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Forensic Autopsy Findings in Sudden Infant Death Syndrome: A Study in a Tertiary Care Hospital, Rajshahi, Bangladesh

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Abstract **Original Research Article**

Introduction: Sudden Infant Death Syndrome (SIDS) is the general diagnosis given when it is not possible to identify the cause of infant death, even after a complete forensic study and death site investigation. SIDS is a term that was first proposed in 1969 for a distinctive subgroup of unexpected infant deaths that occurred during the postneonatal period with relatively consistent clinical, epidemiological, and pathological features. SIDS remains a diagnosis of exclusion, according to the definition proposed in 1969. Although this syndrome has several distinctive features, including age distribution such as only affecting those younger than 1 year of age, and apparent occurrence during sleep, there has been reluctance to include these features in the definition. The aim of this study was to research the findings of SIDS in infants after a detailed forensic autopsy, and determine the importance of forensic autopsy. ***Methods:*** This cross-sectional analytical study conducted at Emergency and the department of Orthopaedic Surgery, Rajshhi Medical College Hospital, Rajshahi, Bangladesh during the period from January 2019 to December 2019 with a sample size of 75. Data were analyzed using statistical software SPSS. Study taken permission from the guardians of the infants. ***Result:*** Over half of the study population was male and 43% were female. 60% of the patients died at home. For 56% of the cases no information was available regarding their activity at the time of death. Of the available information, 26.67% died while sleeping, 14.67% were involved in other activities at home, and 2.66% were involved with some other form of activity. Post analysis showed that 48% were natural death. 38.67% of cases were still under study at the time of data collection. After a proper autopsy, 76% of the cases were ruled with SIDS as the cause of death. SIDS was determined as the cause of death in 57 out of 75 cases. 82.46% of the 57 cases had no available history. 8.77% had a history of respiratory illness, 5.26% had gastrointestinal ailments, and heart defect was present in 1.75% of cases. A history of previous acute life-threatening events was also found in 1.75% of cases. ***Conclusion:*** Perinatal asphyxia is the main cause behind many physical and neurological defects. These affected domains are near impossible to treat, and greatly increases the disability rate of a nation, reducing its workforce.

Keywords: Sudden Infant Death Syndrome, Sudden and unexpected infant deaths; Autopsy; Forensic autopsy; Post neonatal mortality.

I INTRODUCTION

Sudden Infant Death Syndrome, otherwise known as SIDS, is a term that was first proposed in 1969, for cases where it is not possible to determine the cause of death of an infant, even after a complete forensic study, including death site investigation. SIDS is believed to be multifactorial in nature, even though no definite causes have been found to date. It is believed that SIDS occurs in infants with underlying biological vulnerability, who also experience outside stimulation such as side sleeping or soft bedding, during a critical developmental period. Some of the other known risk factors for SIDS are bed-sharing, inappropriate sleep surfaces (including sofas), exposure to tobacco smoke, and prematurity. SIDS is part of the class of sudden and unexpected infant deaths (SUID). This occurs in children under 1 year of age, most often during sleep. Other types of SUID, generally those related to sleeping, can be largely attributed to choking, suffocation, trauma, respiratory infections, metabolic disorders, or infanticides [1]. Outside of those cases, there are groups of sudden and unexpected deaths in

which there are no full investigation, and when no causes are found. These cases are coded according to ICD 10 as R98 and R99 [2]. There can be a single cause or multiple numbers of events that can cause infant deaths, and most of the events are unexplained. There are some protocols for the study of SIDS, but at the current time, these protocols are not present in our country [3, 4]. The major hurdle faced in post-mortem forensic analysis usually happens at death site investigation. Usually, when an infant is found dead, the parents or relatives would try to pick it up and resuscitate the infant. This is impossible to stop, and it disturbs the death scene, making the reconstruction of the exact positioning of the infant uncertain at best. No specific causes have been found to be the cause of SIDS, but the common risk factors associated with it are prone sleeping position, co-sleeping with other family members, nearby tobacco smoking, hyperthermia, soft sleeping surface, and other similar events [5].

II OBJECTIVES

a) General objective

- To determine the cause of SIDS
- To determine the risk factors for SIDS.

b) Specific Objectives

- To observe the importance of forensic autopsy in SIDS

III METHODOLOGY & MATERIALS

This cross-sectional analytical study conducted at Emergency and the department of Orthopaedic Surgery, Rajshhi Medical College Hospital, Rajshahi, Bangladesh during the period from January 2019 to December 2019 with a sample size of 75. This was a cross-sectional observational study conducted with a population of 75 infant deaths under 1 year of age. The data was collected using the survey instrument designed in the previous stage, as well as from the autopsy reports. Before collecting information, researcher taken informed written consent from the legal guardians of the infants. Data were analyzed using statistical software SPSS. Study taken permission from the guardians of the infants

IV RESULT

This study was conducted with a sample size of 75. Of the total 75 infants, over half of the study population was male, and 43% were female. 60% of the patients died at home, 15% died at the hospital, and 7% died at other locations. For the remaining 19% of cases, the data regarding their location of death was unavailable. For 56% of the cases, no information was available regarding their activity at the time of death. Of the available information, 26.67% died while sleeping, 14.67% were involved in other activities at home, and 2.66% were involved with some other form of activity. Post analysis showed that 48% were natural death, and 8% of cases were violent in nature. 5.33% of the cases were indeterminate in nature, and 38.67% cases were still under study at the time of data collection. After a proper autopsy, 76% of the cases were ruled with SIDS as the cause of death. 6.67% of death was caused by infection or sepsis. 4% of deaths were caused by trauma, and another 4% were malformations in the infant bodies. Stillbirth, Miscarriage, congenital heart defect, premature birth, hemorrhage, all had 1.33% cases each. SIDS was determined as the cause of death in 57 out of 75 cases. Looking at the available history, we can see that 82.46% of the cases had no available history. 8.77% had a history of respiratory illness, 5.26% had gastrointestinal ailments, and heart defect was present in 1.75% of cases. A history of previous acute life-threatening events was also found in 1.75% of cases.

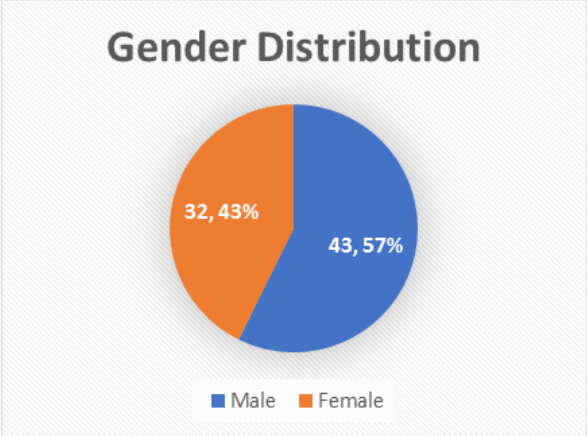

Fig-1: Gender distribution of the study population

Of the total 75 infants, over half of the study population was male, and 43% were female.

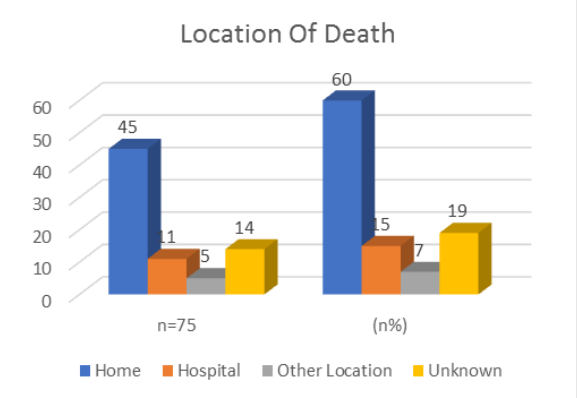

Chart-1: Location of the study population at time of death

The majority of the death happened at home, without proper surveillance. 60% of the patients died at home, 15% died at the hospital, and 7% died at other locations. For the remaining 19% of cases, the data regarding their location of death was unavailable.

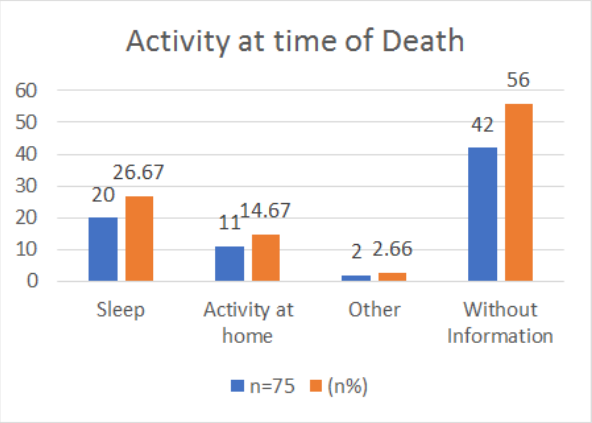

Chart-2: Activity of the study population at time of death

For over half the cases, more specifically, for 56% of the cases, no information was available regarding their activity at the time of death. Of the available information, 26.67% died while sleeping, 14.67% were involved in other activities at home, like playing or eating and 2.66% were involved with some other form of activity.

Table-1: Manner of death of the study populations

Manner of death	n=75	(n%)
Natural	36	48
Under Study	29	38.67
Indeterminate	4	5.33
Violent-Accidental	1	1.33
Violent-Homicide	1	1.33
Violent-Indeterminate	4	5.33

Post analysis of the infant deaths showed that 48% were natural death, 8% of cases were violent in nature, with 1 accidental violent case, 1 homicidal violent case, and 4 indeterminate violent cases. 5.33% of the rest were indeterminate in nature, and 38.67% cases were still under study at the time of data collection.

Table-2: Cause of probable death after Autopsy of the body

Cause of death in Autopsy	n=75	(n%)
Stillbirth	1	1.33%
Miscarriage	1	1.33%
Trauma	3	4.00%
Malformations	3	4.00%
Congenital Heart Defect	1	1.33%
Other	2	2.67%
Sepsis or infection	5	6.67%
Prematurity	1	1.33%
Hemorrhage	1	1.33%
SIDS	57	76.00%

After a proper autopsy was conducted, 76% of the cases were ruled with SIDS as the cause of death. 6.67% of death was caused by infection or sepsis. 4% of deaths were caused by trauma, and another 4% were malformations in the infant bodies. Stillbirth, Miscarriage, congenital heart defect, premature birth, hemorrhage, all had 1.33% cases each.

Table-3: Sudden Infant Death Syndrome with other available causes in the SIDS determined study population

SIDS With available History	n=57	(n%)
SIDS, No History	47	82.46%
SIDS + Respiratory History	5	8.77%
SIDS + Gastrointestinal History	3	5.26%
SIDS + Heart Defect	1	1.75%
SIDS + Former ALTE	1	1.75%

SIDS was determined as the cause of death in 57 out of 75 cases. Looking at the available history to determine anything more about the cause of death, we can see that 82.46% of the cases had no available history. 8.77% had a history of respiratory illness, 5.26% had gastrointestinal ailments, and heart defect was present in 1.75% of cases. A history of previous acute life-threatening events was also found in 1.75% of cases.

V DISCUSSION

The SIDS diagnosis is a very complex process. It is mainly a diagnosis by exclusion and is greatly reliant on the expertise of the pathologist. Different studies provide different opinions of what constitutes a sufficient cause of death. Death is ruled as SIDS when none of the other possible symptoms match the autopsy results. An International Conference at Seattle held in 1969 discussed the causes of infant mortality, and a consensus accepted by the U.S. National Institutes of Health (NIH) was created. In this consensus, the inexplicable death of an infant was standardized by medical records as Sudden Infant Death Syndrome (SIDS) and this remained without a probable cause of death after a thorough post mortem exam that included a death scene investigation [6-8]. After this conference was held, in which an evident cause of death was not found was henceforth determined as SIDS. But there is an argument about using this diagnosis among forensic pathologists, in cases where the major risk factors could be co-sleeping or prone sleeping position, which can lead to suffocation. This led to creating some division among the SIDS cases, such as borderline SIDS, secondary SIDS, unsafe sleeping conditions compatible with SIDS [6-8]. In many countries, forensic pathologists can choose between death types like natural, accidental violent, homicide-violent, suicide-violent, undetermined, and understudy. But in 2004, a group of forensic pathologists proposed that these deaths continue to be labeled as SIDS, to get proper classifications, as completing all the under-study case investigations and standardizing the concepts proved to be extremely challenging [9]. They feared that these deaths might not be explained by the limited investigation and knowledge at the time. According to the agreement made, the sudden death cases with an

identifiable possible cause are to be labeled as SUDI and will be passing through various levels of certainty classified following the findings included on the infant's history of medical records, the death scene investigation, and the results from the post mortem study. It allows the causes of death to be classified after taking into account the incomplete information and the risk factors present. These factors can have major or minor effects on the overall results. This study, conducted with a sample size of 75, had a higher male percentage, with 57% male and 43% female participants. This shows that gender does not play a major effect on SIDS or SUID. 60% of the deaths happened at home, without proper supervision. This greatly affected the study and decreased the chances of a proper death site investigation. Only 15% of the death happened in the hospital, and the rest were in other locations or unknown places. The high number of at-home death greatly affected the data regarding the activity of children at the time of death. For 56% of the 75 patients, no data was available regarding their activities. 20% of the patients were sleeping at their time of death, 14.67% were doing activities at home like playing or eating, and 2.66% were involved in some other kind of activity. Post analysis of the collected sample led to determine 48% of the deaths as a normal death. 38.67% of the cases were still under study at the time of this study, 5.33% were indeterminate deaths, and the remaining 8% of deaths were violent in nature. After the autopsy was done, the majority (76%) of the deaths were ruled as SIDS. 6.67% of cases of death were because of sepsis or infection, trauma and malformations each were the cause of death in 4% of patients, and stillbirth, miscarriage, CHD, Prematurity, and hemorrhage had 1 case each. A closer study on the 57 SIDS cases, after analyzing all available history, showed that no history was available for 82.46% of the SIDS cases. History of respiratory disease was present in 8.77% of the cases. Gastrointestinal History was available in 5.26% of the cases, and a previous acute life-threatening event was also found in 1 case. 1 case also had a history of heart defect. These findings can be found similar to another study conducted in Columbia [10]. This study gives us an insight into the benefits of proper autopsy and forensic analysis. Although not by a great amount, forensic autopsy helped us in reducing the number of SISD cases. This data can help prevent similar deaths from occurring in the future and give us a better understanding of the risks faced by infants. But improvements are still needed to have much fewer SISD cases, both in general knowledge and in forensic science. Proper equipment and research can help in identifying the cause of infant death through autopsy.

Limitations of the study

This was a research study with a small sample size, collected only from a single hospital over duration of 12 months. The study duration was short. Proper technology and research were lacking about this topic, and the lack of experienced forensic pathologists also played a major role.

VI CONCLUSION AND RECOMMENDATIONS

The study showed that proper forensic analysis and autopsy can help identify the causes behind many unexplained deaths. This can help in the long run by making doctors and the general people aware of the risk factors that can cause infant deaths. In-depth research regarding autopsy science and forensic science needs to be conducted to decrease the number of unexplained deaths.

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