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ORIGINAL REPORT

Training on the use of T- piece resuscitator in a newborn unit: an experience from a Tertiary Health Facility in Northwestern Nigeria

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Abstract

Background:

Neonatal resuscitation is one of the key interventions to improve neonatal survival and outcomes. A key component of this intervention is proficient use of intermittent positive pressure ventilation (IPPV) by a skilled birth attendant during every neonatal resuscitation. The current guidelines in neonatal resuscitation recommend three types of devices for IPPV; these are self-inflating bag (SIB), flow-inflating bag (FIB), and T-piece resuscitator (TPR). The choice of which device to use is influenced by a combination of availability, inherent characteristic performance and requirements for use of a device, ease of use and skill of user among others.

Objective: To introduce and assess the knowledge, perception and experience of using T piece resuscitator by staff of a neonatal unit in a tertiary healthcare facility.

Methods: A study involving neonatal unit staff of the Ahmadu Bello University Teaching Hospital (ABUTH) Shika. Using a structured self-administered questionnaire, information was collected on knowledge, perception and experience on the use of T- piece resuscitator before and after training on the device. Data collected were analyzed with IBM SPSS version 20 and results were presented in tables and charts.

Results: Doctors made up 46.4% (13) of the 28 study participants while the other 15 were nurses. Eight (61.5%) of the doctors had some knowledge about T-piece resuscitator compared to 46.7% of nurses even as none of the participants reported using the device before the training. Nine of the 11 participants who were trained described the training as good while a participant reported inability to use the device even after the training. Three (27.3%) participants felt confident using the device while majority (63.6%, n = 7/11) described their confidence to use the device as fair and would want to have more training sessions. Participants suggested availability of protocols, aid on the use of the device and unfettered access will enhance their proficiency in its use.

Conclusion: Some of the neonatal unit staff had some knowledge about T piece resuscitator though, none had used it prior to training on the use of the device. Overall, trained staff felt they

needed more training and support to improve proficiency in use of the device.

Keywords: Neonate, T-piece resuscitator, Positive pressure ventilation, PEEP, Resuscitation.

Introduction

Intermittent positive pressure ventilation (IPPV) is the most important intervention during neonatal resuscitation. It was first proposed by Dr. Hilda Roberts in newborns who failed to cry spontaneously after birth.[1,2] The choice of the best equipment to administer positive pressure ventilation is a crucial research topic. The current guidelines in neonatal resuscitation recommend three types of devices for positive pressure ventilation; these are self-inflating bag (SIB), flow-inflating bag (FIB), and T-piece resuscitator (TPR).[3] The most commonly used device is the self-inflating bag (SIB) without a positive end-expiratory pressure (PEEP) valve which does not provide PEEP. The TPR, FIB, and SIB with PEEP valves are devices that can provide PEEP during resuscitation.

A T-piece resuscitator is a flow-controlled and pressure-limited mechanical device that uses valves to regulate the flow of compressed gas directed toward the patient.[3] These devices deliver positive pressure ventilation (PPV) with PEEP to infants with insufficient respiratory effort and continuous positive airway pressure treatment (CPAP) of breathing infants.[4] They are advantageous over SIBs as they deliver Positive End Expiratory Pressure (PEEP), which not only keeps the alveoli open but improves surfactant secretion, particularly in preterm infants.[1,5] Additionally, a specific Peak Inspiratory Pressure (PIP) can be set to ensure consistency in the amount of pressure given between breaths. Also, it is ergonomically facile to keep the device in place during prolonged resuscitation, minimizing the risk of delivered breaths being unknowingly lost through a leak around the face mask.[6] The use of TPR, however, requires some technical skill and a source of compressed gas, which could be a setback in resource- constrained settings.

Despite gaining widespread utility in developed nations, TPR is not familiar to many health personnel attending to newborns in resource-constrained settings. This study is an action research to assess the knowledge, perception, and practice of healthcare personnel working in a Neonatal Unit before and after training on the use of TPR.

Materials and Methods:

The research was conducted among health personnel working at the Neonatal Unit of ABUTH Shika. Staff were interviewed using a self - administered questionnaire which was followed with a series of training on the use of Neopuff™ Infant T-Piece Resuscitator. The training involved a short presentation and training using the teach–ask–reteach technique and also using the 4-stage demonstration and training approach- real-time run-through, instructor commentary, instructor demonstration with participant commentary, and participant demonstration with commentary. The training was conducted in groups of three to four to ensure the effective engagement of the staff who agreed to participate and indicated availability for the training. Each participant had a go and feedback was taken from participants. All the participants had the opportunity to set up the device including pressure settings (Peak inspiratory pressure{PIP}, Positive end expiratory pressure {PEEP}and Maximum pressure{Pmax}) and practice ventilation until they were able to achieve chest movement of the manikin

(Neonatalie). Post-training; the T- piece resuscitator was placed alongside SIB at strategic resuscitation points to avail willing trained staff access to use of the device.

The participants comprised doctors and nurses of different cadres. A structured self-administered questionnaire was used to collect information on participants' demographics, perception, and knowledge of TPR before the training, and their ability and willingness to use the device after the training. The post-training interview was conducted two weeks after the training. The data collected were analyzed with IBM SPSS version 20 and results were presented in tables, charts, and prose. The data were summarized as percentages, and measures of central tendency; the Chi-square of independence was used for comparing categorical variables. A p-value of less than 0.05 was considered statistically significant.

Result:

Twenty-eight participants took part in the survey with doctors constituting 46.4% (n = 13) and nurses 53.6% (n = 15). The highest proportion of doctors that participated in the study had a working experience of fewer than five years, whereas the highest number of the nurse participants had a practice experience of more than 10 years (Table 1). The majority (61.5%) of the doctors that participated were junior residents, while most of the nurses (66.6%) were nursing and senior nursing officers.

Table 1: Characteristics of Participants

Participants	**Freq (n)**	**Percent(%)**
Doctors	**13**	**46.4**
House officer	2	15.4
Registrar	8	61.5
Senior registrar	3	23.1
Nurses	**15**	**53.6**
Nursing officer	5	33.3
SNO	5	33.3
PNO	2	13.3
ACNO	2	13.3
CNO	1	6.7

Duration of practice (yrs)	**Doctors(%)**	**Nurses (%)**
Less than 1	2 (15.4)	1 (6.7)
1-4	5 (38.5)	3 (20.0)
5-10	4 (30.5)	4 (26.7)
11-15	1 (7.7)	5 (33.3)
>15	1 (7.7)	2 (13.3)

SNO, Senior nursing officer, PNO, Principal nursing officer, ACNO, Assistant chief nursing officer, CNO, chief nursing officer.

Majority (61.5%, n= 8/13) of the doctors had some knowledge about T-piece resuscitator compared to 46.7% (7/15) of nurses (Figure 1). However, none of the participants reported using the device before the training. There was no statistical significant difference in prior knowledge about the device based on work hierarchy (Table II).

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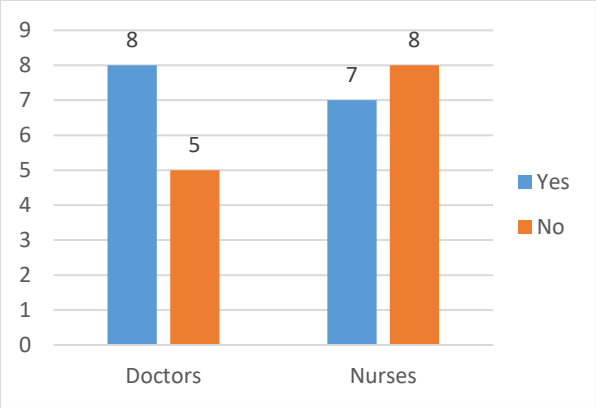

Figure 1. Distribution of health personnel with prior knowledge of TPR

Table 2.
Knowledge of T-piece resuscitator by cadres of personnel

Cadre	Rank	Prior knowledge		P
		Yes	No	
DR.	H.O	1 (50)	1 (50)	p = 0.323
	RG	4 (50)	4 (50)	
	S.RG	3 (100)	0 (0)	
NRS	NO	3 (60)	2 (40)	p = 0.817
	SNO	1 (20)	4 (80)	
	PNO	1 (50)	1 (50)	
	ACNO	1 (50)	1 (50)	
	CNO	1 (100)	0 (0)	

A total of 11 health personnel were trained on how to use a T-piece resuscitator for neonatal resuscitation. Five (45.5%) of the trained staff were doctors while six (54.5%) were nurses. The majority of the participants (81.8%, n = 9) described the training as good and one person reported that it was fair. One of the participants reported an inability to use the device even after the training; the majority (63.6%, n = 7/11; fig 2) described their confidence to use the device as fair and would want to have more training sessions. Three (27.3%) said they were confident in using the device.

The internal consistency of the questionnaire in assessing participants' level of satisfaction with the training was high (Cronbach's alpha = 0.896). Two of the trained staff described their overall experience with the device as good; one found it challenging, while the remaining responses ranged between fair and fulfilling.

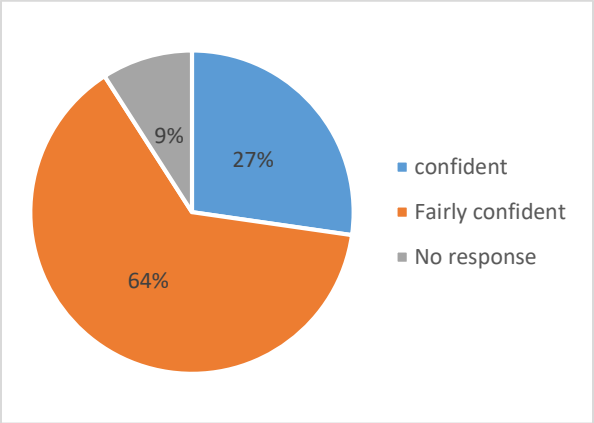

Figure 2. Confidence of the trained participants to use the T-piece device

Most of the staff trained (81.8%, n = 9/11) expressed the desire to have more training sessions. Eighty percent of the doctors would want to have more training compared to 100% of the nurse staff. Eight (72.7%) participants suggested a written manual should be made available in a bid to enhance the training and the utility of the TPR; nine (81.81%) each proposed a written protocol should be provided and felt ready access to the device would enhance the skill to use it while others suggested repeated refresher training and use of training videos.

Discussion:

The majority of the participants reported having some knowledge about T-piece resuscitators but none had used one before the training. This is because most of the neonatal units and labour rooms in our settings typically use self-inflating bags for neonatal resuscitation. To the best of the researchers' search, no center in Nigeria has reported using TPR for neonatal resuscitation. This may suggest lack of use which could be attributed to the non- availability of the device

hinged on the cost of the set-up and certain technical difficulties such as the need for pressurized oxygen compared to the widely used self-inflating bags. Furthermore, there was no difference among the health providers of different grades in terms of prior knowledge of the device. Duration of practice appeared not to have influenced knowledge of participants about the device, which suggests that as staff progressed along their career they did not have the privilege to train or use the device either as pre- or in-service. A higher proportion of doctors than nurses had some knowledge about the device. This is not unrelated to the category of doctors, residents, engaged in the study whose training entails extensive and comprehensive study and researching towards preparation for specialization. This would have exposed them to information about the TPR even as they did not have the opportunity of using the device before this study.

Most of the participants felt the training was good and also reported varying degrees of confidence in using the device; only one participant reported an inability to use the device after the training. The positive perception may be related to the method of training which provided ample opportunity for trainees to have to learn and gradually engage with the device as their confidence was built. Nevertheless, the majority of the trainees would like to have more training sessions. This is consistent with the findings from an Irish study that revealed that all grades of healthcare workers would need frequent training to get the settings right.[7] Another study in India found a higher average score of psychomotor skills in the TPR group compared to the SIB group, implying the ease with which the trainees imbibed the hands-on skills to use the device; however, the difference between the two groups fizzled out after 24 hours.[2] This underscores the need for intermittent refresher training, especially in pressure set-up which, if done incorrectly, could be potentially dangerous.[8,9]

Despite the satisfaction expressed by participants with the exposure to the use of the device, suggestions including written manual, protocol, training videos, ready access to the device and repeated refresher training were made. Such suggestions are not unexpected as integration of these suggestions will aid staff on the job learning, knowledge and skill. Improved knowledge and skill will bring about increased staff confidence and motivation to use device.

Conclusion:

T piece resuscitator was not unheard of by some of the neonatal unit staff however, none had used it prior to training on the use of the device. Trained staff described the training as good and are enthusiastic to use the device. Overall they felt more training, available protocols, and aid on the use of and unfettered access to the device will enhance their proficiency in its use.

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