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Original Article

The Effect of Platelet Count on Closure of Patent Ductus Arteriosus in Preterm Neonates During the First Week of Life. A Prospective-Cross Sectional Study

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Abstract

Background: The patent ductus arteriosus (PDA) is a vital fetal structure that connects the descending aorta and the main pulmonary artery. It typically closes spontaneously after birth, but sometimes ductal patency persists for weeks. The PDA's physiological impact and clinical significance depend on its size and patient's cardiovascular status.

Aim of the study: To evaluate the effect of platelet count on the spontaneous closure of ductus arteriosus in preterm infants.

Methodology: This is a cross section study analyzed 50 preterm infants less than 34 weeks gestational age with patent ductus arteriosus, divided into two groups with open and closed PDAs. Variables such as platelet count, mean platelet volume, platelet mass index and functions were compared to identify which factors influencing spontaneous closure of ductus arteriosus.

Results: The study involved a total of fifty neonates with mean gestational ages 32.4±1.3 weeks, 1.27±0.14 birth weights, 52% males, and 72% born by CS. Over half of the PDA cases had respiratory distress, 18% had low birth weight, 14% were infants of diabetic mothers, and only 3 had intrauterine growth retardation. The mean hemoglobin level was 12.6±2.8 gm/dl, mean TLC was 10.2±3.9/dl, and mean platelet was 52.2±11.3/dl. Over half of the cases had positive CRP (56%). 26% of PDA cases had associated patent foramen oval, 24% had associated ASD, and 20% had associated VSD. After a week of follow-up, 42% had closed PDA, and 58% had closed PDA after a month. 37.9% of cases with opened PDA after 1 week of follow up had platelet transfusion compared to 52.4% of cases with closed PDA with non-statistically significant p value >0.05. About 64% of cases with opened PDA had received platelet transfusion during one-month follow-up of the study.

Conclusion: Closure of the patent ductus arteriosus in premature infants is not affected by the number of platelets.

Key words: Platelet Count; Patent Ductus Arteriosus (PDA), Preterm; Neonates

Introduction

World Health Organization (WHO) defined premature birth or preterm birth as the birth occurring after 20 weeks and before 37 weeks of gestation. Premature birth is a syndrome associated with neonatal morbidity, which has adverse consequences for long-term health and the sum of complications during the lives of premature infants causes high neonatal mortality rates. [1]

Premature birth has been associated with several factors, such as history of preterm birth, anemia, high catecholamine levels in the maternal urine, tobacco consumption, premature rupture of membranes (PROM), high blood pressure (HBP), vaginal bleeding, inter-gestational intervals ≤ 1 year, urinary tract infection (UTI), lack of prenatal care, inadequate prenatal care, maternal age less than 20 years, maternal age over 35 years, oligohydramnios, history of induced abortion, preeclampsia, twin pregnancy, advanced maternal age. Moreover, although there are several risk factors associated with premature birth, its etiology has not been fully determined. [2]

Babies born prematurely, particularly those who are born very early, frequently have serious health problems. The consequences of prematurity usually differ. But the earlier your baby is born, the higher the risk of complication Depending on how early a baby is born, he or she may be [3]

- Late preterm, born between 34 and 36 completed weeks of pregnancy
- Moderately preterm, born between 32 and 34 weeks of pregnancy
- Very preterm, born at less than 32 weeks of pregnancy
- Extremely preterm, born at or before 25 weeks of pregnancy
- Most premature births occur in the late preterm stage.

The most common heart problems premature babies experience is patent ductus arteriosus (PDA) and low blood pressure (hypotension). PDA is a persistent opening between the aorta and

pulmonary artery. While this heart defect often closes on its own, left untreated it can lead to a heart murmur, heart failure as well as other complications. [4]

Patent ductus arteriosus is an important clinical problem associated with exacerbation of respiratory distress syndrome (RDS), pulmonary hemorrhage, prolonged use of assisted ventilation, bronchopulmonary dysplasia (BPD), intraventricular hemorrhage (IVH), renal dysfunction, necrotizing enterocolitis (NEC), periventricular leukomalacia (PVL), cerebral palsy and mortality in prematurity. [4]

Fetal patency preserved by low oxygen tension and vasodilator prostanoids, such as prostaglandin E2 (PGE2) and prostacyclin (PGI2), are part of the classical hypothesis taking ductal closure into consideration. Smooth muscle cells in the ductus arteriosus (DA) constrict as a result of an increase in PaO2 and a drop in PGE2 and PGI2 after birth, which causes the DA to functionally close. This contraction causes a localized hypoxia, which in turn causes anatomic DA closure and vascular remodeling. It also causes cell death and the production of hypoxia-inducible growth factors. [5]

A different theory was recently put out by Echtler et al., who showed that platelets were drawn to the luminal aspect of the mouse DA as soon as it was born. Persistent DA was caused by genetic abnormalities in platelet biogenesis or induced malfunction of platelet adhesion. [6] The findings of the platelet count studies that have been published recently are inconsistent. In a retrospective investigation involving preterm children born between 24- and 30-weeks' gestation, Echtler et al. found that thrombocytopenia on the first day of life was a substantial risk factor for the failure of DA closure. [7]

Patients and Methods

A prospective study included 50 PDA neonates classified into 2 groups

Group I (N=18) consisted of open PDA neonates.

Group II (N=32) consisted of closed PDA neonates.

Inclusion criteria:

- Both sexes neonates were included
- The age included the first week of life
- All patients in the patient group were classified as having PDA using Echocardiography and thrombocytopenia diagnosed by CBC

Exclusion criteria:

Children with diseases or conditions that intrupt the study as

- Full term neonates
- Neonates with thrombocytopenia less than 20,000 or symptomatic thrombocytopenia as bleeding
- Neonates with critical cardiac anomalies as cyanotic heart diseases
- Neonates suffering from bleeding tendency diseases
- Patients suffering from acute or chronic hypoxia

Data collection:

1. Through history taking:

- Age, gender and place of residence
- Symptoms: such as difficult in breathing and bleeding
- Family history:

- Consanguinity
- Similar condition

- Drugs
- Environmental factors
- Psychological factors

2. clinical examination:

A-General physical examination:

- Vital measures include heart rate, respiration rate, temperature, blood pressure
- General appearance: degree of Respiratory distress, state of well being
- Skin
- Location, size, pain, movement, and consistency of lymph nodes
- Mucosa of the mouth (color, redness, nodules, ulcers), gum, palate, and tongue

B- systematic physical examination including:

I. Chest:

1. Shape and symmetry, deformities, respiration rate, and dilated veins are all examined

2. palpation enlargement of the chest

3. percussion: side by side comparison (dull, resonant, and super resonant)

4. Auscultation:

- Is the breath quality vesicular or bronchial?

- Is the volume of the breath adequate or diminished?

- Unusual sounds such as wheezes, and crepitations

II- Heart:

- Examine for apical pulsation
- Palpation: apex, location, radial pulsed, peripheral pulsation and capillary refill time
- Auscultation: To detect murmur

III. Abdomen

- Examine shape of the abdomen, dilated veins, and the umbilicus (form, location and inflammation)
- Palpation: rigidity tenderness, guarding and palpable masses, intra-abdominal structures (size, shape, consistency, surface, border, and mobility)
- Ascites by percussion
- Auscultation to detect bowel sounds and abdominal bruit

3- <u>B- Laboratory investigations including:</u>

A-Routine tests:

1) Complete blood count (CBC): Celtac G, NIHON KIHODEN CORPORATION, AUTOMATED HEMATOLOGY ANALYSER, Japan was used.

Sampling :2ml of venous blood put in Ethylene Diaminr Tetra acetic Acid (EDTA)containing tube for CBC.

<u>Procedure:</u>

During a CBC, a lab technician will draw blood from a vein, typically from the inside of your elbow of from the back of your gand. The technician:

1) cleans your skin with an antiseptic wipe

2) places an elastic band, or tourniquet around your upper arm to help the vein swell with blood

3) Insert a needle in the vein and collect a blood sample in one or more vials

4) Remove the elastic band

5) cover the area with a bandage to stop any bleeding

6) label your sample and send it to lab

4. Echocardiographic examination:

An echocardiogram is an ultrasound image of the heart. Echocardiography examinations were carried out using a (GE Vivid T8) cardiovascular ultrasound machine with 6.5MHz electronic sector traducer. Echocardiographic measurements included M mode and two dimensional, pulsed and continuous wave Doppler and colo flow mapping.

Types of echocardiograms:

- Transthoracic echocardiogram
- Trans-esophageal echocardiogram
- Doppler ultrasound
- D echocardiogram
- Stress echocardiogram

Ethical considerations of the study:

This study was approved by ethical committee, Faculty of Medicine, Minia University (approval No: 1228/ 2023). Protect the participants anonymity and confidentiality, avoiding using deceptive practice. The participants were given the right to withdraw from our research. A written consent from the patient's care giver were obtained.

Statistical analysis:

Data entry and analysis was done using SPSS software program version 21. Quantitative data presented as range mean, standard deviation and median. Qualitative data were presented as frequency distribution. Independent sample t test. Chisquare test and Z test were used to test the significant difference. Logistic regression analysis was done and odds ratio was calculated and P-value of less than 0.05 considered as cutoff for significance.

Results

Regarding the demographic characteristic, the mean gestational age 32.4±1.3 ranged from 29:34 and mean birth weight was 1.27±0.14 with 52% males and 72% were born by CS. more than one half of PDA cases had

respiratory distress, 18% had low birth weight and 14% were Infant of diabetic mother and only 3 cases had intrauterine growth retardation Table 1.

Such features were similar to Dilek **Kahvecioglu et al.** a prospective study included 60 premature infants, were grouped into two groups, including group 1 with "open PDA" and group 2 with "closed PDA", mean GA and median BW were 27.6 ± 1.8 vs. 28 ± 1.6 weeks and 1025 (585–1480)g, respiratory distress syndrome, retinopathy of prematurity were highly observed specially in open "PDA" group. [8]

As shown in **Table 2** there was non-statistically significant difference between cases with open PDA and cases with closed PDA after 1 month of follow up regarding gestational age, sex, birth weight, maternal risk factors and diagnosis (p value>0.05).

Regarding outcome of PDA cases after 1 week of follow up with echo, it was found that 42% had closed PDA and the remaining 58% had still open PDA while after 1 month of follow up with echo, it was found that 64% had closed PDA and the remaining 36% had still open PDA **Table 3**.

In agreement, **Carl H. Backes et al** a study conducted on 52 premature infants with a median procedural weight of 2.9 kg (range 1.2–3.9 kg) underwent attempted PDA closure, 40% had closed after 4 days and 60% had PDA closed after 1 month, all participants had closed PDA after 3 months. [9]

Moreover, the present analysis was in contrast with **Sallmon H et al.** a retrospective study of 1350 very low birth weight (VLBW; <1500 g) infants revealed that 90% had a closed ductus at day 4, and 98% closed by the time of discharge. [10]

In the present study, it was found that 37.9% of cases with opened PDA after 1 week of follow up had platelet transfusion compared to 52.4% of cases with closed PDA with non-statistically significant p value >0.05. Moreover, 66.7% of cases with opened PDA after 1

month of follow up had platelet transfusion compared to 28.1% of cases with closed PDA with a statistically significant p value **Table 4**.

These results were confirmed by **Kumar J. et al.** Thrombocytopenic (<100 000 per μL) preterm neonates with hours-PDA were enrolled and randomly allocated to the liberal and standard transfusion groups: 22 in each arm. They underwent echocardiography daily until closure of PDA, no significant acceleration in the time required to achieve PDA closure (median of 72 h in both groups (p=0.697). [11]

However, almost half of the infants in the liberal transfusion group (41 %) developed intraventricular hemorrhage (IVH) of any grade, while IVH was only seen in 4.5 % of the infants allocated to the restrictive transfusion group (p=0.009).

The increase in blood volume through more frequent platelet transfusions in the intervention arm may have offset any possible benefit of maintaining a higher platelet count when compared with the control group. Higher circulating blood volume is known to contribute to persistence of the PDA. [12]

In addition, Studies have revealed that the platelet-aggregation capacity of transfused donor blood is lower than native blood, and there is potential developmental mismatch between native neonatal platelets and transfused adult platelets.[13] **(Chen Y.Y. et al., 2014; Simon S.R. et al., 2015).**

Moreover, **Kulkarni VV. Et al.** found that the ductal closure was not related with low platelet number in preterm babies. They noticed that low circulating platelet number is not responsible for persistent PDA. It had explained as platelet function in infants is distinct from that of adults in several aspects with neonatal platelets exhibiting a hypo-responsive functional pattern in response to platelet agonists (ADP, collagen, epinephrine, thrombin, thromboxane, rhodocytin) compared to adult platelets. [14]

Furthermore, in agreement with the previous studies **Evrim Alyamac Dizdar et al.** retrospectively evaluated records of premature infants who were between 23 and 32 weeks of gestation (due date from last menstrual period) and had significant PDA. A total of 361 preterm infants were analyzed in the study, including 154 infants with significant PDA and 207 controls. There were no differences between the study groups with regards to birth weight, gender and maternal risk factors. The study showed that PDA was associated with a lower platelet count and higher PDW in preterm infants. No association between platelet counts and persistence or closure of DA. [15]

Contrarily, **Echtler et al.** provided new insights into the mechanisms of ductal closure [4]. It was hypothesized that given the role of endothelial cell injury in DA closure; platelets might have a role in this process as platelets are crucial for DA closure by promoting thrombotic sealing of the constricted DA and by supporting luminal remodeling, which indicated that thrombocytopenia is an independent predictor for failure of DA closure in preterm human newborns, indicating that platelets are likely to contribute to DA closure in humans. [16]

Additionally, **Mezu-Ndubuisi et al.** were in contrast to the present results as a multivariate logistic regression analysis showed that lower platelet volume, a lower BW, and preeclampsia were independently associated with COXI treatment failure. [17]

Gamze Demirel et al. a study included 50 infants with PDA and 50 controls agreed with the present outcomes. Mean gestational week of patients were 28.8 ± 2.4 weeks and mean birth weight of the patients were 1237.5 ± 406 g. The blood parameters including mean platelet volume (MPV) were no statistically different between the two groups. Also, there was no association with the platelet count and the closure or response to the medical therapy. [18]

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Table (1): Demographic data of the studied cases

Demographic data		**PDA cases (N=50)**
Gestational Age	Mean ± SD Median (Range)	32.4±1.3 33(29:34)
Sex	Male Female	26(52%) 24(48%)
Birth weight	Mean ± SD Median (Range)	1.27±0.14 1.3(1:1.5)
Mode of delivery	Normal CS	14(28%) 36(72%)
Maternal risk factors	No	15(30%)
	Diabetic	7(14%)
	Preeclampsia	12(24%)
	Cardiac	10(20%)
	Hyperthyroidism	4(8%)
	Hypothyroidism	2(4%)
Cause of admission	LBW	9(18%)
	RD	27(54%)
	Infant of diabetic mother	7(14%)
	Meconium aspiration	4(8%)
	IUGR	3(6%)

Table 2: Comparison between cases with opened PDA and closed PDA at 1 month of follow up by echo regarding Demographic data

Demographic data		**Opened PDA cases (N=18)**	**Closed PDA cases (N=32)**	**P value**
Gestational Age	Mean ± SD Median (Range)	32±1.5 32(29:34)	32.6±1 33(30:34)	0.09
Sex	Male Female	10(55,6%) 8(44.4%)	16(50%) 16(50%)	0.70
Birth weight	Mean ± SD Median (Range)	1.22±0.15 1.2(1:1.5)	1.28±0.13 1.3(1.1:1.5)	0.07
Mode of delivery	Normal CS	4(22.2%) 14(77.8%)	10(31.1%) 22(68.8%)	0.49
Maternal risk factors	No	4(22.2%)	11(34.4%)	0.91
	Diabetic	2(11.1%)	5(15.6%)	
	Preeclampsia	5(27.8%)	7(21.9%)	
	Cardiac	4(22.1%)	6(18.8%)	
	Hyperthyroidism	2(11.1%)	2(6.3%)	
	Hypothyroidism	1(5.6%)	1(3.1%)	
Cause of admission	LBW	5(27.8%)	4(12.5%)	0.82
	RD	9(50%)	18(56.3%)	
	Infant of diabetic mother	2(11.1%)	5(15.6%)	
	Meconium aspiration	1(5.6%)	3(9.4%)	
	IUGR	1(5.6%)	2(6.3%)	

Table 3: Outcome of PDA cases either closed or opened at 1 week of follow up and after 1 month of follow up by echo.

Outcome		**PDA cases (N=50)**
Ech at One-week	Closed PDA Opened PDA	21(42%) 29(58%)
Ech at 1-month	Closed PDA Opened PDA	32(64%) 18(36%)

Table 4: Comparison between cases with opened PDA and closed PDA at 1 week of follow up by echo regarding platelet transfusion.

Item		Opened PDA cases (N=29)	Closed PDA cases (N=21)	P value
Platelet transfusion	Not done	18(62.1%)	10(47.6%)	0.31
	Done	11(37.9%)	11(52.4%)	

Discussion

Patent ductus arteriosus (PDA) is an important problem for preterm infants in neonatal intensive care units (NICU). The incidence may be as high as 46% among those with extremely low gestational age and very low birth weight infants (Kulkarni VV. Et al., 2016).

Persistent left to right shunt results in a progressive lung over circulation and a left ventricular volume overload. Almost 60–70% of preterm infants < 28 weeks of gestational age receive medical or surgical therapy for PDA (Kumar A. et al., 2017). Although the heart increases cardiac output through an increase in stroke volume, effective systemic perfusion may not be maintained and organ blood flow may be compromised in time ultimately resulting in congestive heart failure (Kumar A. et al., 2017).

Classical hypothesis considering ductus arteriosus (DA) closure includes fetal patency maintained by high oxygen tension and vasodilator proteinoids including prostaglandin E2 (PGE2) and prostacyclin (PGI2). After birth, increase in PaO2 and decrease in PGE2 and PGI2 induce constriction of DA smooth muscle cells resulting in functional closure of DA. This contraction leads to a local hypoxic zone, triggers cell death and release of hypoxia inducible growth factors which results in vascular remodeling and anatomic DA closure.

Recently an alternative hypothesis was proposed by Demir N et al., 2017 after demonstrating in DA model the recruitment of platelets to the luminal

aspect of the murine DA immediately after birth. Induced dysfunction of platelet adhesion or transgenic defects of platelet biogenesis resulted in persistent DA.

The present study aimed to evaluate the influence of platelet count on the spontaneous closure of ductus arteriosus in prematurity. arteriosus in prematurity.

The study conducted on 50 neonates divided into two groups, including Group 1 with "open PDA" and Group 2 with "closed PDA". The variables of mean platelet volume was analyzed and compared between two groups of patients to identify the factors that significantly influenced spontaneous closure of ductus arteriosus.

Regarding the demographic characteristic, the mean gestational age 32.4±1.3 ranged from 29:34 and mean birth weight was 1.27±0.14 with 52% males and 72% were born by CS. more than one half of PDA cases had respiratory distress, 18% had low birth weight and 14% were Infant of diabetic mother and only 3 cases had intrauterine growth retardation. Such features were similar to Dilek Kahvecioglu et al. (2018) a prospective study included 60 premature infants, were grouped into two groups, including group 1 with "open PDA" and group 2 with "closed PDA", mean GA and median BW were 27.6 ± 1.8 vs. 28 ± 1.6 weeks and 1025 (585–1480) g, respiratory distress syndrome , retinopathy of prematurity were highly observed specially in open "PDA" group.

In the present study, regarding lab data of PDA cases, mean hemoglobin level was 12.6±2.8, mean TLC was 10.2±3.9 (10^3) and mean platelet was 52.2±11.3 (10^3) and ranged from 35:73 with all cases had low platelet count less than 100,000. Also, more than one half of cases had positive CRP (56%).

In agreement, Vulliamy P. et al. (2017) a retrospective study included 115 preterm newborns with significant PDA (PDA) and 120 newborns without PDA revealed that hemoglobin of PDA premature

patients was 13.7 ± 2.76, WBCs $6*10^3$ $\pm 1.3 * 10^3$ and the platelet count was 52.000 – 64.000 and two thirds of cases had positive CRP.

It may had explained as lower platelet counts and higher C-reactive protein (CRP) levels (indicating inflammation and potential platelet dysfunction) are associated with PDA, with CRP being the only independent predictive factor of PDA development. However, some clinical studies did not demonstrate a relationship between low platelet count and spontaneous closure of DA (Chen Y.Y. et al., 2014; Simon S.R. et al., 2015).

In the current analysis 26% of PDA cases had associated patent foramen oval, 24% had associated ASD and 20% had associated VSD while 30% had only PDA without any associated condition.

These results in line with Mitsuhiko Riko et al. (2020) a study conducted on 32 premature neonates with PDA, less than one third had ventricular septal defect (10% had VSD <2mm and 13% had VSD > 2mm), For the infants with VSD < 2 mm, no medical or surgical treatments for VSDs were undertaken. Of the infants with VSD ≥ 2 mm, underwent medical and surgical treatment.

Contrarily, a study by David Connuck et al. (2023) conducted on 104 patients aimed to evaluate the platelet function on a patent ductus arteriosus (PDA) indicated that 63 infants (62%) had evidence of a PFO and the rest of participants had no complications.

Michael L. et al (2018) confirmed the present outcomes as a study conducted on 235 PDA neonate, less than one third of neonates (28%) had ASD, 30% had patent foramen ovale and 42% had other complications. Regarding outcome of PDA cases after 1 week of follow up with echo, it was found that 42% had closed PDA and the remaining 58% had still open PDA while after 1 month of follow up with echo, it was found that 64% had closed PDA and the remaining 36% had still open PDA.

In agreement, Carl H. Backes et al. (2016) a study conducted on 52 premature infants with a median procedural weight of 2.9 kg (range 1.2–3.9 kg) underwent attempted PDA closure, 40% had closed after 4 days and 60% had PDA closed after 1 month, all participants had closed PDA after 3 months. Moreover, the present analysis was in contrast with Sallmon H et al. (2012) a retrospective study of 1350 very low birth weight (VLBW; <1500 g) infants revealed that 90% had a closed ductus at day 4, and 98% closed by the time of discharge.

In the present study, it was found that 37.9% of cases with opened PDA after 1 week of follow up had platelet transfusion compared to 52.4% of cases with closed PDA with non-statistically significant p value >0.05. Moreover, 66.7% of cases with opened PDA after 1 month of follow up had platelet transfusion compared to 28.1% of cases with closed PDA with a statistically significant p value.

These results were confirmed by Kumar J. et al. (2019) Thrombocytopenic (<100 000 per μL) preterm neonates with hs-PDA were enrolled and randomly allocated to the liberal and standard transfusion groups: 22 in each arm. They underwent echocardiography daily until closure of PDA, no significant acceleration in the time required to achieve PDA closure (median of 72 h in both groups (p=0.697). However, almost half of the infants in the liberal transfusion group (41 %) developed intraventricular hemorrhage (IVH) of any grade, while IVH was only seen in 4.5 % of the infants allocated to the restrictive transfusion group (p=0.009).

The increase in blood volume through more frequent platelet transfusions in the intervention arm may have offset any possible benefit of maintaining a higher platelet count when compared with the control group. Higher circulating blood volume is known to contribute to persistence of the PDA (Demir N. et al., 2016).

In addition, Studies have revealed that the platelet-aggregation capacity of transfused donor blood is lower than native blood, and there is potential developmental mismatch between native neonatal platelets and transfused adult platelets (Chen Y.Y. et al., 2014; Simon S.R. et al., 2015).

Moreover, Kulkarni VV. Et al. (2017) found that the ductal closure was not related with low platelet number in preterm babies. They noticed that low circulating platelet number is not responsible for persistent PDA. It had explained as platelet function in infants is distinct from that of adults in several aspects with neonatal platelets exhibiting a hypo-responsive functional pattern in response to platelet agonists (ADP, collagen, epinephrine, thrombin, thromboxane, rhodocytin) compared to adult platelets. Furthermore, in agreement with the previous studies Evrim Alyamac Dizdar et al. (2012) retrospectively evaluated records of premature infants who were between 23 and 32 weeks of gestation (due date from last menstrual period) and had significant PDA. A total of 361 preterm infants were analyzed in the study, including 154 infants with significant PDA and 207 controls. There were no differences between the study groups with regards to birth weight, gender and maternal risk factors. The study showed that PDA was associated with a lower platelet count and higher PDW in preterm infants. No association between platelet counts and persistence or closure of DA.

Contrarily, Echtler et al. (2018) provided new insights into the mechanisms of ductal closure [4]. It was hypothesized that given the role of endothelial cell injury in DA closure; platelets might have a role in this process as platelets are crucial for DA closure by promoting thrombotic sealing of the constricted DA and by supporting luminal remodeling, which indicated that thrombocytopenia is an independent predictor for failure of DA closure in preterm human newborns, indicating that

platelets are likely to contribute to DA closure in humans.

Additionally, Mezu-Ndubuisi et al. (2017) results were in contrast to the present results as a multivariate logistic regression analysis showed that lower platelet volume, a lower BW, and preeclampsia were independently associated with COXI treatment failure.

Gamze Demirel et al. (2020) a study included 50 infants with PDA and 50 controls agreed with the present outcomes. Mean gestational week of patients were 28.8 ± 2.4 weeks and mean birth weight of the patients were 1237.5 ± 406 g. The blood parameters including mean platelet volume (MPV) were no statistically different between the two groups. Also, there was no association with the platelet count and the closure or response to the medical therapy.

Conclusions

Closure of the patent ductus arteriosus in premature infants is not affected by the number of platelets

Data availability

The dataset used in the current study is available from the corresponding author on request.

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Author's contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors read and approved the final manuscript

Conflict of interest

The authors declare that they have no conflict of interest

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