Knowledge about continuous positive airway pressure machine usage among nurses at a tertiary hospital in Tanzania

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Abstract

Introduction: Continuous Positive Airway Pressure (CPAP) provides an air pressure that maintains the patency of the airway in patients with a variety of breathing problems. Nurses provide the hour to hour management of patients who require CPAP. The aim of this study was to assess the knowledge of nurses about CPAP machine usage at the tertiary hospital in Tanzania which serves the largest number of patients who require CPAP.

Method: A hospital-based descriptive cross-sectional study was carried out from March to June 2019 at Muhimbili National Hospital (MNH) and Jakaya Kikwete Cardiac Institute (JKCI) where 149 nurses who consented to participate were recruited. Data were collected using structured questionnaires and analysed using a statistical package for social sciences (SPSS) version 20. P-value<0.05 was considered to be statistically significant.

Results: Of the149 nurses recruited 80(53.7%) were female and 69 (46.3%) were male; 99 (66.4.%) were aged 26-35 years; 78 (52.3%) had a diploma in nursing as the highest level of education and 138 (93.9%) had work experience of less than ten years.

Forty five percent of nurses had moderate knowledge about CPAP machine usage. High and moderate level of knowledge among nurses about CPAP general information each equally accounted for 38.9% and poor level of knowledge accounted for 2.7%. Moreover, moderate level of knowledge about CPAP device contraindications accounted for 43% whilst poor knowledge attributed 8.7%. There was no significant association between nurses' knowledge and their socio-demographic characteristics.

Conclusion: Just under half of the nurses had moderate knowledge of CPAP device use and most of them had attended only a single training session on CPAP device use and the range of time from training until completing questionnaires was at least six months. Regular training on CPAP machine usage should be provided to nurses since they are in the front line in management of patients requiring CPAP.

Keywords: Knowledge, Continuous Positive Airway Pressure, Nurses, Muhimbili, Tanzania

Introduction

Continuous Positive Airway Pressure (CPAP) is a general term for a non-invasive method for providing a constant distending pressure level (above atmospheric) during inhalation and exhalation. CPAP has been useful in management of newborn infants with airway instability, oedema, and atelectasis.[1]

CPAP is employed in infants with acute respiratory failure to correct hypoxaemia. It permits a higher inspired oxygen content, increases mean airway pressure, and will improve ventilation to collapsed areas of the lung. The recruitment of the under ventilated lung is similar to the use of positive end expiratory pressure (PEEP) in the intubated mechanically ventilated patient.[2]

Nasal CPAP is the most widely used non-invasive continuous distending airway pressure technique in modern neonatal care. Whereas there has been emphasis on understanding which devices and pressure sources are best to implement CPAP, the optimal duration of this therapy is less well studied. At birth, premature infants have life-threatening anatomic and physiologic immaturities of the respiratory system. CPAP attenuates this pathophysiology until sufficient stability develops and continuous distending pressure is no longer needed.[3]

Nurses have an important role in the management of patients requiring CPAP. In this setting, nurses spend many hours caring for such patients whereas the doctors may attend only during ward rounds. The tasks performed by nurses include assessment of heart rate, respiratory rate, SpO2% range, CPAP settings (water level, temperature, pressures, size of nasal prongs/mask in use), equipment safety checks such as suction, resuscitation devices and the ventilator, intravenous syringe drivers/pump and monitor alarms, blood gases.[4]

CPAP has been useful in treatment of acute hypoxemic respiratory failure (ARF) as it reduces breathing efforts and improves functional residual capacity. CPAP has remained to be useful in management of patients with respiratory failure since the work of breathing increases during ARF.[5]

CPAP is an essential management technique for patients with impending respiratory failure as it has been practised at MNH and JKCI and given the significant number of patients requiring CPAP at JKCI and MNH where about half of critically ill patients require CPAP, it was considered essential to assess the knowledge of nurses providing this frontline treatment.

We are not aware of any study in Tanzania focusing on nurses' knowledge about CPAP. The aim of this study is to address this gap.

Method

This was a hospital based descriptive cross-sectional study conducted from March to June 2019 at Muhimbili National Hospital (MNH) and Jakaya Kikwete Cardiac Institute (JKCI) where 149 nurses were recruited by convenient sampling method.

Those nurses with a diploma or above were recruited upon providing written informed consent. These were registered nurses with authority to handle patients on CPAP. Using a self-administered questionnaire data were collected to assess the nurses' understanding and knowledge of the CPAP machine using scoring criteria.[6] (NOTE: the questionnaire is available from the corresponding author).

Data were analysed using statistical package for social sciences version 20. P-value<0.05 was considered to be statistically significant.

Table 1. Socio-demographic characteristics of participants

Description		n (%)
Sex	Male	69(46.3)
	Female	80(53.7)
	Total	**149(100)**
Level of Education	Diploma	78(52.3)
	Advanced Diploma	7(4.7)
	Degree	53(35.6)
	Masters	8(5.4)
	Other	3(2)
	Total	**149(100)**
Age group (years)	<26	8(5.4)
	26 – 35	99(66.4)
	36 – 45	38(25.5)
	46 – 55	4(2.7)
	Total	**149(100)**
Work experience (years)	<10	138(93.9)
	10 – 19	6(3.4)
	20 – 29	3(1.4)
	30 – 39	2(1.4)
	Total	149(100)
Previous training on CPAP	Yes	75(51)
	No	74(49)
	Total	**149(100)**
Number of training sessions respondent has ever attended	Never attended	74(49.7)
	1 session	49(32.9)
	2 sessions	12(8.1)
	3 sessions	8(5.4)
	>3 sessions	6(4)
	Total	**149(100)**

Table 2. Nurses' level of knowledge about CPAP general information

Description	Level of Knowledge	n (%)
Knowledge about CPAP generally	High	58(38.9)
	Moderate	58(38.9)
	Fair	29(19.5)
	Poor	4(2.7)
	Total	**149(100)**

Table 3. Nurses' level of knowledge about uses of CPAP device

Description	Level of Knowledge	n (%)
Knowledge of the uses of the CPAP device	High	10(6.7)
	Moderate	62(41.6)
	Fair	63(42.3)
	Poor	14(9.4)
	Total	**149(100)**

Table 4. Nurses' level of knowledge about CPAP device contraindications

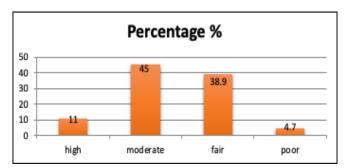| Description	Level of Knowledge	n (%)
Knowledge about CPAP devices contraindications	High	179(11.4)
	Moderate	64(43)
	Fair	55(36.9)
	Poor	13(8.7)
	Total	**149(100)**

Figure 1. Overall knowledge on CPAP device usage

Ethical clearance was obtained from the Research and Ethics Committee of Aga Khan University-School of Nursing and Midwifery. Permission to conduct the study was obtained from the hospital authority.

Results

Socio-demographic characteristics of nurses

Of the 149 nurses recruited 53.7% were female and 46.3% were male. The predominant age group was 26-35 years which accounted for 99(66.4%). The highest level of education was a diploma in nursing 78 (52.3%). Most (93.9%) nurses had work experience of less than ten years. Only 45% had a moderate knowledge of CPAP machine usage and only 51% had received appropriate training (Table 1).

Level of knowledge about CPAP general information

Those with moderate and high level of general knowledge about CPAP were in equal proportions at 38.9%. There were only four nurses who were in the poor knowledge group (Table 2).

Level of knowledge about uses of the CPAP device

Only 42.3% of nurses had a fair knowledge about the CPAP device usage while a high knowledge was found in 10(6.7%) nurses (Table 3).

Level of knowledge about contraindications of CPAP device usage

Again only 43% had a moderate level of knowledge of the contraindications of CPAP device usage and 8.7% had poor knowledge (Table 4).

Overall knowledge about CPAP device use

Forty five percent had generally moderate knowledge about CPAP device use and 4.7% had poor knowledge. (Figure 1).

Table 5. Relationship between nurses' level of education and overall knowledge on CPAP machine usage

Level of education	Overall knowledge n (%)				Total n (%)
	High	Moderate	Fair	Poor	
Diploma	5(6.4)	32(41.0)	37(47.4)	4(5.1)	78(52.3)
Advanced diploma	0(0.0)	3(42.9)	3(42.9)	1(14.3)	7(4.7)
Degree	11(20.8)	24(45.3)	16(30.2)	2(3.8)	53(35.6)
Masters	0(0.0)	5(62.5)	3(37.7)	0(0.0)	8(5.4)
Any other specify (PhDs)	2(66.7)	1(33.3)	0(0.00)	0(0.00)	3(2)
Total	18(12.1)	65(43.6)	59(39.6)	7(4.7)	149(100)

Table 2. Nurses' level of knowledge about CPAP general information

Variables Related	χ2	p-value
Age versus machine usage	9.163	0.422
Sex versus machine usage	2.820	0.420
Education level versus machine usage	17.472	0.133
Work experience versus machine usage	11.770	0.227
Whether ever attended training versus machine usage	1.550	0.671

Relationship between nurses' level of education and overall knowledge on CPAP machine usage

Again only 47.4% of the nurses with diploma had fair overall knowledge on CPAP machine usage while 45.3% of those with a degree had moderate overall knowledge on CPAP machine usage. There was no relationship between nurses' level of knowledge and their level of education since the p-value is 0.133 (Table 5).

Relationship between nurses' socio-demographic factors and the knowledge towards CPAP machine usage

Generally, there was no relationship between respondents' socio-demographic factors and the knowledge towards CPAP machine usage (Table 6).

Discussion

In this study the female to male nurse ratio was 1.16:1 and two thirds were aged 26 -35years. Just over half (52.3%) had a diploma. This is a finding similar to that from Iraq [7] and Karachi.[8]

The majority (93.9%) of nurses had a work experience of <10years. Among nurses who ever attended training on CPAP, only 32.9% attended once during their course of employment. Attendance (50.3%) at training sessions was poor again similar to that found in Iraq.[7]

Awareness of the contraindications for the use of CPAP is important but we found that only 43% of nurses had a moderate knowledge, a finding similar to elsewhere.[7-9] However our findings concerning knowledge about CPAP device use were better than those from other studies.[3,4]

Knowledge of CPAP is of paramount importance as it helps nurses to make appropriate decisions during management of patients treated with this technique and improves safety. There was no relationship in our study between respondents' socio-demographic factors and their knowledge of CPAP machine usage.

Training of nurses undertaking CPAP care should be improved. Our findings emphasize this since few nurses (32.9%) were found to have attended training on CPAP during their course of employment at MNH and JKCI.

Such regular in-service training on CPAP machine is highly recommended since nurses are in the front line in management of patients requiring CPAP.

Conclusion

The majority of nurses in this study had only a fair or moderate knowledge of CPAP device use and of the half that had attended a training session of CPAP device use, most of them had attended only a single session.

Acknowledgement

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Child malnutrition and COVID-19: the time to act is now

Message from the heads of UNICEF, FAO, WFP and WHO

The COVID-19 pandemic is undermining nutrition across the world, particularly in low-income and middle-income countries. The worst consequences are borne by young children. Some of the strategies to respond to COVID-19—including physical distancing, school closures, trade restrictions, and country lockdowns—are impacting food systems by disrupting the production, transportation, and sale of nutritious, fresh, and affordable foods, forcing millions of families to rely on nutrient-poor alternatives. Strained health systems and interruptions in humanitarian response are eroding access to essential and often life-saving nutrition services. ……. without timely action, the global prevalence of child wasting could rise by a shocking 14·3%. ……… this would translate to an estimated additional 6·7 million children with wasting during the first 12 months of the pandemic—80% of them in sub-Saharan Africa and south Asia—and more than 10 000 additional child deaths per month during this same period.

The leaders of four UN agencies have issued a call for action to protect children's right to nutrition in the face of the COVID-19 pandemic.

Five urgent actions to protect children's right to nutrition in the COVID-19 pandemic:

1. Safeguard and promote access to nutritious, safe, and affordable diets

2. Invest in improving maternal and child nutrition through pregnancy, infancy, and early childhood

3. Re-activate and scale up services for the early detection and treatment of child wasting

4. Maintain the provision of nutritious and safe school meals for vulnerable children

5. Expand social protection to safeguard access to nutritious diets and essential services.