

Frequency of factors leading to Patent Ductus Arteriosus.

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Abstract:

Background: Patent Ductus Arteriosus is developing as major problem in our society. Many studies in Pakistan has been done to analyze the efficacy of surgical procedures but no one tried to find the frequency of factors leading to this problem. So the objective to conduct this study was to determine the frequency of factors leading to Patent Ductus Arteriosus in children presented in Punjab Institute of Cardiology, Lahore.

Objective: The purpose of this study was to measure the frequency of factors leading to patent ductus arteriosus in children presented at Punjab Institute of Cardiology.

Method: A cross sectional study was conducted on 242 patients of PDA which already have been treated during the year 2006-2007. They were recalled for recheck up and also interviewed. Their operative information was gathered from their files.

Results: Mean age of children at time of treatment was 6.12±5.203 years. Mostly children were of age 1. Out of 242 children, there were more female children (62.8%) involved as compared to male children (37.2%). In this study 72.73% children belong to urban area while 27.27% children belong to rural areas. 54.5% (n=132) children were surgically legated while 45.5% (n=110) children were catheterized or had device closure. 17.8% children inherited the disease from their close relatives. 43.4% mothers had some infectious problems during pregnancy. 42.6% mothers used antibiotics or other drugs although they were pregnant. 4.5% children had Down syndrome. 56.61% (137) children had premature birth.

Conclusion: These are modifiable factors that can be controlled. If these factors are controlled then the incidence of Patent Ductus Arteriosus (PDA) can be reduced.

Key Words: Patent Ductus Arteriosus, surgical ligation, catheter based procedure

Introduction:

Patent ductus arteriosus (PDA) is a problem in which a blood vessel called the ductus arteriosus fails to close normally soon after birth of an infant.¹ PDA is the persistence of a normal structure between the left pulmonary artery and the descending aorta. The ductus normally undergoes closure at birth. Persistence of this structure after 10 days of birth is considered abnormal.² A PDA is variable in its presentation. It may be varying in size from small to large and some time it cannot be picked up during physical examination at birth. Spontaneous ductal closure can occur without treatment. Complications may include bacterial endocarditis, late congestive heart failure (CHF), and the development of pulmonary vascular obstructive disease. It can complicate other circulatory or ventilatory abnormalities.²

PDA is a common congenital heart defect in the United States. The condition occurs more often in premature infants, occurring in about 8 of every 1,000 births. However, it also occurs in full-term infants, occurring in

about 2 of every 1,000 births.² The available retrospective data on the natural history of untreated patent ductus arteriosus are poor; however, complications can arise.¹ According to a survey was conducted in NWFP in 2002, frequency of PDA was found in 9.7% cases.³ But in 2006 another study conducted in Peshawar, the frequency was increased (12.8%).⁴ So we conduct this study to find out the factors leading to this problem in our set-up. With the help of Punjab Institute of Cardiology we conducted this study to rule out the extent of the problem.

Methodology:

Cross Sectional survey was conducted to collect the data. There were 242 patients who had been treated at Punjab Institute of Cardiology during the year 2006-2007. They were called for recheck up and also interviewed. Their operative information, including their age at time of presentation, size of PDA and procedure, was gathered from their files. Quantitative variables like child's age, mother's age, size of PDA, and height of the children were calculated as mean±standard deviation. Frequency and percentages were calculated for qualitative variables like gender, residential area, Down's syndrome, inheritance, smoking status of parents and any infection to mother during labor of the diseased child. There were no ethical issues as it was just an observational study and after taking informed consent from parents data was collected.

Results:

There were total 242 patients included in the study

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with the mean current age of children was 7.441 ± 5.313 years but mean age at time of treatment was 6.12 ± 5.203 years with minimum age of 1 year and maximum age of 16 years. At time of treatment 52.1% children belong to age group 1-4. (Table I). There were 90 (37.2%) male children and 152 (62.8%) female children included in the study. (Table I) There were more children who belong to urban areas (72.7%) while 27.3% of children belong to rural areas. Mean height of children at time of treatment was 3.509 ± 1.181 feet and mean weight was 24.90 ± 11.33 kg. Minimum weight of 8 kg and maximum weight was 56 kg. Current mean age of mothers was 34.64 ± 7.48 years but age of mother at time of birth of the child was 27.17 ± 4.42 years and minimum age was 19 years and maximum age was 40 years. Mean PDA size of children at time of treatment was 6.87 ± 3.58 mm. There were 17.8% children who inherited the disease from their 1st relatives like grand father, grand mother, mother, father and siblings also had this defect. Only 4.5% of children reported with Down's syndrome. But 56.6% of children had premature birth. There were 43.4% females who reported about the rubella and other severe infection during pregnancy and 42.6% of them used antibiotics for the cure of that infection while they were pregnant. It was observed that 66.1% of children were given medical treatment to manage the PDA but later on when hole was not closed then surgical intervention was adopted to save the child, 45.5% undergone catheter based procedure while 54.5% undergone surgical ligation depending upon the condition of the child. We also observed that 63.6% mothers were exposed to smoking; directly (mother was a smoker) or indirectly (father of child was smoker).

Table I: Age groups of patients

Age groups	n (%)
1-4	126 (52.1%)
5-8	52 (21.5%)
9-12	17 (7.0%)
13-16	47 (19.4%)
Total	242 (100.0%)

Table II: Distribution of males and females in different age groups at time of treatment.

Age groups at time of treatment	Gender		Total
	Male	Female	
1-4	53 (42.1%)	73 (57.9%)	126
5-8	19 (36.5%)	33 (63.5%)	52
9-12	10 (58.8%)	7 (41.2%)	17
13-16	8 (17.0%)	39 (83.0%)	47
Total	90 (37.2%)	152 (62.8%)	242

Discussion:

There were total 242 patients included in the study with the mean current age of children was 7.441 ± 5.313 years but mean age at time of treatment was 6.12 ± 5.203 years with minimum age of 1 year and maximum age of 16 years. At time of treatment 52.1% children belong to age group 1-4, 21.5% belong to age group 5-8, 7.0% belong to age group 9-12 and 19.4% belong to age group 13-16. Females are 2-3 times more likely than males to develop PDA.² PDA is more common among females than among males^{5, 6, 7, 8, 9}, although one investigation reported 53% of the PDA cases to be among males.¹⁰ Same pattern was seen in our study. There were 62.8% females as compared to males. In our study it was also proved as male to female ration was 1:2. thus gender female is itself a factor that may lead to PDA.

Patent ductus arteriosus is a common problem in premature infants and is less likely to be noted as gestational age increases to full term. Incidence ranges from 20% in premature infants older than 32 weeks' gestation up to 60% in those younger than 28 weeks' gestation. Up to 30% of low birth weight infants (<2500 g) develop a patent ductus arteriosus.² According to our study 56.6% of children born premature. But we could not gather the information about the gestational age of child i.e. at which gestational age he/she was born. Thus mothers should be very careful during pregnancy so that they may complete the gestational age and risk of developing PDA may be reduced. The incidence of PDA is inversely related to gestational age and birth weight. A hemodynamically significant shunt due to PDA has been reported in 40% of infants less than 1000 grams and 20% of infants between 1000-1500 grams.¹¹ According to our study mean height of children at time of treatment was 3.509 ± 1.181 feet and mean weight was 24.90 ± 11.33 kg. Minimum weight of 8 kg and maximum weight was 56 kg. These results were because there were children

of age more than 10 were also in the study group. PDA risk increases with maternal diabetes.^{5, 12, 13, 14} PDA has been reported among the offspring of mothers with phenylketonuria.¹⁵ There is no association between PDA and maternal hypothyroidism or hyperthyroidism¹⁶ or influenza.⁵ In a study that examined the relationship between PDA and maternal hyperthermia, PDA risk was associated with fever and upper respiratory infection but not with workplace temperature or sauna bathing.¹⁷ But according to our study 43.4% mothers reported about infection that was severe and 42.6% of mother took antibiotics during pregnancy and most of them took antibiotics over the counter or without any physicians recommendations. There is also a thought that PDA has not been associated with maternal ampicillin use.¹⁸

We also observed that 63.6% mothers were exposed to smoking; directly (mother was a smoker) or indirectly (father of child was smoker). Although one investigation reported increased risk of PDA with maternal smoking,¹⁹ several other studies found no such association.^{4, 20, 21}

Conclusion:

Thus it was concluded that being female, preterm birth, any type of infection during pregnancy, mother's exposure to drugs and smoking, low birth weight can lead to patent ductus arteriosus. These are modifiable factors that can be controlled. If these factors are controlled then the incidence of Patent Ductus Arteriosus (PDA) can be reduced. This study was conducted only in a small set-up with a small sample size. If this would be done at district or provincial level, this could help in finding the extent of the problem in our population.

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