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Assessing the Severity of Congenital Heart Defects in Neonates through AI-based Image Segmentation Techniques

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Abstract: This paper focuses on assessing the severity of congenital heart defects in neonates through AI-based image segmentation techniques. Congenital heart defects are common in newborns, affecting approximately one in every 200 babies. Although some of these defects pose a life-threatening risk, most are treatable, and successful treatment is possible with surgery. Heart defects can arise during fetal development or after birth, and they affect the heart valves, septa, or vessels, disrupting blood flow to various organs and depriving them of complete oxygen. AI-based image segmentation techniques can be used to assess the severity of these defects, providing doctors with critical information for effective treatment planning.

The study proposes segmentation of cardiac images using an AI-based neural network to assess the severity of cardiac arrest in neonates. Cardiac imaging is essential for the diagnosis and management of congenital heart defects. However, traditional image segmentation methods are time-consuming and often require manual intervention. The proposed AI-based technique can improve the accuracy and efficiency of image segmentation, providing doctors with a detailed assessment of the severity of the defect.

The study also provides insights into different types of heart defects in neonates, such as secundum, primus, and sinus venosus perforations, heart valve blockages, translocated blood vessels, and rheumatic fever. The severity of these defects can vary, and accurate diagnosis is critical for effective treatment planning. The paper also highlights the importance of prenatal testing and the role of family history, maternal health, and lifestyle choices in preventing early heart disease. Paper highlights the importance of using AI-based image segmentation techniques to assess the severity of congenital heart defects in neonates. The proposed technique can improve the accuracy and efficiency of image segmentation, providing doctors with critical information for effective treatment planning. The paper also emphasizes the importance of prenatal testing and the role of family history, maternal health, and lifestyle choices in preventing early heart disease. Ultimately, the goal is to ensure the best possible outcomes for neonates with congenital heart defects.

Keywords: congenital heart defects, neonates, AI-based image segmentation, cardiac imaging, severity assessment.

INTRODUCTION

Many people don't know that it is normal for babies to have holes in their heart. However, before the baby is born, small holes or cavities form in the muscular wall that divides the heart into right and left halves [1]. The reasons for this are yet to be identified. However, 70 percent of holes heal on their own either before or after birth [2]. Exceptionally, children whose holes do not close properly may require key hole surgery depending on the location and size of the hole [3-4]. Perforations in children's hearts can be divided into three types: secundum, primus, and sinus venosus [5]. Of these, secundum perforations occur in 8 out of 10 babies and most of them go away on their own. But other sinus and sinus venosus types of cavities occur

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rarely [6]. These are difficult to clog. This can only be solved by surgery. Children also suffer from heart valve blockages and complications after heart punctures [7]. Heart valve problems are second only to heart valve problems in most children. A heart attack is caused by a blockage in the blood vessel valves [8]. Or they are shortened. Apart from these, a few children rarely have translocated blood vessels. These blood vessel blockages can be repaired by balloon dilation therapy [9-10]. Similarly, some other children may be affected by mitral valve problems. Left-sided two-leaflet mitral valves have either one or both leaflets longer in length [11]. It does not close properly and folds slightly inward. As a result, children often have hallucinations, dizziness, and fear. They can now be treated with modern treatments [12]. Some other children may be affected by rheumatic fever ('rheumatic fever'), which causes swelling and constant pain in important joints [13]. This fever can damage the heart valves and have dangerous consequences. A complication of heart
valve problems is the displacement of blood vessels [14]. Due to this, the left and right side chambers come together and oxygen, carbon dioxide - oxidized clean - and impure blood mix together [15].

The oxygen level in the blood of the heart is low. This causes the body of children to turn blue. This is called 'cyanotic' in cardiology. Such babies are called 'blue baby' [16]. If this problem is detected in the fetus, the doctors will give an abortion as the first advice [17]. However, even if diagnosed after birth, 80 percent of children can be permanently cured by surgery. Surgery should be done immediately after the birth of a blue baby, but it can be delayed depending on the level of oxygen in the blood and the condition of the baby [18]. All children can take steps to prevent early heart disease. The heartbeat starts from the 18th day of conception in the mother's womb [19]. It will be fully developed within 55 days. Therefore, if a test called fetal echo is carried out in the 16th week of fetal formation, 99 percent can know about the problem in the heart of the child. However, it cannot detect very small problems [20-21]. At the same time, if anyone in the family has a heart problem, if an already born child has a heart problem, if the mother has taken too many drugs and alcohol during pregnancy, if the mother has diabetes, rubella measles, if there is a marriage in a close relationship, or if there is hypoacid deficiency, this Pari test is necessary [22-23].

Related Works

Congenital heart defects (CHD) are anatomical defects of the heart, its valvular apparatus or vessels that arise in utero (2-8 weeks of gestation). These defects may occur alone or in combination with each other. Ethology [24]. Severe influenza virus infections (rubella, measles, mumps, chicken pox, poliomyelitis, etc.), maternal heart defects, alcoholism, drug addiction, use of certain drugs, ionizing radiation, hypovitaminosis, pregnancy over 35 years, diseases of the genital area [25]. An important factor is also the health of the father. The incidence of CHD is 30% of all birth defects. They are the number one cause of death for newborns and infants in the first year of life [26]. Congenital heart disease can appear right after a baby is born or it can be hidden. Therapy. It is widely accepted to divide CHD into "blue" (with cyanosis) and "white" (without cyanosis). In addition, all CHDs are divided according to the state of hemodynamics in the lungs and larger circulatory systems [27]. There are times when people live without a kidney, half a stomach, and a gall bladder. But it is impossible to imagine a person living without a heart: after this organ stops its work, in a few minutes the life in the body dies completely and irreversibly. That is why the diagnosis of "heart disease" in a child is so scary for parents [28].

If you do not go into medical nuances, then the described disease is associated with the failure of the heart valves, with which the organ gradually fails. This problem is the most common cause of heart disease, but is far from the only disease [29]. Statistics show that only about 1% of babies born suffer from this disease. It

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depends on what kind of life the mother leads while carrying the fetus [30]. The question of whether the baby will be healthy or not is decided in the first months of pregnancy. If an expectant mother during this period, the risk of having a baby with a heart defect increases significantly. Throughout South Asia, most heart diseases are diagnosed after birth [31]. However, some abnormalities in children can detect heart disease. Breastfed babies should be taken to a pediatric cardiologist immediately if they choke while drinking milk, stop drinking milk, or sweat while drinking milk. Abnormal heartbeat, monthly colds, not gaining weight, pneumonia 2 or 3 times a year, turning blue in part or all of the body, eating less food, frequent memory loss, swelling of the face-feet-joints, etc [32].

Proposed model

Children are often born with this pathology (1% of newborns). There are now about 90 congenital syndromes that can be linked to each other in various combinations. There are several classifications, the most common of which are based on the presence or absence of mixing of arterial and venous blood, we give below:

- White: Patent ductus arteriosus, septal defects, isolated stenoses, moods, and dystopias of the heart are the most common. Cyanosis was not observed in this case.
- Blue: Tetrad of Fallot, transposition of major arteries, Eisenmenger's complex, Epstein's anomaly and others are more common.

Blue got their name because of the pronounced cyanosis that accompanies them. The pathologic group combines the reflux of venous blood in the system that feeds all the organs of the child (called the great circle of blood flow). The resulting "mixture" contains enough oxygen. Therefore, the tissues it enters acquire a blue color. It is not yet known exactly why babies are born with such defects. But most doctors agree that there are the following reasons for the appearance of congenital heart defects in children:

- *Genetic factors:* These include the presence of such diseases in the mother's close relatives or her previous children. But sometimes the signs of genetic predisposition cannot be detected early.
- *Failed pregnancy:* If the mother has had a previous miscarriage or stillbirth, this significantly increases the risk of a child with cardiovascular pathology in the future.
- *Bad habits:* the use of alcohol or drugs by a pregnant woman, some drugs directly affect the health of the unborn child.
- *Poor environmental conditions:*Here it is necessary to take into account not only living in a "clean" zone, but also the profession of a mother. Also, work in hazardous manufacturing will emerge in a few years.
- *Diseases during pregnancy:* The most dangerous in this regard are diabetes, epilepsy, severe hypertension, various infections (for example, rubella in the mother can lead to the development of a defect in the fetus).

Often, although not necessarily, there are symptoms such as heart and headache, pronounced arteries in the neck and frequent swelling of some parts of the body. In older children, the symptoms are more common - chest pains spread to the left arm and shoulder. Among these, in the first place are infectious diseases that a woman may have contracted in the first half of pregnancy - rubella, fever, herpes, tonsillitis and others. Chronic diseases of the parents, drug use during pregnancy, smoking and drinking habits of the future parents have a negative impact.The proposed model block diagram has shown in the following fig.1.

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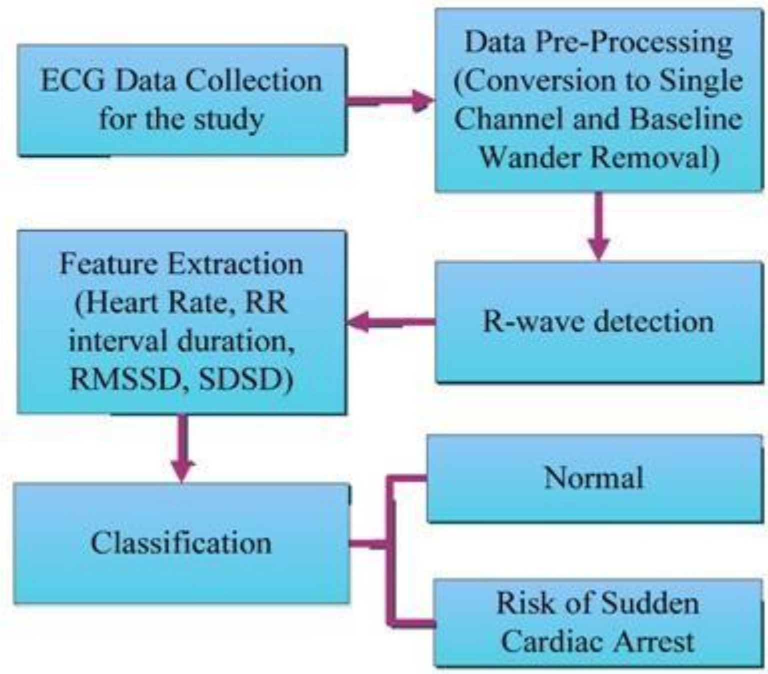

Figure 1. *Proposed block diagram*

Naturally, it will be difficult for a person without proper qualifications to determine the deficiency by the manifestations described above, because the same fatigue and shortness of breath can indicate any other diseases. Therefore, with these symptoms, it is better to take the child to the doctor. Treatment of defects in each case is developed individually based on the type of pathology, characteristics of its course, well-being of the child, his age and many other factors. In some cases, by the age of majority, the vice disappears on its own. But most often, you can't do without medical help. Here there may be three options, which often complement each other: Heart disease is the work of the heart's muscle and valvular apparatus and the change of its septa. Stand out in medicine Congenital and acquired heart defects. Acquired defects change how the heart valve works. Most often they appear in patients with rheumatism, syphilis and atherosclerosis. The clinical picture of all disorders often includes common characteristics... but there are also peculiar manifestations of the disease specific to a particular symptom. Congenital heart disease in infancy is caused by abnormal development of blood flow while the baby is in the womb. A baby's heart begins to form between the 3rd and 8th week of pregnancy. Its normal development can be affected by negative influences. The definition of childhood birth defects as a disease is based on the external manifestation of certain symptoms, data from clinical studies and other techniques. Based on all these symptoms, the doctor can determine the presence of the disease and identify not only the type of defect, but also the group to which it belongs.

A study of the work of the heart includes an electrocardiogram, X-rays of the heart and lungs, and an echocardiogram. Children with heart disease often lag behind their peers in physical development and often suffer from viral diseases. The most common complaints in these cases are shortness of breath during labor, rapid fatigue, even when the child is not busy with anything. In these children, the skin becomes paler than usual. Congenital heart disease in children is very diverse in nature. Most often, defects occur when there is an obstruction in the septum between the ventricle and the atrium, due to which any part of the blood that

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comes from the left half of the heart immediately enters the right half, and must go directly to the pulmonary trunk. With all congenital malformations, arterial blood enters the systemic circulation less than necessary, therefore overloading the small circle. The greater this overload, the harder the disease progresses. Treatment is strictly individualized for each type of birth defect. Those vices that do not directly affect the functioning of the child's body do not require medical intervention. People with such diseases often do not complain about their health. But when problems arise, the child needs surgery. It should normalize the work of the heart. Heart valve replacement is possible. In more severe cases, surgery may not be possible. Then the patient is prescribed a specific regimen, which allows to postpone the time of the final wear of the heart muscle.

Results and Analysis

The proposed AI-Based Neural Network (AINN) approach has compared with the existing Transfusion-associated hyperkalemic cardiac arrest (THCA), Convolutional Neural Network Approach (CNNA) and paediatric and neonatal cardiac arrest (PNCA)

Toxic symptoms management: Pathology of the heart, in which there are defects in the valve apparatus, as well as its walls, is called heart disease. In the future, this pathology is the reason for the development of heart failure. Hearts in vice babies are born and acquired. Congenital heart disease is a pathology when the cause of defects of the heart and adjacent vessels is a disturbance in the processes of fetal development.. The Toxic symptoms management has shown in the following table 1.

Table 1. Toxic symptoms management (in %)

No.of Inputs	THCA	CNNA	PNCA	AINN
100	42.90	31.38	41.14	89.43
200	41.40	30.79	39.27	88.39
300	40.29	29.81	38.44	88.26
400	39.91	28.60	37.53	87.30
500	38.90	27.46	36.61	87.73

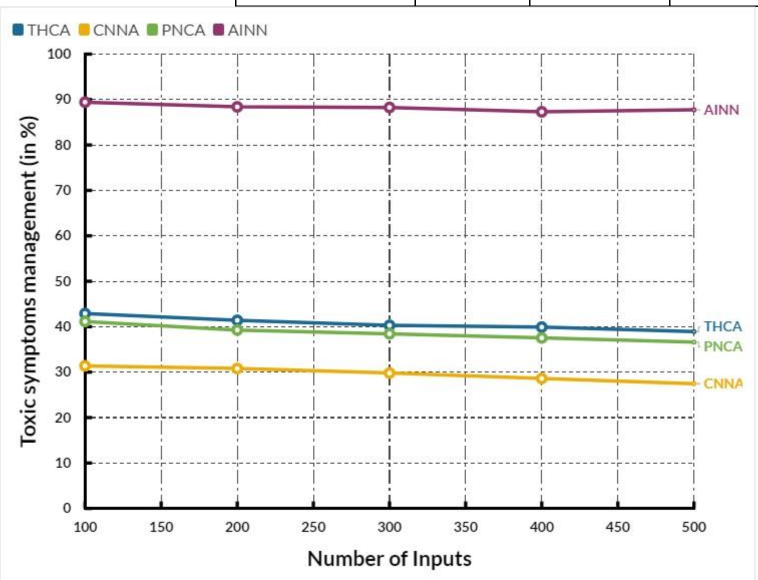

Fig 2: Comparison of Toxic symptoms management

The fig.2 shows the comparison of Toxic symptoms management. In a saturation point, the AINN model achieved 88.26% of Toxic symptoms management. But the existing THCA reached 40.29%, CNNA achieved 29.81% and PNCA obtained 38.44% of Toxic symptoms management. The proposed model achived better results while compared with the existing models.

Dose rate management: Congenital heart defects are of the following types: pulmonary circulation overload defect, atrial septal defect and interventricular septum; patent ductus arteriosus, malformation of pulmonary circulation; Isolated pulmonary artery stenosis; Tetrad of Fallot; Change of major roles; A defect with normal pulmonary blood flow; aortic stenosis; Coagulation of the aorta. Congenital defects in children can also arise in utero. Identify the presence of a disease in the early stages can be done using ultrasound, Doppler or electrocardiography of the heart. The Dose rate management has shown in the following table.2

Table 2. Dose rate management (in %)

No.of Inputs	THCA	CNNA	PNCA	AINN
100	51.32	40.48	45.16	93.11
200	52.82	41.07	47.03	94.15
300	53.93	42.05	47.86	94.28
400	54.31	43.26	48.77	95.24
500	55.32	44.40	49.69	94.81

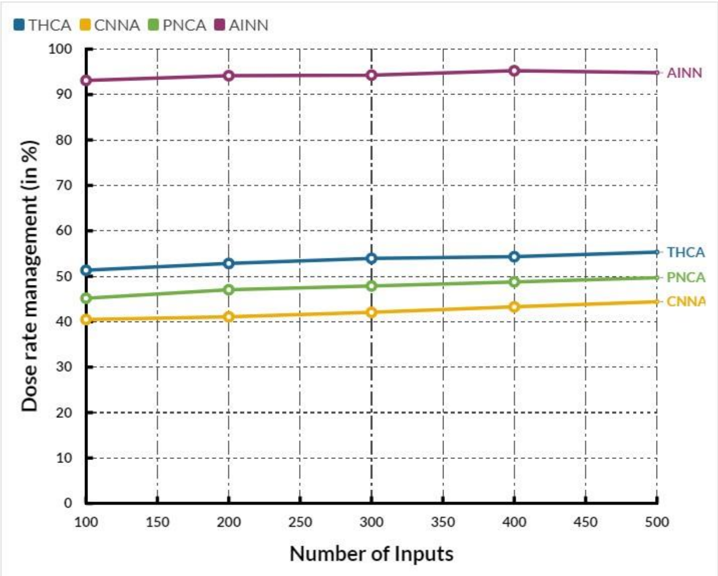

Fig 3: Comparison of Dose rate management

The fig.3 shows the comparison of Dose rate management. In a saturation point, the AINN model achieved 94.28% of Dose rate management. But the existing THCA reached 53.93%, CNNA achieved 42.05% and PNCA obtained 47.86% of Dose rate management. The proposed model achived better results while compared with the existing models.

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Contraction management: With acquired heart defects, there are defects in the area of the valve apparatus, pronounced stenosis or valvular insufficiency of the heart. In this case, surgical intervention is necessary. Acquired heart defects in children usually occur as a result of past diseases such as rheumatic disease, mitral valve prolapse, infective endocarditis, etc.. The Contraction management has shown in the following table.3

Table 3. Contraction management (in %)

No.of Inputs	THCA	CNNA	PNCA	AINN
100	34.80	46.86	45.73	86.78
200	37.56	47.07	48.77	86.67
300	36.58	45.81	49.31	86.61
400	37.50	44.62	51.61	86.56
500	38.50	46.20	51.67	86.52

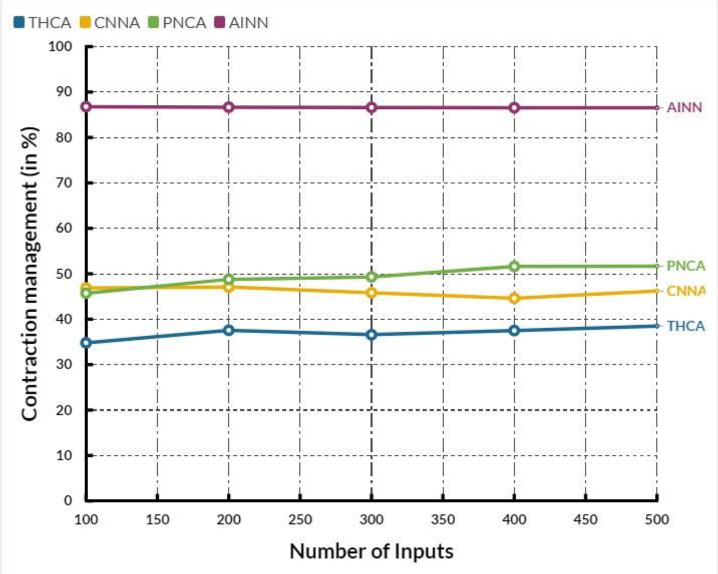

Fig 4: Comparison of Contraction management

The fig.4 shows the comparison of Contraction management. In a saturation point, the AINN model achieved 86.61% of Contraction management. But the existing THCA reached 36.58%, CNNA achieved 45.81% and PNCA obtained 49.31% of Contraction management. The proposed model achived better results while compared with the existing models

Vitamins Management: The help to determine the presence of the disease Heart disease symptoms in children... First, it is a heart murmur. Their doctor can determine by listening to the baby's heart. The presence of organic noise indicates the threat of failure. After the discharge of children whose threat of disease is questionable, doctors give some advice, how to diagnose heart failure. The Vitamins Management has shown in the following table.4

Table 4. Vitamins Management (in %)

No.of Inputs	THCA	CNNA	PNCA	AINN
100	50.84	61.77	52.96	91.15

200	49.34	61.18	51.09	90.14
300	48.23	60.2	50.26	89.98
400	47.85	58.99	49.35	89.02
500	46.84	57.85	48.43	89.45

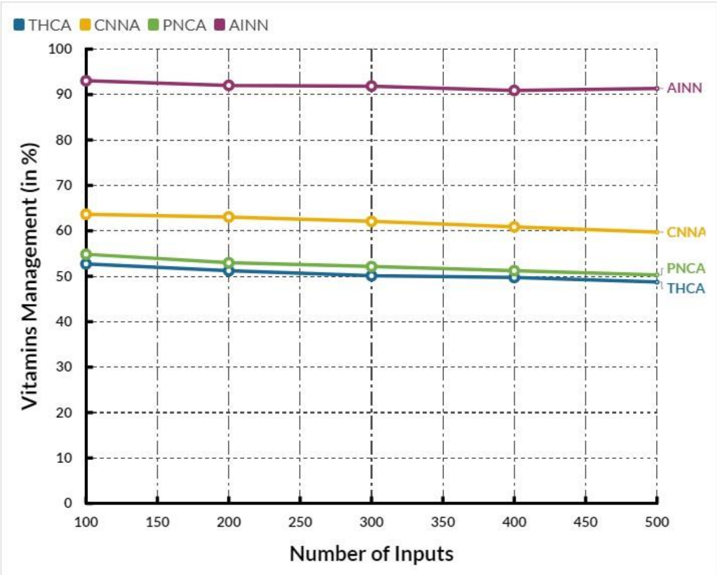

Fig 5: Comparison of Vitamins Management

The fig.5 shows the comparison of Vitamins Management. In a saturation point, the AINN model achieved 89.98% of Vitamins Management. But the existing THCA reached 48.23%, CNNA achieved 60.2% and PNCA obtained 50.26% of Vitamins Management. The proposed model achived better results while compared with the existing models

Treatment management*:* If the child's monthly weight gain is less than 400 grams, parents should be concerned if the child has increased shortness of breath and fatigue. It manifests itself mainly during feeding: the child does not eat enough, gets tired of sucking too quickly. Also, heart disease in children is accompanied by tachycardia - palpitations, cyanosis - cyanosis of the skin. The Treatment management has shown in the following table.5

Table 5. Treatment management (in %)

No.of Inputs	**THCA**	**CNNA**	**PNCA**	**AINN**
100	38.87	37.60	46.31	84.78
200	38.87	36.51	46.05	83.67
300	38.04	35.37	45.48	82.61
400	38.77	35.73	46.62	81.56
500	39.88	37.26	47.64	80.52

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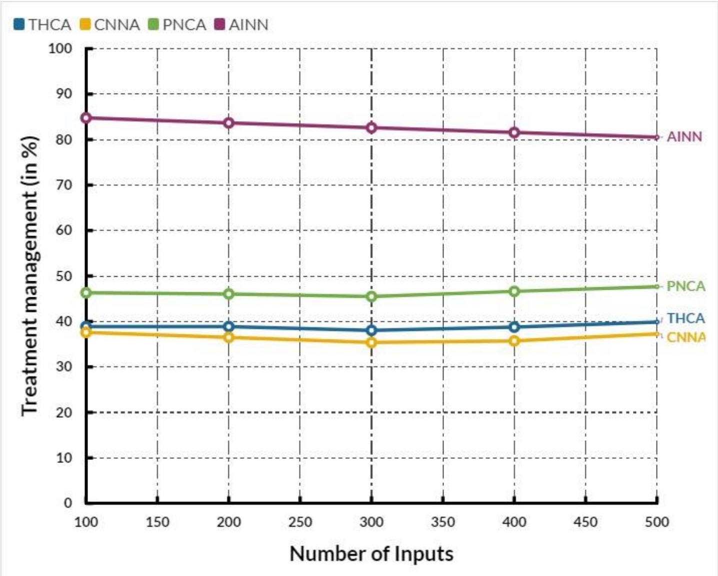

Fig 6: Comparison of Treatment management

The fig.6 shows the comparison of Treatment management. In a saturation point, the AINN model achieved 82.61% of Treatment management. But the existing THCA reached 38.04%, CNNA achieved 35.37% and PNCA obtained 45.48% of Treatment management. The proposed model achived better results while compared with the existing models Cyclone procedures like sun and air baths, inhalations with ginseng, aloe essence and other preventives. Between chronic infections, local and general ultraviolet radiation is used. These procedures are contraindicated in heart failure of the second and third degrees and complications caused by endoparitis. Prevention of hypoxia bath is a child can be assigned: sodium chloride (for the normalization of the sympathetic nervous system), oxygen (oxygen concentration), and carbon dioxide (increases the work of the heart tissue due to the increase in body pressure resistance value) bromine and nitrogen (have anesthetic properties)..

Conclusion

The choice of treatment method depends on many factors such as the type of defect, the nature of the present disease, the patient's condition and age. It should be kept in mind that heart disease in children may be age-related and it goes away on its own after reaching the age of 15-16 years. . This applies to congenital defects. Often, initially, they begin to treat the disease that caused the defect or contributes to its development. In these cases, medical and preventive treatment is used. In cases of acquired defects, the case sometimes ends with surgical intervention. The operative method of treatment is commissurotomy. Isolated It is used in patients with mitral stenosis. With mitral insufficiency, the method of surgical intervention is used, but the disease worsens and the patient's well-being deteriorates. During operation, the valve is replaced with its artificial number. Also, medical treatment for heart defects includes diet, general health measures, and exercise therapy. Nutritionists recommend eating more protein, limiting water and salt intake, and not eating before bed. In addition, physical activity is necessary to train the heart muscle. Doctors have the following exercises for heart defects. First, it's walking, which improves blood circulation, breathing, tones muscles, and prepares them for exercise.

Walking is recommended to begin and end a set of exercises. Second, these are shoulder and arm exercises. They help straighten the spine and chest and are good for breathing. Thirdly, breathing exercises - an

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integral part of classes. In general, the set of training should start with morning exercises, during the day you can jog or take a walk.

References

Burke, M., Sinha, P., Luban, N. L., & Posnack, N. G. (2021). Transfusion-associated hyperkalemic cardiac arrest in neonatal, infant, and pediatric patients. Frontiers in Pediatrics, 9, 765306.

Jiwani, N., Gupta, K., & Afreen, N. (2022, April). A Convolutional Neural Network Approach for Diabetic Retinopathy Classification. In 2022 IEEE 11th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 357-361). IEEE.

Dainty, K. N., Atkins, D. L., Breckwoldt, J., Maconochie, I., Schexnayder, S. M., Skrifvars, M. B., ... & Yeung, J. (2021). Family presence during resuscitation in paediatric and neonatal cardiac arrest: A systematic review. Resuscitation, 162, 20-34.

Bose, S. N., Verigan, A., Hanson, J., Ahumada, L. M., Ghazarian, S. R., Goldenberg, N. A., ... & Jacobs, J. P. (2019). Early identification of impending cardiac arrest in neonates and infants in the cardiovascular ICU: a statistical modelling approach using physiologic monitoring data. Cardiology in the young, 29(11), 1340-1348.

Aggelina, A., Pantazopoulos, I., Giokas, G., Chalkias, A., Mavrovounis, G., Papalois, A., ... & Iacovidou, N. (2021). Continuous chest compressions with asynchronous ventilation improve survival in a neonatal swine model of asphyxial cardiac arrest. The American Journal of Emergency Medicine, 48, 60-66.

Futterman, C., Salvin, J. W., McManus, M., Lowry, A. W., Baronov, D., Almodovar, M. C., ... & Gazit, A. Z. (2019). Inadequate oxygen delivery index dose is associated with cardiac arrest risk in neonates following cardiopulmonary bypass surgery. Resuscitation, 142, 74-80.

Hunfeld, M., Ketharanathan, N., Catsman, C., Straver, D. C., Dremmen, M. H., Bramer, W., ... & Buysse, C. (2020). A systematic review of neuromonitoring modalities in children beyond neonatal period after cardiac arrest. Pediatric Critical Care Medicine, 21(10), e927-e933.

Massey, S. L., Abend, N. S., Gaynor, J. W., Licht, D. J., Nadkarni, V. M., Topjian, A. A., ... & Naim, M. Y. (2019). Electroencephalographic patterns preceding cardiac arrest in neonates following cardiac surgery. Resuscitation, 144, 67-74.

Disma, N., Virag, K., Riva, T., Kaufmann, J., Engelhardt, T., Habre, W., ... & Weiterer, S. (2021). Difficult tracheal intubation in neonates and infants. NEonate and Children audiT of Anaesthesia pRactice IN Europe (NECTARINE): a prospective European multicentre observational study. British journal of anaesthesia, 126(6), 1173-1181.

Edelson, D. P., Sasson, C., Chan, P. S., Atkins, D. L., Aziz, K., Becker, L. B., ... & Topjian, A. A. (2020). Interim guidance for basic and advanced life support in adults, children, and neonates with suspected or confirmed COVID19: from the emergency cardiovascular care committee and get with the guidelines-resuscitation adult and pediatric task forces of the American Heart Association. Circulation, 141(25), e933-e943.

Law, M. A., Benscoter, A. L., Borasino, S., Dewan, M., Rahman, A. F., Loomba, R. S., ... & Alten, J. A. (2022). Inferior and superior vena cava saturation monitoring after neonatal cardiac surgery. Pediatric Critical Care Medicine, 23(7), e347-e355.

Sankaran, D., Vali, P., Chandrasekharan, P., Chen, P., Gugino, S. F., Koenigsknecht, C., ... & Lakshminrusimha, S. (2021). Effect of a larger flush volume on bioavailability and efficacy of umbilical venous epinephrine during neonatal resuscitation in ovine asphyxial arrest. Children, 8(6), 464.

Wagner, M., Cheung, P. Y., Yaskina, M., Lee, T. F., Vieth, V. A., O'Reilly, M., & Schmölzer, G. M. (2021). Return of spontaneous circulation depends on cardiac rhythm during neonatal cardiac arrest in asphyxiated newborn animals. Frontiers in Pediatrics, 9, 641132.

Sanford, E., Jones, M. C., Brigger, M., Hammer, M., Giudugli, L., Kingsmore, S. F., ... & Bainbridge, M. N. (2020). Postmortem diagnosis of PPA2-associated sudden cardiac death from dried blood spot in a neonate presenting with vocal cord paralysis. Molecular Case Studies, 6(5), a005611.

Wu, S. H., Li, R. S., & Hwu, Y. M. (2019). Live birth after perimortem cesarean delivery in a 36-year-old out-ofhospital cardiac arrest nulliparous woman. Taiwanese Journal of Obstetrics and Gynecology, 58(1), 43-45.

Kim, M., Okunowo, O., Ades, A. M., Fuller, S., Rintoul, N. E., & Naim, M. Y. (2021). Single-center comparison of outcomes following cardiac surgery in low birth weight and standard birth weight neonates. The Journal of Pediatrics, 238, 161-167.

Moore, J. P., Gallotti, R. G., Shannon, K. M., Bos, J. M., Sadeghi, E., Strasburger, J. F., ... & Ackerman, M. J. (2020). Genotype predicts outcomes in fetuses and neonates with severe congenital long QT syndrome. Clinical Electrophysiology, 6(12), 1561-1570.

Vali, P., Sankaran, D., Rawat, M., Berkelhamer, S., & Lakshminrusimha, S. (2019). Epinephrine in neonatal resuscitation. Children, 6(4), 51.

Jiwani, N., Gupta, K., & Whig, P. (2021, October). Novel healthcare framework for cardiac arrest with the application of AI using ANN. In 2021 5th international conference on information systems and computer networks (ISCON) (pp. 1-5). IEEE.

Garcia-Marcinkiewicz, A. G., & Matava, C. T. (2022). Safe in the first attempt: Teaching neonatal airway management. Current Opinion in Anaesthesiology, 35(3), 329-336.

Disma, N., Veyckemans, F., Virag, K., Hansen, T. G., Becke, K., Harlet, P., ... & Zacharowski, K. (2021). Morbidity and mortality after anaesthesia in early life: results of the European prospective multicentre observational study, neonate and children audit of anaesthesia practice in Europe (NECTARINE). British journal of anaesthesia, 126(6), 1157-1172.

Luong, D., Cheung, P. Y., Barrington, K. J., Davis, P. G., Unrau, J., Dakshinamurti, S., & Schmölzer, G. M. (2019). Cardiac arrest with pulseless electrical activity rhythm in newborn infants: a case series. Archives of Disease in Childhood-Fetal and Neonatal Edition, 104(6), F572-F574.

Kuan, C. C., & Shaw, S. J. (2020). Anesthesia for major surgery in the neonate. Anesthesiology Clinics, 38(1), 118.

Foglia, E. E., Davis, P. G., Guinsburg, R., Kapadia, V., Liley, H. G., Rüdiger, M., ... & International Liaison Committee on Resuscitation Neonatal Life Support Task Force. (2023). Recommended Guideline for Uniform RTHCArting of Neonatal Resuscitation: The Neonatal Utstein Style. Pediatrics, e2022059631.

Naim, M. Y., Putt, M., Abend, N. S., Mastropietro, C. W., Frank, D. U., Chen, J. M., ... & Kimmel, S. E. (2021). Development and validation of a seizure prediction model in neonates after cardiac surgery. The Annals of Thoracic Surgery, 111(6), 2041-2048.

Graham, E. M., Martin, R. H., Buckley, J. R., Zyblewski, S. C., Kavarana, M. N., Bradley, S. M., ... & Atz, A. M. (2019). Corticosteroid therapy in neonates undergoing cardiopulmonary bypass: randomized controlled trial. Journal of the American College of Cardiology, 74(5), 659-668.

Stein, M. L., Quinonez, L. G., DiNardo, J. A., & Brown, M. L. (2019). Complications of transthoracic intracardiac and central venous lines in neonates undergoing cardiac surgery. Pediatric Cardiology, 40, 733-737.

Gupta, K., Jiwani, N., & Afreen, N. (2022, April). Blood Pressure Detection Using CNN-LSTM Model. In 2022 IEEE 11th International Conference on Communication Systems and Network Technologies (CSNT) (pp. 262366). IEEE.

Amodeo, I., Di Nardo, M., Raffaeli, G., Kamel, S., Macchini, F., Amodeo, A., ... & Cavallaro, G. (2021). Neonatal respiratory and cardiac ECMO in Europe. European journal of pediatrics, 180, 1675-1692.

Sillers, L., Handley, S. C., James, J. R., & Foglia, E. E. (2019). Pulseless electrical activity complicating neonatal resuscitation. Neonatology, 115(2), 95-98.

Miura, S., Jardim, P. V., Butt, W., & Namachivayam, S. P. (2020). Extubation failure and major adverse events secondary to extubation failure following neonatal cardiac surgery. Pediatric Critical Care Medicine, 21(12), e1119-e1125.

Mani, S., Gugino, S., Helman, J., Bawa, M., Nair, J., Chandrasekharan, P., & Rawat, M. (2022). Laryngeal mask ventilation with chest compression during neonatal resuscitation: randomized, non-inferiority trial in lambs. Pediatric Research, 92(3), 671-677.