ISSN- O: 2458-868X, ISSN –P : 2458 – 8687

International Journal of Medical Science and Innovative Research (IJMSIR)

IJMSIR : A Medical Publication Hub

Available Online at: www.ijmsir.com

Volume – 2, Issue – 2, March - April - 2017, Page No. : 19 - 24

Effect of Mode of Transport on Outcome of Sick Children Requiring Emergency Care – A Cohort Study

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Conflicts of interest: None to declare

Acknowledgements: The authors acknowledge the support rendered by Professor Indhumathy Santhanam, Head of Emergency Department, Institute of Child Health and Hospital for Children, Egmore, Chennai.

Abstract

Objective

To determine whether mode of transport has any effect on outcome of children requiring emergency care.

Methods

This observational study was conducted in ICH&HC from April 2014 to June 2014. All consecutive children who were treated in Emergency department were enrolled. Mode of transport, approximate distance of the hospital from their residence and whether pre-hospital therapy was given were noted down from the person accompanying the patient. The physiological status of patient on arrival was assessed by rapid cardio pulmonary cerebral assessment. All patients were followed up and their outcome was noted. Chi square test was performed to determine the relation between mode of transport and outcome.

Results

Out of 150 patients enrolled, 47 (31%) reached the hospital in ambulance and the rest 103 (69%) used public or private transport. The mortality rate of both patients transported by ambulance as well as other modes of transport was 21% and 22% respectively. Chi square analysis did not establish any significant relation between mode of transport and outcome, even after adjusting for potential confounders such as distance between residence and hospital, pre-hospital therapy received and physiological status on arrival.

Conclusion

There is not enough evidence that using ambulance as mode of transport improves the survival in children requiring emergency care.

Keywords: Transport, Sick children, Emergency care.

Introduction

In children, cardiac arrest resulting in death occurs most commonly secondary to respiratory derangement or hemodynamic compromise and is seldom primary. Hence, interventions to provide adequate oxygenation and correction of shock may have to be instituted in the prehospital setting to save life. [1] The provision of an effective prehospital emergency medical service (EMS) is an important element in reducing childhood mortality.[2] In pediatric EMS, the health-care personnel are trained for interventions such as bag-valve-mask ventilation, intravenous/intraosseous access placement, and provision of life-saving medications, endotracheal intubation, and defibrillation if needed.[3-5]

Apart from EMS, ambulance services run by government and private hospitals as well as private agencies are

increasingly available. These ambulances are often mere transport vehicles equipped with only a bed and an oxygen supply, manned by personnel with minimal or no medical training. Thus critically ill children being transported by these vehicles are deprived of appropriate stabilization, which has an adverse impact on the outcome. It is not uncommon for caregivers to not realize that the child is sick and as a result they may choose public transport to reach the hospital resulting in inordinate delay in initiation of treatment.

Given these facts, the aim of this study was to determine if the mode of transport had an impact on the outcome of sick children treated in the Emergency room of our hospital.

Materials and Methods

This ambidirectional cohort study was conducted in the emergency room, pediatric wards and intensive care unit of Institute of Child Health and Hospital for Children, Egmore, Chennai from april 2014 to june 2014. All children 1 month to 12 years of age who were treated in the emergency room and subsequently shifted to pediatric ward and intensive care unit were included in the study. There were no specific exclusion criteria. All children treated in the emergency room in the above period were included in the study. Convenient sampling was followed.

After obtaining informed consent from either of parent, demographic characteristics like age and sex were noted. The mode of transport used, whether the child received any pre hospital therapy and distance between the hospital and place of residence were noted from the parent. The distance between the hospital and residence, stated by parent was counterchecked using google maps. Rapid cardiopulmonary cerebral assessment of children was performed and their physiological status on arrival was classified as respiratory distress, shock/respiratory failure and apnea/cardiac arrest. [6] All children were treated as per standard protocol and transferred to intensive care unit or pediatric ward after stabilization. The place of transfer depended on availability of bed in intensive care unit. Whenever bed was available in intensive care unit, the child was shifted there and whenever bed was not available in the intensive care unit child was shifted to pediatric ward. In both the places, children were treated as per standard protocol. All recruited children were followed up every day, at a fixed time of the day till discharge or death and the outcome was noted down.

Children who were alert with tachypnea and dyspnea, with or without tachycardia, with normal perfusion were classified as having respiratory distress. Children with impaired sensorium with effortless tachypnea, tachycardia or relative bradycardia, with signs of poor peripheral perfusion like pale or mottled peripheries, increased core-peripheral temperature gap, capillary refill time more than 2 seconds, weak peripheral pulses with or without low blood pressure were classified as having shock. Children with impaired sensorium with severe tachypnea or relative bradypnea, with increased or decreased work of breathing, with tachycardia or relative bradycardia with perfusion abnormalities were classified as having respiratory failure. Unresponsive children with no or minimal respiratory effort with perfusion abnormalities were classified as having apnea. Unresponsive children with an unstable airway with no heart rate or heart rate less than 60 with perfusion abnormalities were classified as having cardiac arrest/ imminent arrest.

Data was coded and entered in excel sheet. Statistical analysis was performed using statistical software SPSS version 21. Categorical variables were expressed as proportions and numerical values were converted into categories and expressed in proportions. The association between dependent variable and independent variable was

determined using 'chi-squared' test. The level of significance was fixed at 5%.

Results

Totally 154 cases were enrolled in the study. Four of them had incomplete data and were not included in the analysis. Finally, 150 cases were included for analysis. 54 (36%) were infants while 59 (39%) were 1-5 years of age, 28 (19%) were 5-10 years of age and 9 (6%) were between 10 to 12 years of age. Male female ratio was 1.7:1. Out of 150 patients, 47 (31%) were transported in an ambulance, while the rest 103 (69%) were transported in public or private transport system. The complete break up of mode of transport is depicted in Figure 1. 82 (55%) of children were transported from their residence which was within 20 kilometer from the hospital while 47 (31%) from between 21 to 100 kilometer and the rest 21 (14%) from more than 100 kilometer distance. 36 (24%) had received some pre hospital therapy in a hospital prior to transport while the rest 114 (76%) arrived at the emergency room without any pre hospital therapy. 58 (39%) had apnea/cardiac arrest on arrival, while 71 (47%) had shock and the rest 21 (14%) had respiratory distress. Finally, 33 (22%) patients died and 117 (78%) survived and were discharged.

The impact of mode of transport on outcome was analyzed and is given in Table 1. It is obvious that the mortality of those transported by ambulance and those by public/private transport was almost same. (21% Vs 22%) implying there was no significant impact of mode of transport on outcome.

None of the other variables like distance of residence from health facility, pre hospital therapy and status of patient on arrival at the hospital had significant impact on the outcome. (Table 2) On analyzing the data further, it was found that there was significant association between mode of transport and pre hospital therapy as well as distance of residence from hospital. (Table 3) More patients who received pre hospital therapy were transported by ambulance whereas more patients who did not receive any pre hospital therapy opted for public/private transport. Patients who resided between 21 to 100 kilometers from the hospital utilized ambulance services while those living nearer and farer preferred public/private transport. There was a significant association between mode of transport and status on arrival to the hospital, sicker children being transported by ambulance. (Table 4) 25 (53%) patients who were transported by ambulance had apnea/cardiac arrest on arrival, of which 7 were already intubated. The rest 18 (38%) needed immediate resuscitation on arrival at emergency department.

Discussion

This study shows that the mode of transport does not have significant impact on mortality of critically ill children. But there was significant association between mode of transport and distance from residence, pre hospital therapy and condition at arrival at the emergency department. These associations help us understand the health seeking behavior of our people. It was observed that people who lived very close or very far away from the hospital preferred public or private transport while those residing between 21 to 100 kilometers utilized services of ambulance. More patients who received pre hospital therapy were shifted by ambulance, while children who were brought by their parents directly from house came by public/private transport.

On an average, patients who were brought by ambulance were sicker than those who were brought by public/private transport. This could be interpreted as sicker patients who are more needy of ambulance, utilized its services. It was noted that more than half of the patients who were transported by ambulance were critical on arrival. But it is disturbing to note that only a quarter of them were stabilized with endotracheal intubation before arrival and

around 72% of sick children had apnea or cardiac arrest on arrival and needed immediate resuscitation. This reiterates the fact that our ambulance services are far from satisfactory not only in quantity, but also in quality. This could have been the reason underlying the lack of significant association between mode of transport and outcome.

Similar observation of no significant impact of mode of transport on outcome was reported in a study done in the same region (7) That study also observed that there was no significant difference between Government and private ambulances in that regard. Few studies have observed that it is the time taken to reach the hospital rather than the mode of transport which determines the outcome of the patient. (8-10)

The positive highlights of the study is that this is done in a large government run tertiary care centre with huge patient attendance and an exclusive emergency department functioning round the clock. Further, this study has yielded valuable information to help us gain insight into our people's health seeking behavior. Limitations are the small number and not including the time taken to reach the hospital, which may be a potential confounder.

Based on the results of this study, we recommend that there is an urgent need to improve our ambulance services, both in number and quality. Inclusion of essential equipment like ventilators and adequate training of the personnel are essential components of improving the quality. Educating people on availability of free ambulance and benefits of its utilization will improve their health seeking behavior.

Conclusion

There is not enough evidence that using ambulance as mode of transport improves the survival in sick children requiring emergency care.

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Tables

Table 1 – Relation between mode of transport and outcome.

Mode of Transport	Death n (%)	Survival n (%)	Total
Ambulance	10 (21%)	37 (79%)	47
Public/Private transport	23 (22%)	80 (78%)	103
Total	33	117	150

$x^2 = 0.021$

p = 1.000

Table 2 – Relation between distance of residence, pre hospital therapy and status at arrival and outcome.

Factor	Categories	Death n (%)	Survival n (%)	x^2	p value*
Distance from residence	<20 km	19 (23%)	63 &77%)		
	21-100 km	8 (17%)	39 (83%)	1.273	0.909
	>100km	6 (29%)	15 (71%)		
Pre hospital therapy	Given	9 (25%)	27 (75%)		
	Not given	24 (21%)	90 (79%)	0.248	0.647
Physiological status at arrival	Respiratory distress	2 (9%)	19 (91%)		
	Shock/ Respiratory failure	16 (22%)	55 (78%)	2.421	0.298
	Apnea/ Cardiac arrest	15 (26%)	43 (74%)		

*p value less than 0.05 is considered significant.

Table 3 – Relation of Mode of transport with distance of residence and Pre hospital therapy.

Factor	Categories	Ambulance n (%)	Public/Private transport n (%)	x^2	p value*
Distance of residence	< 20 km	22 (27%)	60 (73%)		
	21-100 km	22 (47%)	25 (53%)	8.841	0.012
	>100km	3 (14%)	18 (86%)		
Pre hospital therapy	Given	29 (81%)	7 (29%)		
	Not given	18 (16%)	96 (84%)	53.34	< 0.001

*p value less than 0.05 is considered significant.

Table 4 – Relation between mode of transport and physiological status on arrival

Mode of transport	Respiratory distress n (%)	Shock/ Respiratory failure n (%)	Apnea/Arrest n (%)	Total
Ambulance	6 (13%)	16 (34%)	25 (53%)	47
Public/Private transport	15 (15%)	55 (53%)	33 (32%)	103
Total	21	71	58	150

$x^2 = 6.36$

p = 0.042 (significant)

Figure 1 – Usage of different modes of transport by sick children arriving at the Emergency department