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## Bag and mask ventilation in neonates - A Key towards reducing neonatal mortality

**Kaur Parvinder, Saini Amrita, Kaur Herbaksh, Kaur Kuldeep**

**Abstract**

**Background:** Birth of a healthy newborn baby is one of the greatest gifts of nature. After birth, the newborns undergo many changes. Majority of the newborns handle the transition well, between 5%–10% of all babies born need some degree of resuscitation. Approximately 3%–6% require basic neonatal resuscitation, consisting simple initial steps and assisted ventilation. As newborn resuscitation is a key component of effort to reduce neonatal mortality occurring due to birth asphyxia, the nursing students as future nurses should possess knowledge and skills to overcome the barriers of providing newborn resuscitation.

**Objective:** To evaluate the effectiveness of Planned Teaching Programme on skills regarding Bag and Mask ventilation in neonates among nursing students.

**Methodology:** An observation checklist regarding Bag and Mask Ventilation given by WHO was used for data collection with the help of OSCE method and Planned Teaching Programme was implemented. A pre-experimental approach (one group pre-test post-test design) was used. Pre and post-test data was collected from 78 conveniently selected nursing students of B.Sc Nursing 3<sup>rd</sup> year from M.M College of Nursing, Mullana, Ambala.

**Results:** Findings of the study revealed that majority of the nursing students (70.8%) were females and majority of nursing students (90.2%) had previous knowledge regarding bag and mask ventilation in neonates but majority of nursing students (79.16%) had not performed bag and mask ventilation during their clinical experience. The mean 2nd post-test skill score of nursing students regarding bag and mask ventilation (15.7+2.55) was higher than pre-test skill score of students (7.15+0.22) as evident from the calculated 't' of 21.95 which was found to be statistically highly significant at 0.00 level of significance.

The skills of nursing students were significantly associated with previous knowledge ( $\chi^2 = 8.35$ ) and number of ventilations performed previously ( $\chi^2 = 9.53$ ).

**Conclusion:** The study concludes that Planned teaching program regarding Bag and Mask Ventilation was very effective in improving the skills of nursing students regarding bag and mask ventilation in neonates.

**Keywords:** Effectiveness, Bag and Mask ventilation in neonates, Skills, Planned Teaching Programme and Nursing students.

### Introduction to Net Neutrality

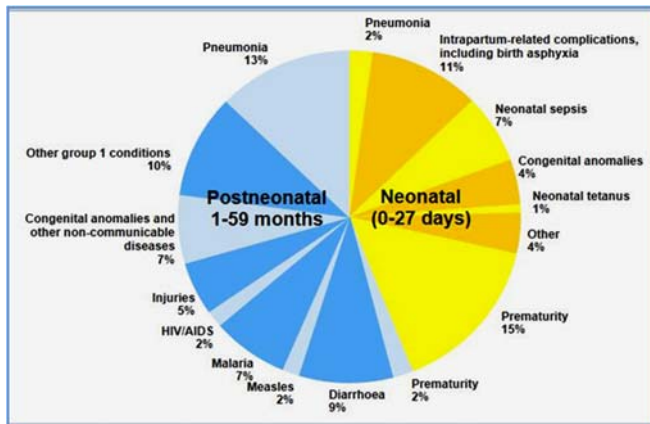
#### Background of the Study

Oxygen is important for every part of the human life. Without it, the cells that make up our organs - brain and other body parts- will die. Before birth, the foetus acquires oxygen from the placenta. But after birth, the umbilical cord is clamped by artery forceps and slotted and the newborn has to undergo tremendous physiological changes to initiate his first breath. At least 90% of neonates successfully make this transition without need of help. The remaining 10% of newborns require some assistance to begin breathing at birth and 1% or more may require intensive resuscitative efforts [1].

India accounts for the greatest burden of newborn deaths in the world. According to Sample Registration System Statistical Report 2012, with the current Neonatal Mortality Rate of 29 per 1,000 live births, about 70 percent of infant deaths and more than half of under-five child deaths in the country fall in the neonatal period. The Early Neonatal Mortality Rate - deaths in the first week of life - is 23 per 1,000 live births (Table 1). This implies that 1st week alone accounts for about 45% of total under-five deaths [2].

**Table 1:** Showing current Child and Neonatal Mortality Rates (2012) per 1000 live births<sup>2</sup>

Under-five child mortality rate (U5MR)	52
Infant mortality rate (IMR)	42
Neonatal mortality rate (NMR)	29
Early neonatal mortality rate (ENMR)	23
Late neonatal mortality rate (LNMR)	6



**Fig 1:** Pie Chart showing the causes of Neonatal deaths (by WHO)<sup>3</sup>

According to Global Health Estimates by W.H.O (2000-2013), among the causes of neonatal deaths in India, Birth asphyxia accounts for 11% of total neonatal deaths (Figure 1) and is the second major causes of neonatal mortality after prematurity that accounts for 15% of neonatal mortality<sup>[3]</sup>.

A prospective study by Baqui AH *et al.* provides data on the timing of cause-specific neonatal deaths showed that almost all deaths due to asphyxia (97.8%) occur in the first week of life, with 70% of them occurring within the first 24 hours i.e (Day 0), indicating the need for good practices of Neonatal Resuscitation to safeguard the life of newborn<sup>[4]</sup>.

WHO's report states that Basic resuscitation focusing on initial steps and assisted ventilation, without the use of endotracheal intubation or drugs, is sufficient for the vast majority of newborns<sup>[5]</sup>.

Nursing constitutes a major role among team members in caring the asphyxiated neonates. Development of skills of nursing students who are going to be future nurses, will tackle these problems related to neonatal mortality. Hence the study was undertaken to evaluate the effectiveness of planned teaching programme on skills regarding bag and mask ventilation in neonates among 3<sup>rd</sup> year B.Sc. nursing students.

**Aims and Objectives**

1. To assess and compare the skills of nursing students before and after administration of planned teaching programme on Bag and Mask ventilation in neonates.
2. To determine association of level of skills of nursing students regarding bag and mask ventilation in neonates with selected demographic variables.

**Methodology**

A pre-experimental approach was adopted with one group Pre-test Post-test design. Convenient sampling technique was used to select 78 nursing students of B.Sc Nursing 3<sup>rd</sup> year of M.M. College of Nursing, Mullana, Ambala (Haryana) who were already divided into 3 groups according to their Master Rotation Plan.

Assessment of the skills of nursing students was done through Observational Checklist on Bag and Mask Ventilation given by WHO which was modified according to the expert's

guidance and opinion. Level of skills was classified as Good ( $\geq 80\%$ ), Fair (65-80%), Average (51-65%), Poor ( $\leq 50\%$ ).

On the day 1, Pre-test assessment of skills was done and Planned Teaching Program including teaching and demonstration on Bag and Mask ventilation in neonates was given with the help of Power points, Videos<sup>[6]</sup>, Handouts<sup>[7]</sup> and a baby NRP simulator.

Data was collected with the help of Observed Structured Clinical Examination (OSCE) method. Three stations were made namely-

**Station 1-** "Choosing Appropriate Bag and Mask",

**Station 2-** "Positioning of Infant, Positioning of Resuscitator and Procedure"

**Station 3-** "How will you assess the effectiveness of Bag & Mask Ventilation?"

On 2<sup>nd</sup> day of Planned Teaching Program, First post-test assessment and on 15<sup>th</sup> day, second post-test assessment of skills of nursing students was done. There was attrition of 8 subjects in post-test assessments (N=72). Data was analysed by using both descriptive and inferential statistics.

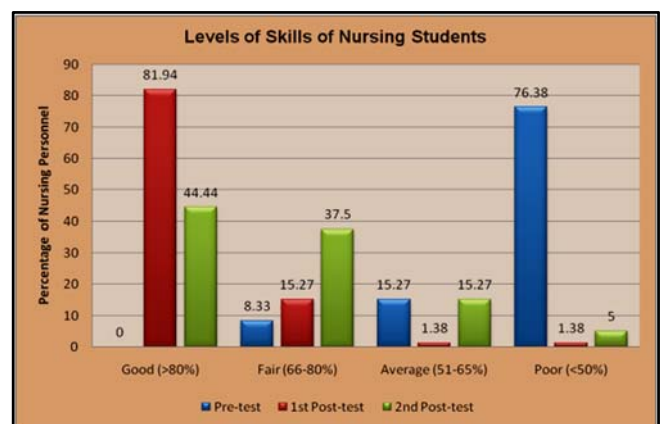
**Results**

**Socio-demographic Characteristics of Nursing Students-**

Majority of nursing students were female (70.83%). Majority of nursing students (90.2%) had previous knowledge regarding bag and mask ventilation in neonates. Majority of nursing students (54.16%) got information regarding bag and mask ventilation through demonstration followed by 45.83% who got information from books. Majority of nursing students(79.16%) had not performed bag and mask ventilation during their clinical experience and of 20.83% nursing students who had performed bag and mask ventilation during their clinical posting, performed it 1-2 times only (16.6%).

**Evaluation of effectiveness of Planned Teaching Program in terms of skills of nursing students:**

**Figure1** shows that in pre-test, majority of the nursing students (76.38%) had poor skills whereas in 1<sup>st</sup> post-test and 2<sup>nd</sup> post-test, majority of nursing students possess good skills regarding bag and mask ventilation in neonates i.e. 81.94% and 44.44% respectively. However, the level of skills declined in 2<sup>nd</sup> post-test which indicated poor retention of skills regarding Bag and Mask ventilation among nursing students as no further reinforcements were given.



**Fig 2:** Bar Graph showing the percentage distribution of levels of skills of nursing students

Data presented in Table 1 revealed that the mean skill score of nursing students in 1<sup>st</sup> post-test and 2<sup>nd</sup> post-test regarding Bag and Mask Ventilation in neonates was 17.68 and 15.78

respectively which was higher than the mean pre-test skill score of nursing students which was 7.15 with a mean difference of 10.52 and 8.62 respectively. The computed “t” value of 24.76\*\*and 21.95\*\* for 1<sup>st</sup> post-test and 2<sup>nd</sup> post-test respectively was found to be statistically highly significant at 0.00 level of significance which showed that there was significant difference between skills of nursing students in pre-test and 1<sup>st</sup>and 2<sup>nd</sup>post-test, indicating the effectiveness of Planned Teaching Program regarding Bag and Mask Ventilation in neonates.

Hence, research hypothesis H<sup>1</sup> which states that “there will be a significant difference in the mean pre-test and mean post-test skill scores of nursing students regarding bag and mask ventilation in neonates at 0.05 level of significance” was accepted.

**Table 1:** Mean, Mean difference, Standard Deviation of Difference, Standard Error of Mean Difference and ‘t’ value of pre-test and 2<sup>nd</sup> Post-test skills scores of nursing students regarding bag and mask ventilation in neonate N=72

Skills score	Mean	Meand	SD <sub>D</sub>	SE <sub>MD</sub>	‘t’	df	p-value
Pre-test	7.15						
1 <sup>st</sup> Post-test	17.68	10.52	3.6	0.42	24.76	71	0.000**
Pre-test	7.15	8.625	3.33	0.393	21.95	71	0.000**
2 <sup>nd</sup> Post-test	15.78						

\*significant (p≤0.05) \*\* highly significant (p≤0.00)

**Item wise frequency and percentage distribution of pre-test, first post-test and 2nd post-test skill score of nursing students regarding bag and mask ventilation**

In pre-test, only 31.9% nursing students checked for the working of pop-off valve while choosing the appropriate bag while in 1<sup>st</sup> and 2<sup>nd</sup> post-test majority of nursing students checked for proper functioning of pop-off valve i.e 98.6% and 91.7% respectively.

In the area of choosing the appropriate mask, in pre-test, only 69.4% nursing students choose appropriate size mask while in 1<sup>st</sup> and 2<sup>nd</sup> post-test, almost all the nursing students choose appropriate size mask i.e.98.6% and 100% respectively.

In pre-test, only 43.1% nursing students used shoulder roll while positioning the infant while in 1<sup>st</sup> post-test 97.2% and in 2<sup>nd</sup> post-test 94.4% nursing students used shoulder roll while positioning the infant.

During position of resuscitator, in pre-test only 44.4% nursing students stood on the head end while in 1<sup>st</sup> post-test 98.6% and in 2<sup>nd</sup> post-test 97.2% nursing personnel stood at the head end to perform bag and mask ventilation in neonates.

While positioning and holding the mask, in pre-test only 36.1% nursing students ensured sung seal while in post test 93.1% students ensured a snug seal.

In pre-test, only 13.9% nursing students squeezed the bag with finger tips while in 2<sup>nd</sup> post-test, 72.2% students squeezed the bag with fingertips and not with whole hand. Only 29.2% nursing students provided ventilations with the rate of 40-60 breaths per minute while the percentage increased to 68.1% in 2<sup>nd</sup> post-test.

In pre-test, only few nursing students knew how to assess the effectiveness of ventilations while in 2<sup>nd</sup> post-test, 98.6% answered ‘increasing heart rate’, 75% answered ‘improving color’ and 94.4% answered ‘spontaneous breathing’.

**Association of level of skills of nursing students regarding bag and mask ventilation in neonates with their selected demographic variables**

The Data presented in Table 2 revealed that the computed chi-square value of source of information, experience during clinical posting and previous ventilation was found to be non-significant which shows that there is no any association of level of skills of nursing students regarding bag and mask ventilation with these demographic variables. Further it can be inferred that the effectiveness of Planned Teaching Program in terms of skills of nursing students regarding Bag and Mask Ventilation in neonates was associated with the gender, previous knowledge regarding Bag and Mask ventilation and number of ventilation performed previously during clinical postings as evident by their chi-square values of 9.97, 8.35 and 9.53 respectively which were found to be statistically significant at 0.05 level of significance.

**Table 2:** Chi square value showing association of level of mean gain in post-test skills score of nursing students regarding bag and mask ventilation with selected variables N = 72

S. No	Sample Characteristics	Skills Scores				Df	χ <sup>2</sup>
		Poor	Average	Fair	Good		
1	<b>Gender</b>						
	Male	2	6	7	6	3	9.97*
	Female	0	5	21	25		
2	<b>Previous Knowledge Regarding Bag &amp; Mask Ventilation</b>						
	Yes	1	9	25	30	3	8.35*
	No	1	3	1	2		
3	<b>If Yes, Than Source Of Information</b>						
	Demonstration	1	4	15	19	3	1.18 <sup>NS</sup>
	Books	1	6	13	13		
4	<b>Any Experience During Clinical Posting</b>						
	Yes	1	1	7	6	3	2.46 <sup>NS</sup>
	No	1	1	20	26		
5	<b>Previous Ventilation Performed During Clinical Posting</b>						
	Yes	1	1	7	6	3	2.46 <sup>NS</sup>
	No	1	10	20	2		
6	<b>If Yes, Number Of Ventilation Performed</b>						
	1-2	0	0	7	5	3	9.53*
	3-5	1	1	1	0		

(\*) significant (p≥0.05), (NS) Not significant (p≤0.05)

### Discussion

The present study findings revealed that the computed “t” value (21.95) regarding Bag and Mask Ventilation was found to be highly significant at 0.00 level of significance. The study findings are consistent with the study conducted by Waldemar A. Carlo, Linda L. Wright *et al.* (2005) [8] to evaluate the effectiveness of the AAP Neonatal Resuscitation Program (NRP) in improving knowledge, skills, and self-efficacy of nurse midwives which reported that after training, written scores (knowledge evaluation) improved from 57% to 80%; performance scores (skills evaluation) improved the most from 43% to 88%. The study findings are also consistent with the study conducted by Laurel Bookmana, Cyril Engmann *et al.* (2007-2009) [9] to evaluate the effectiveness of the American Academy of Pediatrics Neonatal Resuscitation Program (NRP) in improving knowledge, skills, and self-efficacy of nurse midwives which showed that the percentage of items performed correctly on the practical evaluation of skills increased from 58% pre-training to 81% in post-training ( $p < 0.01$ ).

### Conclusion

Neonatal resuscitation has the potential of altering the outcome of intra-partum events. Universal application of Basic Resuscitation (including Initial steps and Bag and Mask Ventilation) may save thousands of newborn's lives and contribute significantly to progress toward Millennium Development Goal 4. The student nurses as future staff nurses must possess adequate knowledge and good skills regarding Bag and Mask Ventilation.

The study findings concluded those despite of good knowledge of nursing students regarding Bag and Mask ventilation, their skills were very poor. Planned Teaching Program was effective in improving the skills of nursing students regarding Bag and Mask ventilation in neonates. But the level of skills further declined in 2<sup>nd</sup> post-test assessment as no reinforcements were given in-between. So the study recommended that there is a great need of introducing periodic and routine Basic Neonatal Resuscitation Training programmes that may improve the skills of nursing students.

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### Conflict of Interest

The authors declare of conflict of interest.

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