corresponding to 34 weeks, but the placental maturation is corresponding to 39 weeks. So, that means, there is disparity and you know this signifies that there can be some IUGR or intrauterine growth retardation. So, this is important. Coming to the placental function, placental function number 1 is transfer of nutrients from the mother to the fetus and waste products excretion from the fetus into the maternal circulation.

So, these are respiratory carbon dioxide oxygen into the fetus, carbon dioxide outside the fetus. Excretory yes we know urea creatinine uric acid will be excreted into the maternal circulation nutritive mostly glucose by facilitated diffusion. Now coming to the endocrine function it releases human chorionic gonadotropin, it releases human placental lactogen, placental specific beta glycoprotein 1 protein these are all peptide hormones, it also secretes two important steroid hormones estrogen and progesterone. Progesterone is the hormone of pregnancy helping in continuation with pregnancy. Number 3 is barrier function it acts as a protective barrier thereby know it will not allow the passage of very high molecular proteins more than 500 Daltons and thereby protecting the fetus from insults from the maternal circulation.

Immunological function yes it has some immunological function and you know it has macrophages, it has you know T helper 2 the humoral immunity is given by the placenta. So, these are all regarding the placental function in the next class we will continue with abnormal placenta. Thank you.