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Autopsy Findings in Cases of Suspected Pediatric Homicide



الموجودات التشريحية في حالات الاشتباه بقتل الأطفال

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Abstract

Pediatric deaths in developing countries, especially in Africa, are often attributed to supernatural causes or to aged family members or unfriendly neighbors. This study aims to evaluate autopsy-based causes of death in such cases.

All autopsy deaths in children less than 15 years of age in which homicide was suspected from January 2001 to December 2015 were retrospectively reviewed. Their bio-data, circumstances surrounding death and cause of death were extracted, and are presented in this report.

In the 15 years reviewed, there were 55 pediatric homicide related cases. Based on autopsy findings (coupled with clinical and circumstantial evidences), manners of death were classified as natural (34%), accidental (31%), homicidal (9%) and unascertainable in the remaining 26% of the cases.

The study highlights the need for forensic pathologists working in developing countries to be actively involved in all stages of investigating cases of suspected pediatric homicide.

Keywords: Forensic Sciences, Forensic Pathology, Pediatric, Homicide, Infanticide, Autopsy

المستخلص

غالباً ما تعزى وفيات الأطفال في البلدان النامية، وخاصة في أفريقيا، إلى أسباب خارقة للطبيعة أو إلى أفراد الأسرة المسنين أو جيران غير وديين. وتهدف هذه الدراسة إلى تقييم أسباب الوفاة المبنية على التشريح في حالات وفيات الأطفال المشتبه فيها بوجود فعل جرمي.

تمت مراجعة جميع حالات تشريح الوفيات من الأطفال الذين تقل أعمارهم عن 15 عاماً والتي كان يُشتبه وجود قتل في حدوثها خلال الفترة من يناير 2001 إلى ديسمبر 2015، وروجعت البيانات الحيوية والظروف المحيطة بالوفاة وسبب الوفاة، وعرضت في هذا التقرير.

في السنوات الخمس عشرة التي تم استعراضها، كان هناك 55 حالة تتعلق بجرائم القتل لدى الأطفال، واستناداً إلى نتائج التشريح (إلى جانب الأدلة السريرية والظرفية)، صنفت طرق الوفاة على أنها طبيعية في 24% من الحالات، وكحالات وفاة عرضية بنسبة 31%، وكحالات قتل بنسبة 9%، أما الحالات المتبقية والتي صنفت كحالات غير مؤكدة بلغت نسبتها 26%.

تؤكد الدراسة على الحاجة إلى اشتراك جميع أخصائي الطب الشرعي والأدلة الجنائية الذين يعملون في البلدان النامية بشكل نشط في جميع مراحل التحقيق في حالات الاشتباه في القتل عند الأطفال للوصول إلى أفضل النتائج.

الكلمات المفتاحية: علم الأدلة الجنائية، الطب الشرعي، طب الأطفال، القتل، الواد، التشريح.



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1. Introduction

Homicide, from the Latin Words Homo and caedere, means to “murder man” [1]. The term itself generally encompasses murder, manslaughter and infanticide. The highest pediatric homicide estimate reported was in El Salvador, at 27 per 100,000 [2]. Mandong et al. [3] in Jos, northcentral Nigeria, reported that pediatric homicides accounted for 29% of total pediatric deaths.

In several parts of Africa, including Nigeria, pediatric deaths are often attributed to supernatural causes [4]. In such circumstances, autopsy, which is often declined, becomes the only arbiter. This study aims to evaluate the risk factors and eventual autopsy-based cause of death in cases of suspected pediatric homicide.

2. Materials and Methods

All autopsy notes of deaths in children less than 15 years of age, in which homicide was suspected, were retrieved from the archives of the forensic pathology unit of a teaching hospital in northern Nigeria. The records spanned over a period of 15 years (from January 2000 to December 2015). Information regarding age, sex, cause of death and history surrounding the deaths were extracted and analyzed. The deaths were categorized based on circumstances of the cases into those following alleged abandonment, alleged abduction, alleged assault, alleged poisoning, alleged maternal infanticide and alleged witchcraft. Following autopsy, actual manners of death were then classified as natural, accidental, homicidal and indeterminable.

3. Results

In the 15 years reviewed, there were 103 pediatric autopsies, 48(47%) of which were non-homicide related while the remaining 55 (53%) were suspected/alleged ho-

micide- related.

As shown in Table-1, alleged child abandonment by the mother was seen in 8 (16.4%) cases with age range between 1 day to 7 months and an average age of 28 days. All the cases were male infants. Six (75%) of the 8 cases were found abandoned in public toilets, while the remaining 2 were found in bushes. Autopsy showed advanced state of decomposition in 3 cases (38%) while 2 cases (25%) had died from intra-cranial hemorrhages. Other identified causes of death among cases of abandonment included diffuse alveolar damage (DAD) in 2 cases and bronchopneumonia in the last.

There were 15 cases of alleged maternal infanticide. Among those, the male to female ratio was 4:1 and age ranged from 1 day to 3 months, with an average age of 29 days. Autopsy results showed that in 6 (40%) of the cases death had resulted from intra-cranial hemorrhage secondary to traumatic birth; 4 (27%) had died from bronchopneumonia, and the remaining 5 (33%) from DAD.

There were 12 cases of death following alleged assault, with a male to female ratio of 1:2, age range of 2 to 12 years and average age of 6.2 years. Of the 12 cases, fathers of 4 of the dead children were alleged to have been responsible for the assault while 4 were alleged to have been beaten by stepfathers and the remaining 4 by neighbors. Autopsy confirmed that the death was due to intracranial hemorrhage in 5 (42%) of the cases while infection was the cause of death in 6 (50%) cases. The last case was the alleged rape of an 8-year-old girl. Autopsy revealed that asphyxia due to aspiration was the cause of death without any other features of forced vaginal penetration or external bruising.

Six (12.2%) of the pediatric deaths, consisting of 5 boys and 1 girl with an average age of 4.3 years, were cases of alleged abduction occurred at different times by unknown



Table 1- Characteristics of the alleged homicide cases and autopsy findings.

Case Scenario	Male	Female	Average Age	Circumstances of Death	n	%
Abandoned by mother: - In toilet (6) - In the bushes (2)	8	-	28 days	Decomposed (unascertainable)	3	38
				Intracranial hemorrhage	2	24
				Others*#	3	38
				Birth trauma	6	40
Alleged infanticide by mother	12	3	28.5 days	Pneumonia	4	27
				Full term (DAD)	3	20
				Premature +DAD	2	13
Alleged abduction	5	1	4.3 yrs	Decomposed	6	100
				Pneumonia	5	42
Alleged Assault - By father (8) - By neighbor (4)	4	8	6.2 yrs	Intra-cranial hemorrhage	5	42
				Meningitis	1	8
				Asphyxia	1	8
				DAD*	2	29
				DAD + ATN**	2	29
Alleged Poisoning - By co-wife 5 - By new husband 2	3	4	1.5 yrs	ATN + Cerebral edema	1	14
				DAD + Cerebral edema	1	14
				Decomposed (unascertainable)	1	14
				Pneumonia	1	14
				Carbon monoxide poisoning	6	86
Alleged witchcraft	6	1	3 yrs			
Total	38	17			55	100

*DAD, Diffuse alveolar damage; **ATN, Acute tubular necrosis; #, Bronchopneumonia

persons. The children were each found within the communities from which they had been allegedly abducted. Their bodies were in stages of advanced decomposition by the time they were found. The cause of death was unascertainable.

Cases of alleged poisoning occurred in 7 children, with a male to female ratio of 3:4 (Table-2). In all of these deaths, the poison identified was locally concocted organophosphate containing insecticide. Two cases each had died of DAD, and DAD plus acute tubular necrosis (ATN), re-



Table 2- Clinical characteristics of poisoning cases and autopsy findings.

Age	Sex	Cause of Death	Resuscitation
3 years	M	DAD	Oral palm oil
5 days	F	DAD	-
3 years	M	DAD + Cerebral oedema	Forced emesis
5 months	F	DAD + Cerebral oedema	-
3 days	M	DAD + ATN**	-
5 months	F	DAD + ATN	-

**ATN, Acute tubular necrosis; DAD, Diffuse alveolar damage

Table 3- Autopsy-based classification of manners of death in the alleged homicide cases.

Alleged Cause of Death before autopsy	Cause of Death after Autopsy				Total (%)
	Natural	Accidental	Homicidal	Unascertainable	
Abandonment/Dumping	3	2	-	3	8 (14.6)
Infanticide	9	6	-	-	15 (27.3)
Abduction	-	-	-	6	6 (10.9)
Assault	6	-	5	1	12 (21.8)
Poisoning	-	3	-	4	7 (12.7)
Supernatural	1	6	-	-	7 (12.7)
Total (%)	19 (34%)	17 (31%)	5 (9%)	14 (26%)	55 (100%)

**ATN, Acute tubular necrosis.

spectively. Cases also followed DAD with cerebral edema and ATN with cerebral edema, respectively. Cause of death in the last case could not be ascertained because the body was badly decomposed due to poor storage conditions in the morgue. Co-wives and a stepfather were the fingered culprits in the cases.

Witchcraft was the alleged cause of death in a 3-year-

old girl, but after autopsy she was found to have died of lobar pneumonia. Homicide for ritualistic purposes was purported to be the cause of death in six homeless children who had sought shelter in the garage of a house during a rain storm. Autopsy however revealed carbon monoxide poisoning in all of them.

Overall, based on autopsy findings in the alleged cases



of homicide, manners of death were classified as natural (38%), accidental (27%), homicidal (9%) and unascertainable in the remaining 26% of the cases (Table-3).

4. Discussion

In Kano, northwestern Nigeria, where this study was conducted, autopsy has a low acceptance rate. This is reflected in the low pediatric autopsy rate of about 7 cases per year. This is lower than the average frequency of about 27 cases per year reported by Akhiwu et al. [5] in mid-western Nigeria but close to the 10.7 per year reported by Kumar et al. [6] in a pediatric facility in the US. Even though autopsy rates are declining worldwide, its role as an arbiter in medico-legal cases is yet to be supplanted.

The manner of death, based on autopsy findings, were categorized into natural, accidental, homicidal and unascertainable. Apart from a high number of unascertainable cases due to high frequency of decomposed bodies in this study, the preponderance of natural and accidental deaths reflect that have been previously described in other parts of the country by Akhiwu et al. [5] (natural 76%; accidental 21%; homicide 1.5% and undetermined 0.5%) as well as in Nevada, United States (natural 58.9%; accidental 27.6%; homicide 4.4% and undetermined 6.7%) [7]. Similar high frequency (38%) of body decomposition at discovery was also documented in 35% of cases reported by du Toit-Prinsloo and colleagues in South Africa [8].

4.1 Child Abandonment (Baby Dumping)

Child dumping accounted for 25% of all cases being reported in this study, and all were found dead. This may be the tip of the iceberg as no systematically gathered data on the phenomenon of baby dumping exists in the study area. However, in other parts of the country, including Oyo state, southwestern Nigeria, an average of 38 cases per year was

reported; Lagos State, also in southwestern Nigeria recorded 497 cases in 2011, while in Kebbi state, northeastern Nigeria, the HISBA (Social Welfare authority) recorded over 50 cases of abandoned babies in various locations across the State, between October and December 2011 [9-11]. A Malaysian study reports an average of 5.7 babies dumped per month, while the number runs into thousands in China as a consequence of its one child policy and pressures for male children [12, 13].

Public toilets in 75% of cases were the preferred dumping site found in this study. This supports the report by Famuyiwa on abandoned babies in Lagos, Nigeria, which indicates that the low-risk sites, including public toilets, accounted for 83.2% of dumping sites. [14] He further concluded that the data suggests the intention of the majority of parents in studied cases was not to put the child's life in serious danger, but for the baby to be rescued.

Even though all the children abandoned in this study were males, this may be coincidental, bearing in mind that northern Nigeria is patriarchal in orientation. This is at variance with other countries like china, which show preponderance of female child abandonment [15]. Yet, other studies, like ours, have shown a preference for male abandonment [16]. However, in the southern parts of Nigeria, local studies have shown no clear cut preference for gender dumped [9, 14].

In the 5 cases which were not decomposed, the finding of intracranial hemorrhage was attributed to traumatic birth, suggesting poorly supervised delivery. The babies were adjudged to be Low Birth Weight (weight less than 2.5 Kg) suggesting an intra-uterine growth retardation. Two were premature and had died from respiratory distress, suggesting premature spontaneous delivery or a late abortion.

The risk of dumping unwanted babies in the part of the country, where this study was conducted, is heightened by



the paucity of social support structures, such as orphanages, that readily accept such babies. Incidentally, where such services exist, overwhelming bottlenecks are a palpable deterrent for both mothers and potential adopters.

4.2 Physical Assault

Of the 12 cases of alleged pediatric homicide by physical assault, only 5 (42%) cases were conclusively proven, all of whom had died from intra-cranial hemorrhage. According to the Center for Disease Control, the death rate among such children with abusive head trauma ranges from 25% to 30%, with perpetrators, as also seen in this study, being the male parent [17, 18]. Involvement of step-fathers in these abusive traumatic deaths was identified by others, non-biological fathers being twice to five times more likely to be involved than biological fathers [19]. In Canada, data in national archives of all reported homicides indicated that children under 5 years of age were beaten to death 120 times more frequently by stepparents than by biological parents [20]. However, while index study shows a preponderance of female victims over males (2:1) other studies have found otherwise [21].

Only one case of alleged rape, in an 8-year-old girl, was autopsied, and she had died from asphyxia secondary to aspiration. However, she was not *virgo intacta*, and histology of the passages did not show inflammatory changes in keeping with trauma, nor sperm cells in the introitus, nor evidences of strangulation. In the study by Jones et al., [22] as much as 8% of claims of alleged rape were found to be fictitious. In other children alleged to have been physically assaulted, cause of death at autopsy turned out to be pneumonia and bacterial meningitis.

Association of assault with low socio-economic status and preponderance in the urban setting, similar to Kano city, are risk factors, similar to ours, identified by Wohlgemut et al. [23] in Scotland.

4.3 Poisoning

The common finding in the cases of poisoning was the type of poison implicated. In local parlance, the poison is an insecticide called *otapiapia*. The poison is a mixture of organophosphates (OP) usually mixed with kerosene and used as an insecticide for controlling mosquitoes in the poorest homes. Death and harm through ingesting it is becoming increasingly more common, especially among children who are still exploring the world through the oral cavity.

Cases of homicidal poisoning were difficult to prove because the social setting in which these deaths occurred were inauspicious and the alleged poison is often missing. In polygamous settings, as is common in northern Nigeria where this study was carried out, intense rivalry between co-wives is very common. In such a scenario, the co-wife is often held culpable by the mother of the dead baby. The new stepfather of the dead baby may also be blamed for killing the baby in a bid to rid himself of an unwanted child, or to start on a clean slate with his new wife. The time interval from consumption to time of death was also difficult to estimate because of inconsistent history in the cases. Home remedy applied in two of the cases was forced emesis with and without administration of oral palm oil. However, they both died before any medical resuscitation could be attempted.

Risk factors identifiable in our cases, similar to those reported in other studies, included low socio-economic status [24, 25] and low levels of education of victim's care givers [25, 26]. In addition to these, the *otapiapia* is sold in recycled soft (soda) drink bottles and recycled pediatric syrup bottles, both of which children may associate with something sweet to drink.

Autopsy findings in our cases showed that respiratory features were most prominent and these comprised cyano-



sis, features consistent with DAD and pulmonary oedema. These may result from inhibition of lung surfactant by hydrocarbons in the poison [27]. This would result in airway collapse, ventilation-perfusion mismatch and hypoxia. In addition to this, the OP component of the otapiapia causes excessive stimulation of muscarinic receptors. This manifests as bronchoconstriction, bronchospasms and paralysis of respiratory muscles [28]. These may also contribute to the respiratory features seen on autopsy.

ATN was seen in one of the 4 cases reflecting the possibility of renal affectation by the poison. Rubio et al. [29] also documented this mode of presentation in a case report on OP poisoning. The pathogenesis of the ATN is unknown because of lack of experimental data. In laboratory animals, finding of low urinary osmolality has suggested tubular dysfunction secondary to direct tubular damage or an increase in oxidative stress [29].

4.4 Infanticide

All the women accused of infanticide were not in any stable marital relationship and had inadequate antenatal care. The babies (40%) had mostly died of intracranial hemorrhage from traumatic birth and (13%) from DAD secondary to prematurity, reflecting the poor state of antenatal care in most developing countries of sub-Saharan Africa. Takai et al. [30] reported that up to 69.4% of women in northern Nigeria, where our study was conducted, do not attend antenatal care during pregnancy and over 70% deliver at home.

4.5 Witchcraft / Ritual Killing

Belief in witchcraft underlined the allegation of homicide against an elderly woman; however, autopsy findings showed the 3-year-old girl had died of pneumonia. Belief in and practice of witchcraft is rife in most parts of Africa,

and while the practice of ritual human sacrifices is muted, its subterranean practice is well recognized. Children are mainly the preferred victims of such practice. Male children are mostly affected, and this is reflected in the 5:1 male to female ratio identified in our study. However, examination showed no body parts were missing in these children as is sometimes found in such cases. The abducted children's bodies were found within the communities from where they had been declared missing; however, the causes of death were not identifiable because of decomposition.

Accusation of suspected ritual killing was also levelled against a prominent politician in the death of 6 Almajiri (homeless) children found dead in his garage. However, autopsy revealed that all the bodies showed features of acute carbon monoxide poisoning. The children had taken shelter in the garage on a cold rainy night and because of the warmth in the place they had slept. Unknown to them, the warmth was due to the heat generated from the carbon-monoxide emitting electricity generator set also running in the garage.

5. Conclusion

In conclusion, this study exemplifies the irreplaceable role of autopsy in the investigation of suspected pediatric homicide and proper administration of justice. In addition, this study also highlights the importance of forensic pathologists working in developing countries to be actively involved in all the stages of investigations in cases of suspected homicide.

Conflict of Interest

None.

Source of Funding

None.



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