

# Diagnostic Utility of Autopsy in a University Hospital in Iran

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## ABSTRACT

**Objective.** The objective of this study was to evaluate the diagnostic utility of the autopsy in University hospital in Tehran, Iran.

**Methods.** In this retrospective descriptive – analytic survey during a six years period from 1998 to 2003, autopsies in the Bahrami Children Hospital, a tertiary care hospital in Tehran, were studied. The clinical and autopsy diagnoses were compared and categorized as follows: 1. Change (clinical and autopsy diagnoses discordant), 2. Add (significant unexpected findings noted on the autopsy, although the clinical diagnosis was not altered), 3. Confirm (clinical and autopsy diagnosis concordant), 4. Autopsy inconclusive.

**Results.** Eighty four autopsies were studied. Out of 350 neonatal deaths in the period, autopsy was performed in 74 neonates (21%) and of 249 under 5 year deaths (except neonates) autopsy was performed in only 10 cases (4%). In 61 cases (73%) the autopsy diagnoses confirmed the clinical diagnosis, in 10 cases (12%) it changed the clinical diagnosis, in 11 cases (13%) it significantly added to the clinical diagnosis and in 2 cases (2%) it was inconclusive.

**Conclusion.** This study demonstrated that neonatal and infantile autopsy continued to provide clinically useful data in 25% of cases and remains an invaluable tool in pediatric medicine. [*Indian J Pediatr* 2008; 75 (6) : 585-588] *E-mail* : [psalamati@tums.ac.ir](mailto:psalamati@tums.ac.ir)

**Key words** : Autopsy; Infant; Neonate; Diagnosis

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The autopsy has been important in medicine since the 15<sup>th</sup> century and has contributed greatly to clinical knowledge. Especially, infantile autopsy can be invaluable in determining the precise cause of death, reducing parental concerns and guilt over prenatal events and genetic counseling of families for subsequent pregnancies. Unfortunately, the rate and perceived importance of pediatric autopsies declined, although not as precipitously as adult rates. Rates of neonatal autopsy have generally remained higher than adult ranging from 59% to 81 % in Western countries.<sup>1</sup>

However, parental consent is thought to be the major limiting factor in doing autopsy.

Autopsy if properly performed, accurately interpreted and well transferred to medical staff, could be conclusive.

It could be one of the most useful tools for development of the medical knowledge. It plays a clinically relevant role in evaluating and ultimately improving the quality of medical care, medical education and research.

The purpose of this study was to evaluate the trend of autopsy in Bahrami children's hospital during 6 years period and the yield of new information in terms of discordance between diagnosis before and after death.

## MATERIALS AND METHODS

This study was conducted at Bahrami children's hospital related to the Tehran University of Medical Sciences. It has a 106 – bed, with various wards including neonatal intensive care unit (NICU), neonatal, infectious, internal and surgical pediatrics departments.

The present study included medical records and autopsy reports of all autopsies in the hospital from 1998 to 2003. For all cases, demographic data such as patient age, sex, place of birth, kind of delivery, etc were collected. For those patients with autopsies, medical

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records and autopsy reports were reviewed and additional data were collected on length of stay, ante mortem imaging studies, ante mortem diagnosis and autopsy findings. All autopsies were performed after obtaining informed consent from parents. Autopsy examinations were done at no charge to families, and included of clinical records, anthropometric measurements, external gross examinations, examinations of the brain and organs of the thoracic, abdominal and pelvic cavities, and recorded weight and microscopic examination of organs. Aerobic and anaerobic bacterial cultures and viral cultures were obtained selectively when indicated by history or findings.

Antemortem diagnoses included all diagnoses listed by the physician on the death certificate before autopsy and all diagnoses in the medical record that either had been established before death or appeared sufficiently likely for specific treatment to have been instituted before death. Autopsy diagnosis including histologic results, were obtained from the final autopsy report. Autopsy reports and medical records were reviewed by the authors. Subspecialists were consulted as needed to verify the significance of autopsy findings and to assess their effect on clinical outcomes. Clinicopathologic concordance or discordance was divided into four categories according to the information revealed at the autopsy: Category 1 was *change* – the autopsy revealed a new diagnosis or made a change in the main diagnosis, 2, *additional* – the autopsy revealed additional diagnoses or findings, which were not suspected clinically, but did not change the main diagnosis; 3, *confirmation* – the autopsy revealed exactly the same main diagnosis and no additional findings were established; and 4, *inconclusive* – the autopsy demonstrated no obvious cause of death or other significant findings.

Statistical analysis using chi-square test were compared and  $P < 0.05$  was considered significant.

## RESULTS

There were 350 neonatal deaths, 191 infant deaths (1-12 months) and 58 child deaths from 1 to 5 years in Bahrami children's hospital during the 6 years study period. Eighty four autopsy reports evaluated. Seventy four patients were neonate (age less than 28 days) and 10 patients were more than 1 month and less than 5 years old. Fifty one deaths were male and 33 deaths were female. Autopsies were performed on neonatal group for 74 deaths (21.1%) of neonatal deaths and on 1 month – 5 years group for 10 deaths (4% of infantile deaths).

Examination was carried out by a pathologist from 1998 to 2000. Then, after missing one year, from mid 2001 to end of 2003 autopsies were performed by two other pathologists. Patients referred for autopsy from these wards: NICU (51 cases), pediatric surgery (15 cases), neonatal (14 cases) and internal medicine (4 cases). Autopsy findings according concordance between diagnosis before death and at autopsy were as follow: change diagnosis=10 (11.9%), additional diagnosis = 11 (13.1%), confirmation=61 (72.6%) and inconclusive=2 (2.4%). The actual changed and additional diagnoses are mentioned in tables 1 and 2.

All children were born in the hospital. Half of them were born by cesarean section.

The mean of age of mothers was  $24.8 \pm 3.5$  years. Sixty two autopsy cases (74%) were born in the first born of pregnancy and others were due to second to fifth pregnancy. All parents were Muslims. There is no history of addiction in the parents of these 84 deceased children. Ninety percent of mothers have no history of stillbirth or abnormal neonate. Fifty two mothers (62%) had history of using prescribed ferrous sulfate or folic acid tablets during her pregnancy and only one of them used levothyroxin for her hypothyroidism.

TABLE 1. Antemortem and Postmortem Diagnoses in Changed Group of Discordance

No	initials of the name	group of age	antemortem diagnosis	postmortem diagnosis
1	Jaf	N	interstitial pneumonitis	congenital heart disease
2	Naz	N	hyalin membrane disease	vegetative infective endocarditis
3	Gha	N	metabolic acidosis	complete atrioventricular endocardial cushion
4	Sef	N	heart disease	bilateral renal agenesis
5	Eli	N	congenital heart	esophageal atresia disease
6	Far	N	respiratory distress syndrome	congenital heart disease (PDA, ASD)
7	Ker	N	bowel obstruction	perforation of urinary bladder
8	Azi	NN	sepsis + polycystic kidney	sepsis+normal kidney
9	Dad	N	sepsis	congenital heart disease (hypoplastic mitral valve)
10	Gha	N	imperforate anus	diaphragmatic hernia + peritonitis

N-Neonate, NN-Nonneonate

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Major antemortem diagnoses (clinical diagnosis assisted by imaging and lab data) consisted of : pulmonary problems (such as respiratory distress syndrome or hyaline membrane disease) in 34 % of cases, gastrointestinal problems in 26% of cases and complications of infection in 16 % of cases. Only one of them expired due to advanced metastatic tumor.

Major postmortem diagnoses (principal underlying diseases and primary cause of death) were pulmonary problems 36%, gastrointestinal problems 26%, infections 11%, cardiac problems 8 % and brain hemorrhage 6%. Thirty six children had congenital malformations (33 cases were neonate and 3 cases were infant) and in 23 cases were primary cause of death.

There was no significant difference between age group (neonate and infant), sex, maternal age and type of delivery with autopsy results in the four groups of patients ( $P > 0.05$ ) (Table 3).

### DISCUSSION

Autopsy has contributed to medical care since the advent

of modern medicine. Especially in newborns that clinical manifestations of many diseases are not clear, autopsy may precisely determine cause of death. Kumar reported neonatal autopsy rate 61% during a 10 – years period at a single tertiary care institution. New diagnoses were made at autopsy in 44% of cases despite the fact that significant decline in neonatal autopsies during 1984 -1993.<sup>2</sup> Landers and Mac pherson reported prevalence of the neonatal autopsy 48.4% in 33 american prenatal centers.<sup>3</sup> Dhar *et al* reported a neonatal autopsy rate from a regional neonatal intensive care unit in Canada.<sup>4</sup> The neonatal autopsy rate has generally remained for higher than adult ranging from 59-81%.<sup>5</sup> In the present study there was less neonatal autopsy rate in comparison to western studies. In our country, there was no certain statistics from overall neonatal autopsy rate. The only Iranian study was Valizadeh *et al* which reported crude data of 138 neonatal autopsies in one university hospital in Tehran during 3 – years period.<sup>6</sup>

In the present study, autopsy made a change in the main diagnosis in 11% and revealed additional diagnosis in 14%. Therefore, there is a total discordance rate of 25%

**TABLE 2. Antemortem and Postmortem Diagnoses in Additional Group of Discordance**

No	initials of the name	group of age diagnosis	antemortem diagnosis	postmortem
1	Ebr	NN	interstitial lung hemorrhage	multicystic dysplastic left kidney
2	Alb	N	esophageal atresia	right kidney artresia
3	Kah	N	imperforate anus	multiple GI anomalies
4	Dal	N	kernicterus	interstitial lung hemorrhage
5	Kia	N	respiratory distress syndrome	immature lung & severe congestion in internal organs & multiple anomalis in limbs
6	Has	N	imperforate anus	left kidney agenesis
7	Rez	N	esophageal atresia	duodenal atresia
8	Tah	N	repiratory distress syndrome	congenital heart disease
9	Zain	N	diaphragmatic hernia	congenital heart disease
10	Bah	N	brain hemorrhage	right renal hemorrhage
11	Ash	N	brain hemorrhage	congenital heart disease

N-Neonate, NN-Nonneonate

**TABLE 3. Patients Characteristics and Type of Discordance**

Patient characteristics		Types of discordance				P value
		Change	Additional	Confirmation	Inconclusive	
Age at death	Neonate	9	10	54	1	>0.05
	One month to 5 years	1	1	7	1	
Sex	Female	2	5	26	0	>0.05
	Male	8	6	35	2	
Maternal age(years)	<20	1	1	4	0	>0.05
	20-35	8	10	57	11	
	>35	1	0	0	1	
Type of delivery	NVD*	5	5	30	2	>0.05
	C/S**	5	6	31	0	

\*Normal vaginal delivery \*\* Cesarean section

between antemortem and postmortem findings which could be useful. Autopsy rate in Bahrami Children's Hospital was 21% for neonatal deaths and 4% in the infancy period and more. The overall our autopsy rate was 14% for all deaths under 5 years old which is lower than reports of other countries.

Religious prospections concerning autopsies have been implicated in the general decline of autopsy rates. Geller argues that with the exception of orthodox, Jews and Muslims most religions do not prohibit autopsies *per se* and that furthermore, in some cases resistance is based on misinformation.<sup>7</sup> Two other researchers rejected Geller's opinion about autopsy in Islam and they believed there was no reference in the Holy Quran.<sup>8,9</sup> In the present study, all of parents were muslims and in our opinion with good explanation and communication with parents, there are no limitations for parental consent due to religion.

One of the most important benefits of autopsy is the ability to confirm or modify antemortem diagnosis. The present study showed total discordance rate of 25% between antemortem and post mortem findings. This observation is consistent with earlier reports on the yield of the neonatal and infantile autopsies. Dhar *et al* reported a total discordance rate of 58% in 338 neonatal autopsies.<sup>4</sup> Saller *et al* reported that after autopsy, a diagnosis was changed or added in 34% of 47 neonatal deaths.<sup>10</sup> Tasdelen *et al* reported a total discordance rate of 55% between antemortem and post mortem findings in 301 neonates with autopsies. In 32.2%, major discrepancies were noted.<sup>11</sup> Meier *et al* examined 172 perinatal deaths and found that autopsy helped to establish the cause of death in 26% of 139 perinatal cases.<sup>12</sup> Gordijn *et al* reviewed 27 perinatal autopsy articles and conclude autopsy revealed a change in diagnosis or additional findings in 22% to 76% of cases.<sup>13</sup> These reviews and our study demonstrate that neonatal autopsy continues to provide clinically significant data and remains an invaluable tool in perinatal medicine.

Attempts have been made to identify those cases in which autopsies would yield the most benefits. Studies in adults have been tried to use patient antemortem characteristics to predict the yield of information at autopsy, but have been largely unsuccessful.<sup>14</sup> Previous researches on neonatal autopsy has not revealed the association between patient characteristics and results of autopsy.<sup>15</sup> In the present study, we evaluated relationship between autopsy findings with patient variables and concluded there was no significant statistical relationship between autopsy findings with age, gender, maternal age and kind of delivery ( $p > 0.05$ ).

Kumar *et al* found increased benefits at autopsy in

infants whose mothers had not prenatal care or in infants born between 28 through 36 weeks gestational age. There were no statistically significant associations between new findings at autopsy and maternal age, infant sex, age at death. The use of antemortem imaging studies did not influence the yield at autopsy.<sup>2</sup> In spite of lower samples in the present study, but some of the present results are similar with Kumar study. Further studies should be conducted to confirm these findings and to explore relationships between infant characteristics and diagnostic yield.

In conclusion, the present study revealed that in spite of decline in autopsy rate, neonatal and childhood autopsies continued to provide additional information in a significant proportion (25%) of children's deaths.

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