

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

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Labour Analgesia

Good morning students. Hope you are all doing good. Welcome to today's session for the NPTEL online certified course on the topic and overview on maternal health, the antenatal, intranatal and postnatal care. I am Dr. Barnali Ghosh, an obstetrician and gynecologist working as assistant professor at B.C.Roy Multispeciality Hospital and Medical Research Center, IIT Kharagpur. Today, our topic of discussion is labor analgesia.

So the concepts covered in today's class will be the labor pain, cause of onset of labor pain and the different nerve roots which are involved in this labor pain procedure. And of course, the methods of labor analgesia. Key words for this class are as given. Right? So, how you can explain labor pain? It is one of the most intense pain that a woman can experience all throughout her lifetime.

And this labor pain is more excruciating and more, you know, as per the woman in case of her first delivery. And as in subsequent deliveries, she becomes more aware of this labor procedure, the next delivery is the pain is somewhat less or maybe the labor process is somewhat smooth. No? Thus, the patient gets more labor pain in her first delivery. So, typically it is worse. It is worse than even the pain which is associated with deep laceration.

And the magic is that she endures all this labor pain all throughout the process of labor and the delivery. But immediately after the delivery, the mother has a sense of relief seeing the baby in her hands and she will forget all this labor pain. Right? So, most of the primary gravida in our institute, they describe this pain of uterine contraction. What is labor? Labor is both due to uterine contraction as well as due to the dilatation of the cervix. And it has been described as unbearable, intolerable and excruciating in nature.

Right? So, that's why to decrease the labor pain, we need to have methods of labor analgesia so as to make the labor process smooth and, you know, pain not pain free. But I would say that the pain is lessened to a certain degree to make it bearable for the mother. Awareness on the part of the mother, approximately 98 percent of primi gravida didn't even know whether it is possible

or not. Right? Whether there is methods of labor and analgesia, they don't know. So, these awareness has to be created by the obstetrician treating her during the antenatal period.

She must be educated regarding the types of labor and analgesia, the methods that can be implemented during the process of labor. And she, you know, sometimes she can even go or get a beforehand knowledge, right, regarding the process, the scenario, the, you know, the whole method that will be done to her during the process of labor and delivery. So, as per the ACOG recommendation, you know, what is the indication for the use of labor and analgesia? Only maternal request. Maternal request is sufficient for medical indication for pain relief during labor. So, when mother asks for, you know, methods or some medication to decrease the labor pain, that is sufficient for initiating this labor and analgesia.

And when we go for, you know, induction or initiation of labor and analgesia, it is immediately after the onset of labor. It can be done when the mother requests the doctor and it may be in the first stage or in the late second stage or say in the late first stage or say in the second stage, right, second stage of labor. So, it can be initiated any in any of these steps and once initiated, it is better to continue with that labor and analgesia procedure until the delivery is complete to make the whole process of labor and delivery smooth for the mother. Now, coming to the physiology of labor pain. What are the physiology? Why does this pain occurs? In the first stage, we know that two events are going on.

Number one is the onset of true labor pain, that is the uterine contraction. They are increasing in intensity, in duration, in frequency and also along with this uterine contraction, there is no cervical dilatation, cervical dilatation and effacement, right. So, here in the first stage, there is also taking up of the cervix into the lower uterine segment, right. So, formation of the lower uterine segment. So, these are these three factors are actually causing the labor pain in the first stage of labor and in this first stage, we know that the character of the pain is dull, aching, poorly localized in the lower abdomen and radiating to the legs, radiating to both the thighs and this pain increases as the labor progresses from the latent phase to the active phase, right.

Now, coming to the pathway, which nerves are responsible? The nerves which carry this pain, the first stage is the afferent slow conducting A, delta and C fibers. So, they are the afferent nerve fibers which are carrying the pain sensation from the uterine fundus, the uterine muscles as well as the cervical plexus, right. So, these pains are carrying, these fibers are carrying the pain sensation to the spinal cord and what is the level that is T 10 to L 1 level. So, when we go for labor analgesia, we need to block this T 10 to L 1 level to have adequate analgesia for the mother, right and this is the visceral component because it is you know taking the pain sensation from the viscera that is mostly the uterus and the cervix, it is the visceral component of labor pain. Now, coming to the second stage of labor, what happens in the second stage? The second stage the cervix is fully dilated, cervix is fully dilated and there is fetal descent.

So, this is the fetus, there is fetal descent in the second stage of labor, right and that will cause pressure on the pelvic floor muscle. So, pelvic floor muscle pressure that will lead to that will lead to you know this is the vagina and say this is the perineum, the vulva and the labia minora and the labia majora. So, this is the vagina, this is the perineum. So, along with this descent there will be you know expansion, right. So, distention you can say distention or dilatation or you know stretching, right.

So, stretching, stretching of the vagina, stretching of the perineum which will result in the second stage pain and in this second stage the bearing down efforts of the mother, right. Due to the abdominal increase in abdominal pressure caused due to forced expiration against a closed glottis that this will result in increase of abdominal pressure of the muscles of the abdominal muscles and this is called as the bearing down efforts from the mother which takes place in the second stage. So, all these are causing the pain in the second stage. So, it is due to the fetal descent, right, causing the distention of the pelvic floor. This there is distention of this pelvic floor muscles and that will cause the distention of the vagina and stretching of the perineum and that will lead to the pain of the second stage and what is the character? It is excruciating, sharp, severe and well localized, right.

And what is the pathway, which fibers? This is the somatic component because you know the perineum, the vagina, the vulva, right, the skin around the perineum is supplied by the sacral nerves and the pudendal nerve which is a somatic nerve component which is a mixed nerve having both sensory and motor fibers. The sensory fibers carry the pain of the second stage of labor, right. So, the pathway is via the pudendal nerve and the sacral nerves and what is the nerve root or the level of the nerve root that is S2 to S4, S2, S3 and S4, right. So, that was the somatic component of pain pathway of the second stage of labor. So, we now go for the pictorial representation.

These are the afferent sympathetic nerve fibers, the A, delta and C fibers which are carrying the pain sensation from the uterine muscles, the uterine fundus and the uterine lateral wall of the uterus and due to this uterine contraction there will be pain and these pain sensations are carried to, you know this T10 is also included here. So, T10 to L1, T10 to L1 is the nerve roots which are actually sensing the pain pathway in the first stage of labor due to uterine contraction and cervical effacement and dilatation. In the second stage mainly it is the pudendal nerve, right. Pudendal nerve which is S2, S3 and S4, S2, S3 and S4 and these pain fibers are parasympathetic afferent. See these this is the cervix and here just lateral side of the cervix is the frankenhauser plexus, right.

So, now fibers from this plexus and also from the vagina and the perineum will be coming together to form the pudendal nerve which will carry the fibers to S2, S3 and S4, right. So, this

is for the second stage of labor. So, this is the visceral component and this is the somatic component of pain pathway in labor. Now, coming to the supraspinal component this is nothing but the cortical response to pain. What is that? The pain fibers they have connections via the spinothalamic tract, they have connections with the thalamus, the hypothalamus through the thalamocortical projections and they have a higher center control, right.

So, in the cortex mostly the limbic region will be you know will be guiding this pain sensation and when the mother is well educated during this labor procedure she has a preconceived idea about how the labor is going to progress, about her experience during the phase of labor that will modulate or that will have an effect on the supraspinal component of labor pain pathway and that will modulate the pain experienced by the mother during the process of labor. So, these are the supraspinal effect or having a supraspinal I mean modulation in the pain process of labor in a pregnant female, right. So, now coming to labor pain the you know that this labor pain is highly individualized response. Every female they each one have a different experience during this process of labor and what are the factors which are modulating this labor pain? Number one is motivational. The mother should be motivated to you know to go through the process of labor though it is very painful, it is associated with excruciating, intolerable, unbearable pain, but still you know when the mother is motivated she will have a positive outlook and this will help to bear with this pain so as to go for the smooth process of labor.

Number two is age. More the age, more is the I mean less is the capability of the mother to endure this pain, right. So, you know elderly primary they will not be able to go through the labor process so smoothly as seen most of the times. Emotional this is a very important factor. Strong emotional support from the family members specially the husband during the process of labor is very important to modulate the pain sensation of the mother, right. So, then social, social you know stigma regarding this labor will have an effect.

Cognitive you know education regarding the labor process, regarding the delivery process, regarding the you know interventions done during delivery these all should be you know noted or the mother should be beforehand educated regarding these events, right. So, this is the medical education during this you know during the process you know they should know that there are methods for labor analgesia and depending upon that they can go for labor analgesia or they cannot also sometimes mother will say that no doctor it is not necessary for me to go for any types of analgesia because all the analgesics or all the painkillers which we administer to decrease the labor pain will have an effect on the fetus. And it sometimes have been seen that it sometimes some of the drugs can even prolong the process of labor, right. So, maternal response now coming to we have noted that labor pathway, labor pain pathway, the different three power components the visceral component, the somatic component and the supraspinal component involved in this pathway then we have noted the factors which modulate the pain perceived by the mother during the process of labor. Now, coming to the maternal response to

labor what is the response from the mother's side during the process of delivery and labor that will modify both the fetal and maternal well-being.

Number 1 sorry number 1 is you know increase in BMI, BMR basal metabolic rate that means, increase in respiratory rate there is hyperventilation. So, the respiratory rate increases there is hyperventilation and this will lead to hypocarbia or respiratory alkalosis, right. So, this increase in respiratory rate number 1 feature during the process of labor. Number 2 is sympathetic stimulation there is stress, there is anxiety, there is you know lots of sympathetic stimulation during the process of labor due to stress, due to anxiety, due to the pain perceived and this will lead to increase in sorry heart rate increase in heart rate and increase in blood pressure, right. And ultimately heart rate blood pressure increase will cause increase in cardiac output during this process and we have seen that you know heart disease patient they are more vulnerable to heart failure during the process of labor and immediately after the delivery, right.

So, ultimately sympathetic stimulation will be causing increasing heart rate as well as increasing blood pressure. Also number 3 is release of cortisol into the bloodstream, right. All these taken together will affect will have effect on the mother, mother what is the effect there is hyperventilation leading to hypercarbia and respiratory alkalosis, sympathetic stimulation causing increase in heart rate, increase in blood pressure leading to increase in cardiac output and more chance of heart failure in case there is any pre-existing heart disease as well as increase of cortisol more and more cortisol in the bloodstream, right. So, this is the pictorial diagram what happens the you know different sympathetic stimulation now due to the pain, due to the anxiety, due to fear, ignorance all these taken together will lead to sympathetic stimulation which will cause cortisol release, catecholamine release and this will no sorry this will increase the uterine contraction this is associated with labor. So, uterine contractions are also increasing which will decrease the placental perfusion, right.

So, during the contraction period of the uterus there will be decrease in utero placental blood flow which will cause fetal hypoxia. So, these are the effects on the fetus there will be fetal hypoxia, but a well term fetus, right a well matured term fetus can you know it can sustain this hypoxia without any you know without any insult, right, but if the fetus is premature if the fetus is previously compromised as in case of intrauterine growth retardation IUGR those fetuses in this the labor process there will be fetal hypoxemia which can cause more detrimental effects on the fetus, right as in case of fetal bradycardia, right. So, that will be manifested as fetal distress and in that time we need to expedite the process of delivery to quickly take out the fetus out of the mother's womb, right. So, that was a effect on the fetus during the labor process and I have told that yes respiratory rate increases there is more hyperventilation more oxygen consumption, but hypo-cardia that is respiratory alkalosis and this sympathetic stimulation what will we do? It will increase the BP, increase the heart rate, increase cardiac output, increase peripheral resistance, it will decrease gastric emptying. So, the mother is asked not to take any food solid

food during the process of labor mostly it should be given you know she should be in empty stomach also with nothing per mouth not even fluids because there is risk of aspiration, right and you know lactic acidosis, metabolic acidosis and all these will together lead to fetal hypoxemia, fetal acidosis which will cause fetal compromise not in case of a term mature fetus.

A term mature fetus can sustain this episodes during the labor this hypoxemic episodes, but if the fetus is previously compromised it can lead to sometimes fetal distress. Now, coming to so that was the effect on the of labor on mother as well as the fetus. Now, coming to the labor analgesics or the drugs which can be used to decrease the labor pain what do you mean by ideal labor analgesic? It should be such that neither it should have any effect on the fetus, neither it should have any effect on the process of labor or the progress of labor, right. It will it should not have any effect and it can be given to you know mothers as a whole, right. It should be safe it can be administered to a large number of women useful to a to approximately all women in labor without any contraindication and most importantly it decrease what it should do it will decrease the duration and the intensity of pain during this process of labor, but it should not interfere with uterine contraction or the progress of labor and very importantly it should not interfere with mobility, right.

So, no motor blockade because this there it should be only sensory blockade. Motor blockade if occurs then the mother cannot you know walk, the mother will not be ambulatory during the process which is required in the first stage we ask the mother to walk for the proper progress of labor. Also in the second stage to go for those bearing down efforts you know the muscle strength is required. So, motor blockade should not be there in a case of ideal analgesics. These are all ideal, but you know all the analgesics have some advantage, some disadvantage and we have to choose from them.

Now, coming to the methods of a labor analgesia what are the methods? Number one is non-pharmacological. Non-pharmacological meaning that there is no drug administration, but we give you know psychological then your different methods acupuncture which are used to decrease the labor pain and number two are the pharmacological agents or the drugs which can be administered to decrease the labor pain. First coming to the non-pharmacological agents you without using any special equipment. We know emotional support, you know the very important part right for emotional support from the family members during this labor process is an important part for the mother to give her a positive feeling during the process of labor. Touch and massage this is lamaze technique right.

So, massaging the perineum in certain way will help to decrease the labor pain. Heat and cold compression alternative heat and cold compression over the perineum hydrotherapy or water injection these all decreases the labor pain vertical position or ambulatory ambulatory phase of the mother will decrease the labor pain. As she walks there is more further fetal descent there is

more progress of labor and the labor pain is somewhat seen to be decreased in these in these mothers. And non-pharmacological with special equipment are bio feedback then intradermal water injection at PSIS right PSIS. So, at that point water injection helps to block the nerves and decrease the labor pain.

Tense right electrical nerve stimulation, transcutaneous electrical nerve stimulation, acupuncture, acupressure these are used hypnosis these now these are now acupuncture is somewhat it has shown to have a very positive effect on this labor pain. It decreases the labor pain also helps in smooth progression also somewhat decreases the period of labor. Now, coming to the pharmacological agents number one are the parenteral that is IM or IV inhalational through nasal inhalation, regional or neural axial block where we have the epidural, we have the spinal epidurals plus spinal and also we have para cervical and pudendal nerve blocks these are regional para cervical and this is para cervical that is blocking the para cervical nerve plexus which is present all around the cervix and the pudendal nerve block pudendal nerve block which will block the S2 to S4 mixed pudendal nerve thereby decreasing the pain sensation through the pudendal nerve which is the main component of pain pathway in the second stage of labor. So, coming to one by one psycho prophylaxis this is important psychotherapy while education regarding the labor process then the positive motivation right emotional support all will come under this heading of psycho prophylaxis. Lamaze technique I have already told massaging in a particular way of the perineum touch and massaging of the perineum also heat and cold alternate compression over the perineum helps to decrease the pain associated in the second stage of labor.

Sterile water injection or you know H₂O injection also helps to decrease the pain see here 4 points and 4 injections are given at the PSIS and this will block the nerve roots coming from there that will decrease the labor pain. Tense is nothing but transcutaneous electrical nerve stimulation and that will also decrease the labor pain pathway right. So, that where the non pharmacological part coming to the pharmacological agents we have one by one parenteral. Parenteral meaning IM or IV administration of the analgesic agents right. So, parenteral route mostly the opioids opioids are taken into account and also the non opioids.

Opioids have several side effects, but you know in the previous days opioids were given and mostly the most commonly used was meperidine or pethidine with promethazine right. So, meperidine or pethidine is the opioid, promethazine is nothing but phenergan this is you know given in combination to decrease the vomiting associated with pethidine right. And this was given you know can be given IM or IV where as IM is preferred over IV right. IM is preferred over IV I am discussing this only because this was the most commonly used in the previous days, but what were the side effects? Side effects where I have written in the next slide, but still you just know that side effect is neonatal, neonatal respiratory depression right. So, side effect of opioid is neonatal respiratory depression and so, it has stopped you know its use has been

stopped.

Other opioids are fentanyl, remifentanyl, butorphanol, morphine, tramadol injection. Tramadol injection is also an opioid, but it is not associated with neonatal complication it is somewhat safe. So, right non-opioids is paracetamol infusion. Now, coming to the different side effects. So, what are the side effects of opioid injection? Opioid injection you know there will be neonatal depression right low 1 minute and 5 minute up guard score right that is due to neonatal respiratory depression neonatal respiratory depression and causing respiratory acidosis right.

And now there will be prolonged observation the baby has to be admitted in NICU and for a prolonged period observation is required so, as to decrease the effects of opioid which has gone inside the baby right and dose dependent neuro behavioral depression has been noted. So, these are the side effects and you know it is said that after pethidine injection delivery should be within 1 hour or after 4 hours of pethidine injection. Because when pethidine is injected in the mother it increases or it passes to the fetus and the maximum blood concentration within the fetus is 2 to 3 hours after administration in the mother. So, delivery should either be within 1 hour of pethidine injection or after 4 hours of pethidine injection so, as to safeguard the baby from neonatal depression or neonatal respiratory depression after its birth. And what is the antidote for pethidine it is naloxone injection sometimes it is used in case of overdose and ventilatory assistance very important may be required for the baby.

So, opioid analgesia as such is not followed in India due to all these side effects we have another terminology that is the patient controlled analgesia where we give you know IV infusion and we give the mother the your the part where which can you know increase or decrease the dose of analgesia. As per the pain felt by the mother if she can increase the dose and if the pain is you know sustainable or bearable by the mother the dose of the pethidine infusion can be decreased by the mother herself and it is called as patient controlled analgesia that is an IV infusion route, but this is also not followed in India due to the different side effects of opioid. Coming to the non opioids in IV route is the paracetamol infusion which is to be given 1 gram IV infusion every 4 hours right and this is also this has less neonatal side effect and also a good analgesia decreases the labor pain to a much much extent right. So, as to decrease the labor pain for the mother. So, that was all regarding the parenteral route of labor analgesia that.

So, with this we end today's class. So, we have discussed the non pharmacological agents of labor analgesia as well as of out of the pharmacological agents we have discussed the parenteral parenterally administered analgesics that is the opioids of which tramadol is somewhat safe IM and with opioids we need to give some antiemetics also like your promethazine right or phenergan or you can go for pan 40 or ondem injection to decrease the vomiting because with vomiting there is chance of aspiration. And we have also discussed the non opioid parenteral

infusion of paracetamol. So, that was today's class. Thank you for today and next we will all continue with this pharmacological agents of labor analgesia. Thank you.