ESTIMATION OF APGAR SCORING BY ARTIFICIAL NEURAL NETWORKS

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Abstract: To determine the effect of obstetric anesthesia on infants, It was developed in 1953 by Virginia Apgar. It is also an important method in terms of neurological development as far as the baby's physical health is concerned. This method, which consists of 5 criteria, is used in the evaluation of the fetal condition, nst, cst, oct, amniotic fluid index, doppler, umbilical cord and cord blood gas analysis methods, as well as Apgar Score, are frequently used. In this study, maternal and fetal physiological data and attributes extracted from FHR (fetal heart rate) and UC (uterine contraction) signals were examined for a prenatal determination whether an intervention was needed for newborn baby and studies were made for Apgar Scoring.

Keywords: Apgar Score, Cardiotocography, Neural Networks, SPSS Analysis, Mann-Whitney U Test.

I. INTRODUCTION

Apgar scoring, a fast and effective method, is used to determine whether newborn babies are healthy. It is decided as a result of Apgar Scoring and examination of various physiological data whether or not any intervention (resuscitation or intubation) is done to the baby. The shortening of the intervention period is vital for the baby.

II. MATERIAL AND METHOD

Early evaluations of babies are very important right after birth. It is necessary to keep the fetuses and the fetuses under constant control in order to detect the adverse conditions and risks that may affect the health of the baby or the mother and to take early precautions [1] [2]. After birth, the newborn baby should be determined in the timeframe of whether or not any intervention is necessary. After giving birth, evaluation is done by scoring over general findings to determine the kindness of the newborn baby. The scoring method used for newborn babies is called Apgar Score [3].

III. APGAR SCORE

Apgar Score is a simple and reproducible method that is used to assess the health of newborn babies in a quick and accurate manner right after birth. Apgar Scoring was used to determine the effect of obstetric anesthesia on infants. It was developed by Virginia Apgar in 1953 and is important for the neurological development as well as for the baby's physical health. This assessment method is it was named Apgar Score because it was developed by Virginia Apgar. In addition, the first letters of the English names of the 5 criteria that make up the Apgar Score are bakronomically APGAR testimonies. These; appearance, pulse rate, stimulus-response (grimace), muscle tone (activity) and respiratory effort are the criteria [2] [13] [14] [15]. Apgar scoring is performed twice in the baby at the 1st and 5th minutes immediately after birth [16].

Generally, it is decided based on the 1 minute Apgar Score whether or not oxygenation deficiency during birth and therefore intubation (respiratory support) is required. Whether or not a newborn resuscitation (basic life support, resuscitation) operation is required is decided by looking at the 5th minute Apgar Score. Values of 8 and above are normal for Apgar Scoring, while values of 7 and below are necessary for resuscitation or intubation of the baby when deemed necessary [17] [18].

1.1. Criteria That Determine Apgar Score

Apgar scoring consists of 5 criteria:

1. Heart beating
2. Respiratory shape
3. Muscle tone
4. Leather color
5. Answer to alert

Each criterion is evaluated in the range of 0-2 points scale and the sum of 5 values determines the Apgar Score in the range of 0-10 points of the baby. Since each criterion evaluates a newborn baby from different angles, no criterion should be given to each criterion. For example, respiration and skin color are not equally important [19].

1.1.1. Appearance / Complexion

Generally, newborn babies are cyanotic (deep and mucosal blue coloration) because they have low oxygen intake despite high oxygen transport capacities. Many children can show cyanotic hands and feet for a few minutes despite excellent ventilation and oxygen supply. In the evaluation

stage, when baby's hands, feet, and body are pink 2 when the body is pink when acrocyanosis (cyanosis of the hands and feet) 1, when the baby is all over and when it is pale color is given 0 points.

The least important criterion is that skin color is associated with respiration and heart beating. Few of the newborn babies are pink in color [20]. Skin color is considered to be the least reliable criterion since it is a highly subjective criterion.

1.1.2. Pulse Rate

If the baby's heart rate is above 100, it is 2, if it is below 100, it is 0 and if it is not seen, it is 0 [3]. It is the most important criterion in terms of diagnosis and symptom. The heart beats can also be determined from epigastrium and precordium.

1.1.3. Grimace

If the newborn infant gives one of the cryings, sneezing, coughing or self-withdrawal reactions to aspiration (mechanical cleansing of the baby's mouth and nose) with a soft rubber catheter to the oropharynx or nostrils 2 if the face is crouching or weakly crying 1 if not crying 0 points are given [3].
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1.1.4. Activity

Babies with good body strength and stretching their arms and legs by stretching spontaneously are given 2, 1, and 0 for those who cannot resist [3].

1.1.5. Respiratory Effort

An assessment is made according to the oxygenation status of the newborn baby. Within the next 60 seconds, breathing stops (apnea) 0, weak and irregular breathing 1, normal respiration and crying 2 points for infants [3].

RESULTS

Whether an intervention is needed for the newborn baby can be decided by looking at the APGAR score. Whether the baby needs intervention may be determined by means of some physiological data and signals before the baby is born. The circumstances that may require intervention on this point are determined before the Apgar Scorecard is done so that the time of intervention can be minimized and the baby can be prevented from being physically damaged. The study requires intervention before the baby is born, or the efficiency of the system can be checked by comparing it with the Apgar Score made after the end-effector birth.

With the extraction of the attributes of the mother and fetus signals, 10 attributes can be used to be extracted in time-space. Various tests can be applied to determine if there is a meaningful difference between these attributes and the attributes extracted from the signals.

Attributes that can be extracted in time-space from the usable signals are as follows:

1. Standard deviation
2. Maximum value
3. Skewness coefficient
4. Kurtosis coefficient
5. Shape factor
6. Variance
7. Hjorth activity parameter
8. Hjorth complexity parameter
9. Average curve length [7]
10. Mean teager energy [7]

When these attributes are used to determine the Apgar score, it will be a great deal easier to know before the birth of the baby if an intervention is needed after birth. This will reduce the intervention time and minimize fetal and neonatal deaths.There are studies to determine the diseases requiring resuscitation such as oxygen deficiency (asphyxia), acid poisoning (fetal acidosis) and the decrease of the oxygen level in the body tissues (lung) with help of FHR (fetal heart rate) signal. UC signal and physiological data are used together to determine the Apgar score [2] [3] [4] [5]. Signals can be analyzed together with different attributes to be extracted from mother and fetus signals. Studies can be carried out to analyze signals together with statistical data.

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