

Availability of Life Support Equipment and its Utilization by Ambulance Drivers

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ABSTRACT

Background: An effective ambulance is a vital requirement for providing an emergency medical service. Well-equipped ambulances with trained paramedics can save many lives during the golden hours of trauma care. The objective was to document the availability and utilization of basic life support equipment in the ambulances and to assess knowledge on first aid among the drivers.

Methods: Descriptive design was used. Total of 109 ambulances linked to B.P. Koirala Institute of Health Sciences were enrolled using purposive sampling method. Self-constructed observation checklist and semi structured interview schedule was used for data collection.

Results: More than half of the respondents had less than five years of experience and were not trained in first aid. About two-third of the respondents had adequate knowledge on first aid. About 90% of the ambulance had oxygen cylinder and adult oxygen mask which was 'usually' used equipment. More than half of ambulance had equipment less than 23% as compared to that of national guidelines. There was significant association of knowledge with the experience ($p = 0.004$) and training ($p = 0.001$). Availability of equipment was associated with training received ($p = 0.007$), organization ($p = 0.032$) and district ($p = 0.023$) in which the ambulance is registered.

Conclusions: The study concludes that maximum ambulance linked to BPKIHS, Nepal did not have even one fourth of the equipment for basic life support. Equipment usually used was oxygen cylinder and oxygen mask. Majority of driver had adequate knowledge on first aid and it was associated with training and experience.

Keywords: Availability; knowledge; utilization.

INTRODUCTION

World Health Organization regards emergency medical systems (EMS) as an integral part of any effective and functional health care system. EMS consist of different component like pre-hospital care, equipment and communication, transportation of the patient to the hospital and health facilities.¹ An effective ambulance is a vital requirement for providing an emergency medical service. Well-equipped ambulances with trained paramedics can save many lives during golden hours of trauma care. In Nepal, a large number of people die annually due to lack of access to well-equipped health care services for immediate treatment of sudden fatal illness, accidents or complication in child birth. Majority of the death could be prevented with a professional functioning transportation system.² For an effective

ambulance service system to be developed, the existing facilities need to be studied. The objective was to document availability and utilization of basic life support equipment in ambulances and to assess knowledge on first aid among the ambulance driver.

METHODS

Descriptive design was used for the study. The study was conducted within the premises of B.P. Koirala Institute of Health Science. As it is a tertiary level referral center hospital, ambulances from most of the districts of eastern region are linked to this center. Purposive sampling method was used and a total of 109 ambulance linked to BPKIHS were enrolled in the study.

Self-constructed interview schedule, observation

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checklist and rating scale was used to collect data. Interview schedule consisted of questions related to knowledge on first aid. Observation checklist consisted of list of equipment to be available for basic life support. It was made based on the National guideline for ambulance for Basic Life support, Category B(National Ambulance Service Operational Policy, Nepal). Rating scale consisted of items to document utilization of available equipment by ambulance driver. Utilization of equipment was documented on the basis of verbal response provided by the participants. Descriptive statistics (frequency, percentage, mean, standard deviation) was used to describe the demographic characteristics of participant. Knowledge of the participants on first aid and availability of equipment was assessed by calculating percentage score. Regarding knowledge on first aid, there were total 18 knowledge related question for which score 1 was given for correct answer and 0 for wrong answer.

The score of all respondent was converted into percentage score and mean percentage was calculated at 95% Confidence Interval (CI) and lower bound mean score was taken as a reference value. Those respondent acquiring score mean percentage score were considered having “adequate knowledge” and those obtaining score mean percentage score were considered having “inadequate” knowledge. Association of percentage score of knowledge was seen with selected variable using Independent Sample t- test and ANOVA. P value ≤ 0.05 was considered as statistically significant. There were total 22 items to be present in the ambulance for basic life support. Score 1 was given for presence of the equipment and 0 for absence. The obtained score was calculated in percentage score and association was calculated with selected variable. For categorization of availability of equipment, the score of all respondent was converted into percentage score and mean percentage was calculated at 95% Confidence Interval (CI) and lower bound mean score was taken as a reference value. Availability was categorized as having equipment above mean score and below mean score. Ethical permission was obtained from Institutional Review Committee of BPKIHS.

RESULTS

Ages of respondents were between 19-58 years with mean age 34.1 ± 8.3 . Maximum (44.0%) were in the age group 25-35 years. Two third (66.1%) of the respondents had received secondary level of education. About half (48.6%) of the ambulances were from Sunsari. Three-fourth (75.2%) of the ambulance were run by the private organization. More than half (56.9%) of the respondents had not received any training on first aid. (Table 1)

Table 1. Demographic Characteristics of Respondent (n=109).

Characteristics	Categories	Frequency	Percent
Age in years	Less than 25	17	15.6
	25-35	48	44.0
	35-45	35	32.1
	>45	9	8.2
	Mean S.D = 34.1 8.3, Range = 19-58		
Education	Literate Only	5	4.6
	Primary	20	18.3
	Secondary	72	66.1
	Higher Secondary and above	12	11.0
District	Sunsari	53	48.6
	Morang	19	17.4
	Jhapa	14	12.8
	Saptari	7	6.4
	Other	16	14.6
Type of organization	Governmental	11	10.1
	Private	82	75.2
	Non-governmental	16	14.7

Majority of the respondents had provided correct answers regarding definition of first aid, first aid when patient is not breathing, first aid in cut-injury, necessity of humidifier in oxygen cylinder (Table 2).

Table 2. Knowledge on first aid and equipment (n=109).

Category	Frequency	Percent
Definition of First aid	90	82.6
Prioritization of first aid concept	38	34.9
Assessment of unconscious patient	74	67.9
First aid when patient is not breathing	102	93.6
Position during difficulty in breathing (in non-trauma case)	24	22.0
Position when obstruction of mouth by secretion	59	54.1
First aid for fracture of legs	73	67.0
Basics of splinting	85	78.0
First aid in cut- injury	100	91.7

Transfer of patient with neck injury	62	56.9
Rate of oxygen through face mask	65	59.6
Rate of oxygen through nasal catheter	82	75.2
Do not open patients mouth during seizure	46	42.2
Do not hold the person still during seizure	30	27.5
Necessity of humidifier	106	97.2
Function of humidifier	31	28.4
Normal Pulse Rate	18	16.5
Oxygen administration during cyanosis	24	22.0

Majority (64.2%) of the driver had adequate knowledge on first aid. More than half (53.2%) of ambulance had equipment less than mean score (23.2%) as compared

to that of required for basic life support. The maximum score was 45.4% while lowest score was 4.5%. It shows that majority of ambulance in Nepal did not have even one fourth of the equipment for basic life support as mentioned in national guideline. (Table 3)

Table 3. Score on Knowledge on First Aid and availability of equipment (n=109).

Category	Characteristic	Frequency	Percent
Knowledge on first aid	Inadequate	39	35.8
	Adequate	70	64.2
	Mean ± S.D= 55.5 ± 13.4, Maximum= 83.3%, Minimum= 22.2%		
Availability of equipment	< 23%	58	53.2
	≥23	51	46.8
Mean ± S.D = 23.2 ± 8.9, Maximum= 45.4%, Minimum= 4.5%,			

Table 4. Availability and Utilization of Available Equipment in Ambulance.

Equipment	Available	Percent	Utilization				
			Always	Usually	Sometimes	Occasionally	Never
First aid box	54	49.5	1 (1.9%)	1(1.9%)	8 (14.8%)	24 (44.4%)	20 (37%)
Oxygen Cylinder	108	99.1	4 (3.7%)	42 (38.8%)	44 (40.7%)	18 (16.6%)	-
Adult oxygen mask	101	92.7	1 (0.9%)	41 (40.6%)	42 (41.6%)	17 (16.8%)	-
Pediatric oxygen mask	63	57.8	-	28 (44.4%)	30 (47.6%)	5 (7.9%)	-
Nasal Catheter	51	46.7	-	12 (23.5%)	35 (68.6%)	4 (7.8%)	-
I/V cannula	1	0.9	-	-	-	-	1 (100%)
I/V infusion set	1	0.9	-	-	-	-	1 (100%)
I/V stand	93	85.3	-	4 (4.3%)	32 (34.4%)	54 (58.1%)	3 (3.2%)
Stretcher cum bed	73	67.0	-	3 (4.1%)	3 (4.1%)	42 (57.5%)	25 (34.2%)
Hand washing facility	15	13.8	-	1 (6.7%)	2 (13.3%)	10 (66.7%)	2 (13.3%)
Adult AMBU bag	41	37.6	-	1 (2.4%)	11 (26.8%)	26 (63.4%)	3 (7.3%)
Pediatric AMBU bag	12	11.0	-	-	2 (16.7%)	9 (75%)	1 (8.3%)

Table 5. Association of Knowledge and Availability of Equipment with Selected Variable (n=109).

Variable	Category	Number	Knowledge	P value	Availability of equipment	P Value
			MeanS.D.		MeanS.D.	
Age*	<25 years	17	48.615.0	0.138	24.19.2	0.151
	25-35 years	48	56.212.8		28.410.5	
	35-45years	35	57.713.6		28.88.0	
	>45 years	9	56.911.3		21.6.4	

Education*	< Secondary	25	57.111.5	0.262	27.410.0	0.997
	Secondary	72	54.213.4		27.29.9	
	>Secondary	12	60.617.4		27.59.4	
Organization*	Governmental	11	49.413.4	0.119	20 7.7	0.032
	Private	82	55.813.1		28.210.0	
	Non-governmental	16	60.413.1		27.88.3	
Training received**	Yes	47	61.711.5	0.001	30.2 8.9	0.007
	No	62	50.913.2		25.29.9	
Experience**	< 5year	64	52.413.9	0.004	25.910.4	0.076
	> 5 year	45	60.111.7		29.38.6	
District**	Sunsari	53	55.413.0	0.908	29.59.5	0.023
	Other	56	55.714.0		25.29.7	

* ANNOVA

** Independent sample t test

Most (90%) of the ambulances had oxygen cylinder and adult oxygen mask. Provision of I/V stand/hook was present in 85.3% of ambulances (28.4% had I/V stand and 56.9% had presence of hook). More than half of the ambulances had pediatric oxygen mask and stretcher cum bed (Table 4). Other equipment to be present in the basic life support ambulance like suction, machine, cervical collar, fracture splint, I/V fluids, Stethoscope, B.P apparatus, spine support, airway, patient restraint strap, torchlight were also observed but none of the ambulance had these equipment.

Equipment “usually” used were oxygen cylinder in more than one third of the ambulance and adult oxygen mask in 40.6% of ambulance while nasal catheter was “sometimes” used in more than two-third of ambulance. Similarly, equipment that were “occasionally” used were first-aid box I/V stand (58.1%), stretcher cum bed (57.5%), handwashing facility (66.7%) and adult AMBU bag (63.4%) (Table 4).

There was significant association of knowledge with the experience ($p = 0.004$) and training ($p = 0.001$). The mean score was higher in those who had experience > 5 year and had received training. There was significant association of availability with training ($p = 0.007$), organization ($p = 0.032$) and district ($p = 0.023$) in which the ambulance is registered. Mean score was higher in those who had received training, ambulance run by private organization and those registered in Sunsari district. (Table 5)

DISCUSSION

In this study, equipment available in the ambulances were assessed according to the guidelines provided in the National Ambulance Operational Policy. The findings showed that more than half (58.7%) of the respondents had less than 5 years of experience and similar percentage had not received any training on first aid. This does not meet the national guideline on ambulance provided by Nepal. It states that a person must have at least 5 year of driving experience to be an ambulance driver and should be trained in first aid.³

The study showed that majority (62.4%) of the respondents had adequate knowledge on first aid. There was significant association of knowledge with the experience and training. This shows that providing training to the ambulance driver in first aid increases their knowledge and helps in providing appropriate care to the patients. This finding was supported by the findings of study conducted in Vienna area among bystanders where they found a clear relationship between the level of first aid training and the quality of first aid measures provided.⁴

Majority (82.6%) of the respondents mentioned that first aid means the first treatment given at accident site and one third (34.9%) correctly prioritized airway management in first aid concept. The study conducted on Nigeria among commercial inner city driver showed that 34.6 % of the driver responded first aid as what

is done for the patient at the accident site and 59.9% correctly prioritized airway management in first aid concept.⁵

About 20.2% of ambulance had only about one-fourth of equipment required for basic life support as mentioned in National guideline, Nepal. None of the ambulance had greater than 50% of the equipment. This is far less than the finding of the similar study conducted in Iran where it was found that road ambulances have an average of about 51% of equipment as mentioned by MOH of Iran.⁶

In this study, equipment 'usually' used in the ambulance were oxygen cylinder in 38.5% and adult oxygen mask in 40.6% which is supported by the study conducted in Klang Valley of Malaysia which showed that oxygen delivery devices were used in 45.8% of the ambulance.⁷

CONCLUSIONS

The study concludes that majority of ambulance linked to BPKIHS, did not have even one fourth of the equipment for basic life support. Commonly available equipment were oxygen cylinder, oxygen mask, first aid box, intravenous fluid stand and stretcher cum bed. The equipment usually used was oxygen cylinder and oxygen mask. Majority of ambulance drivers had adequate knowledge on first aid and was significantly associated with training and experience of driver. Availability of equipment was significantly associated with training of driver, type of organization that runs the ambulance and district in which ambulance is registered.

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