

Effectiveness of Simulation Based Education on Competencies on Helping Babies Breathe and Perceived Self-Efficacy among Undergraduate Nursing Students, Kathmandu

Bhuwan Kumari Dangol¹, *Archana Pandey Bista¹, Muna Rana Thapa¹, Ganga Panta,¹ Gayetri Darshandhari¹, Suzanna Mukhia¹

¹Maharajgunj Nursing Campus, Institute of Medicine, Tribhuvan University

ABSTRACT

Introduction: Simulation based education is an intervention that enable students to become competent in performing clinical skills. The study aimed to find out the effectiveness of simulation-based education on competencies on performing Helping Babies Breathe (HBB) and perceived self-efficacy on performing Helping Babies Breathe among nursing students.

Methods: Pre-experimental study design was adopted. Total 40 nursing students of BSc third year were included. Initially, pre-intervention data was obtained and simulation based intervention on skills practice on Helping Babies Breathe was intervene by research team members based on HBB guideline and post-intervention data was obtained after 4 weeks of intervention. Data were analysed by using descriptive and inferential statistics specifically, paired t-test and Wilcoxon test was used

Results: All most all participants were able to initiate effective ventilation within a minute in post-test. The skills scores on performing all the steps of effective ventilation in post-test were increased. Specifically, there is a significant increased on skills score on initial steps of HBB after intervention with ($p=0.001$), birth time to initiation of effective ventilation ($p=0.002$), continuing effective ventilation ($p=0.005$) and on overall skill competencies for performing HBB per minute ($p=0.000$). Regarding their perceived self-efficacy on performing HBB, score was higher on all aspects after intervention.

Conclusions: Statistical significant increased scores on skills on performing Helping Babies Breathe (HBB) on post-test than pre-test signifies that simulation based education on HBB is effective on increasing skills competencies among nursing students and enhancing their perceived self-efficacy. Thus, skills practice on HBB is recommended to promote among nursing students in simulated labs.

Keyword: Competencies on Helping Babies Breathe, perceived self-efficacy, simulation based education

***Correspondance:** Dr. Archana Pandey Bista, Associate Professor Maharajgunj Nursing Campus, Institute of Medicine, Tribhuvan University, Email: archanabista67@yahoo.com, Mobile: 9841587917

INTRODUCTION

Nursing and midwifery education is based on skills competencies acquired through acquisition of knowledge, skills and attitudes. Nursing educators create professional learning experience to their students to become competent and respond appropriately and effectively to specific clinical scenario. Simulated practice of clinical skills in skills

laboratories are the evidences to support for learning performance-based skills.¹ Students develop psychomotor skills, technological skills and critical thinking skills through simulated scenarios which prepare them to perform skills applying for clinical situations for doing different procedures and clinical performance and opportunity to learn uncommon situations.^{2,3}

Simulation based learning have been found for less clinical errors by applying complex scenarios in a safe environment. Students are equipped with clinical competencies through self-learning and peer learning by integrating their knowledge, skills and judgment for safe and ethical nursing practice.^{4,5} Simulation scenario have been increasing in trends in nursing and midwifery practice at different level of nursing programs and help the students get opportunities for learning basic and complex nursing and midwifery skills to achieve desired patient outcomes which enhances to meet educational goals and outcomes.^{6,7}

Around the world, every year almost 700,000 babies born in low and middle-income countries die from birth asphyxia. An estimated 1 in 10 infants will struggle to breathe at birth. Concept of "golden minute" on Helping Babies Breathe (HBB) aims to reduce child mortality related to birth asphyxia. HBB is an evidence-based educational program which teaches the simple steps to resuscitate the majority of infants with birth asphyxia with good survival rate. For 99 percent of newborns, simple interventions can be lifesaving.^{6,7} Few experimental studies found that simulation training have the statistically significant effect with higher score on post-test scores on skills checklist among nursing, midwifery students and among health professionals.^{8,9} Likewise, studies reported that simulation-based training has a positive impact on improving self-efficacy in nursing students after participating in simulations scenarios. Self-efficacy is associated with student success by positively academic performance achievements, predictor of motivation and self-regulatory outcomes.^{10,11} Little literature available for evaluation of simulation and on the student perceptions regarding simulation-based education.¹¹ Therefore, this study aimed to measure the effectiveness of simulation-based education on competencies on helping babies breathe (HBB) and perceived self-

efficacy for HBB among nursing students.

METHODS

The study had adopted pre-experimental one-group pretest-posttest design. The setting was Maharajgunj Nursing campus (MNC) at midwifery skill laboratory where moderate-reality simulator for practicing newborn resuscitation named Neo-Natalia and other accessories equipment and materials were available. The duration of data collection was from December 2021 to June 2022. The target populations were BSc nursing students studying during the year 2021 at respective campus. Total 40 students of third year were recruited through a consecutive sampling technique. Students willing to participate voluntarily were included.

Before data collection ethical approval was obtained from Institutional Research Committee (IRC) of Institute of Medicine (IOM), referred no. 217 (6-11) E2 078/079. The skills competencies were assessed through structured checklist for assessing HBB competencies consisting of 23 steps as per national standard guideline on HBB of Nepal Government and self-administered tool were used for measuring self-efficacy consisting of 14 item questions.

INTERVENTION PROCEDURE

Initially, theory related to HBB was provided by research team members. Pre-test data was collected before simulation intervention on HBB. Simulations on HBB was intervene into small group of 8 to 10 where they were pre-briefed, given scenarios for practicing and allowed for debriefing sessions. Further participants were grouped into 4 small groups where they practice the HBB individually by using the checklist and into peer practice under the guidance of 4 independent facilitators who were the research team members. Principle of low dose high frequency was followed. Post-test data were collected after 8 weeks of intervention.

Ethical considerations like voluntarily participation, anonymity and confidentiality of the information were maintained. All data were entered into a Statistical Package for Social Science (SPSS-20). Descriptive statistics were used to describe the nature of data and inferential statistics specifically Paired t-test and Wilcoxon test was used to compare the significant differences between pre-test and post-test score on HBB skills competencies.

Table1 show that on pre-test 80% students had practiced 4 to 6 times but in post-test all most all students practiced 8 to 10 times practice HBB in skill lab. All most all students were able to initiate effective ventilation within 60 seconds. There was a statistical significant differences on score on pre-test and post-test on number of ventilation per minute ($p=0.000$) and initiation of effective ventilation within minute ($p= 0.002$).

RESULTS

Table 1 Comparison between HBB Skill Practices Pre and Post Intervention (n=40)

Criteria	Pre-test		Post-test Percent		Median Differences (Pre-test- Post- test)		
	Number	Percent	Number	Percent			
Frequency of self -skill practices on HBB Frequency set is minimum 6 times							
1 - 3 times	8	20.0	-	-			
4 - 6 times	32	80.0	-	-			
> 8 times	-	-	40	100.0			
8-10			36	90.0			
11-13			4	10.0			
Median score on number per minute	Q1	Q2	Q3	Q1	Q2	Q3	$p=0.000$ *
	.6477	.8636	.9239	.9239	1.0000	1.00000	
Initiation of effective ventilation from Birth Within 60 second	3	3.5	37	92.5			
After 60 second	37	92.5	3	7.5			$p=0.002$ *

*significant at $p < 0.005$

Table 2 Comparison on Initial Steps on Helping Babies Breathe Skills Practices before and after Interventions (n= 40)

Criteria	Pre -test Yes		Post -test Yes		Mean differences Pre-test Post-test P value
	Num-ber	Percent	Num-ber	Percent	
Preparation for birth	23	57.5	39	97.5	0.001 *
Dry thoroughly	31	77.5	40	100	
Keep baby warm	27	67.5	38	95.0	

Criteria	Pre -test Yes		Post -test Yes		Mean differences Pre-test Post-test P value
	Num-ber	Percent	Num-ber	Percent	
Keep slight extent of the baby's head	31	77.5	39	97.5	
Suction if needed	30	75.0	40	100	
Stimulate baby's back by rubbing 2-3 times	31	77.5	38	95.0	
Clamp and cut the cord	31	77.5	37	92.5	
Place the baby on the area of ventilation	37	92.5	40	100	
Stand at the baby's head	38	95.0	40	100	
Position the head slightly extent	38	95.0	39	97.5	
Apply the mask to the face	39	97.5	40	100	
Make a tight seal between the mask and face	38	95.0	40	100	
Squeeze the bag to produce gentle movement of the chest	31	77.5	40	100	
Start ventilation with bag and mask within Golden minutes (60 seconds)	30	75	40	100	

*significant at $p < 0.005$

Table 2 shows that respondents score on performing all the steps of initial steps of HBB were increased in post-intervention than pre=intervention with statistically significant differences ($p = 0.001$).

Table 3 Comparison on Continuing Effective Ventilation regarding Helping Baby Breathe Before and after interventions (n=40)

Criteria	Pre -test		Post- test		Mean differences Pre-test and Post-test
	Number	Percent	Number	Percent	
Observe the moving of chest	28	70.0	38	95.0	0.005
Re-apply the mask to better seal	33	82.5	40	100	
Re-positioning the baby's head	34	85.0	40	100	
Clear mouth and nose secretion	30	75.0	37	92.5	
Make mouth slightly open	23	57.5	36	90.0	
Squeezed the bag harder	31	77.5	40	100	

Criteria	Pre -test		Post- test		Mean differences Pre-test and Post-test
	Number	Percent	Number	Percent	
Should ventilate the baby 40 times per minutes	27	67.5	38	95.0	
Reassess the baby's breath, heart rate and color	26	65.0	39	97.5	
If baby breathe spontaneous and HR >100b/m stop ventilation.	29	72.5	39	97.5	

*significant at $p < 0.005$

Table 3 reveals that respondents had higher score on continuing effective ventilation on performing steps of Helping Babies Breathe after intervention then before intervention with ($p=0.005$).

Table 4 Comparison on Perception on Clinical Competencies on HBB before and after Interventions (n = 40)

Statements		SA		A		UD		D		SD	
		N	%	N	%	N	%	N	%	N	%
In skills lab (SL)	Pre	17	42.5	18	45.0	5	12.5	-	-	-	-
	Post	21	52.5	16	40.0	1	2.5	2	5.0	-	-
Learning a complex procedure in small parts	Pre	6	15.0	26	65.0	6	15.0	2	5	-	-
	Post	12	30.0	24	60.0	-	-	2	5	2	5
Get adequate help to learn	Pre	13	32.5	25	62.5	1	2.5	-	-	1	2.5
	Post	19	47.5	18	45.0	1	2.5	-	-	2	2.5
Practicing must to be beneficial	Pre	12	30.0	26	65.0	1	2.5	-	-	1	2.5
	Post	16	40	10	25.0	12	30.0	-	-	2	5
If mistakes nobody get damage	Pre	12	30.0	12	30.0	12	30.0	3	7.5	1	2.5
	Post	21	52.5	15	37.5	2	5.0	1	2.5	1	2.5
Assist to understand of the theory previous taught	Pre	17	42.5	19	47.5	2	5.0	1	2.5	1	2.5
	Post	18	45.0	19	47.5	2	5.0	-	-	1	2.5
Time spent improve of clinical skills	Pre	22	55.0	18	45.0	-	-	-	-	-	-
	Post	25	62.5	13	32.5	1	2.5	-	-	1	2.5
Practicing makes students self-confident	Pre	19	47.5	19	47.5	2	5.0	-	-	-	-
	Post	14	35.0	20	50.0	4	10	1	2.5	1	2.5
In hospital setting often using the skills learnt	Pre	17	42.5	20	50.0	3	7.5	-	-	-	-
	Post	9	22.5	22	55.0	7	17.5	1	2.5	1	2.5

Statements		SA		A		UD		D		SD	
		N	%	N	%	N	%	N	%	N	%
In skills lab (SL)											
Practicing improves the performance on clinical	Pre	10	25	23	57.5	5	12.5	1	2.5	1	2.5
	Post	15	37.5	22	55	2	5	-	-	1	2.5
Practicing makes safer for patients	Pre	13	32.5	26	65.0	-	-	1	2.5	-	-
	Post	20	50.0	17	42.5	2	5	-	-	1	2.5
We find suggestions from peers to improve	Pre	15	37.5	22	55.0	3	7.5	-	-	-	-
	Post	21	52.5	18	45.0	-	-	-	-	1	2.5
Skill practice need training with actual	Pre	5	12.5	22	55.0	9	22.5	3	7.5	1	2.5
	Post	19	47.5	10	25	8	20	1	2.5	2	5
Manikins are realistic for helping to develop skills	Pre	3	7.5	27	67.5	4	10	3	7.5	3	7.5
	Post	10	25	24	60	2	5	3	7.5	1	2.5
Performing better than actual patients	Pre	5	12.5	16	40	12	30	2	5	-	-
	Post	9	22.5	22	55	5	12.5	3	7.5	1	2.5
Performing better with real patients	Pre	10	25	14	35	6	15	7	17.5	3	7.5
	Post	13	32.5	14	35	8	20	3	7.5	2	5
Enjoyed using SL	Pre	9	22.5	20	50	6	15	5	12.5	-	-
	Post	15	37.5	16	40	6	15	2	5	1	2.5
Learned more	Pre	14	35	22	55	1	2.5	3	7.5	-	-
	Post	17	42.5	17	42.5	3	7.5	2	5	1	2.5
Preparation sessions helps	Pre	12	30.0	25	62.5	3	7.5	-	-	-	-
	Post	18	45	13	32.5	6	15	1	2.5	2	5

Table 4 reveals that perception on clinical competencies on HBB score was higher on all aspects after intervention.

Table 5: Perceived Self-efficacies in Performing Helping Babies Breathe before and after Interventions (n=40)

Statements N		SA		A		UD		D		SD	
		%	N	%	N	%	N	%	N	%	
Feel confident on Simulation based learning	Pre	22	55	16	40	2	5	-	-	-	-
	Post	16	40	19	47.5	3	7.5	2	5	-	-
I am thankfulness learn how to handle unforeseen situations	Pre	19	47.5	19	47.5	2	5	-	-	-	-
	Post	18	45	21	52.5	1	2.5	-	-	-	-
I can always solve complicated problems	Pre	5	12.5	16	40.0	17	42.5	2	5	-	-
	Post	8	20	23	57.5	8	20	1	2.5	-	-

Statements N		SA		A		UD		D		SD	
		%	N	%	N	%	N	%	N	%	N
If I find trouble caring a newborn, can usually think of a solution	Pre	3	7.5	25	62.5	7	17.5	5	12.5	-	-
	Post	13	32.5	20	50	7	17.5	-	-	-	-
I feel well prepared to function as a nurse	Pre	5	12.5	25	62.5	8	20	2	5	-	-
	Post	22	55	15	37.5	3	7.5	-	-	-	-
I have self-confident that I could treat efficiently with emergencies	Pre	4	10	20	50	14	35.0	2	5	-	-
	Post	11	27.5	23	57.5	6	15	-	-	-	-
It is simple for me to handle my aims and accomplish my goals in taking care of new born baby	Pre	2	5	17	42.5	16	40	4	10	1	2.5
	Post	4	10	24	47.5	9	22.5	2	5	1	2.5
I can usually handle difficult situations in care of new born	Pre	3	7.5	17	42.5	15	37.5	3	7.5	2	5
	Post	5	12.5	25	62.5	9	22.5	1	2.5	-	-
If a co-worker disagree, can discover the ways to address,	Pre	1	2.5	21	42.5	15	37.5	1	2.5	2	5
	Post	5	12.5	24	60	9	22.5	2	5	-	-
Can solve most problems that arise	Pre	4	10	25	62.5	8	20	3	7.5	-	-
	Post	7	17.5	28	70	5	12.5	-	-	-	-
Effectively apply theory with practice	Pre	5	12.5	29	72.5	5	12.5	1	2.5	-	-
	Post	6	15	22	60	7	17.5	4	10	1	2.5
We can remain calm when facing difficult situations	Pre	1	2.5	14	35	13	32.5	10	25	2	5
	Post	3	7.5	17	42.5	16	40.0	2	5.0	2	5.0
When a care problems, I can usually find many solutions	Pre	3	7.5	19	47.5	13	32.5	5	12.5	-	-
	Post	4	10	28	70	7	12.5	-	-	1	2.5

Table 5 reveals that score on perceived self-efficacies in HBB after intervention was higher on all aspects.

DISCUSSION

In this study, we compared on frequency of practices and effective initiation of ventilation in Helping Baby Breathe Skill Practices in pre and post intervention. In pre-test majority students had practiced 4 to 6 times but in post-test all most all students practices 8 to 10 times practice HBB

in skill lab. In pre-test all most all students could not initiate effective ventilation within a minute whereas in post-test almost all students had initiated effective ventilation within a minute.

We had also found that on skills to perform HBB, there was a statistical significant difference on post - test score with p value (0.024) on birth time to perform effective ventilation. (p=0.002) on ventilation per minute (p=0.000) on overall skill competencies for performing HBB, (p = 0.024) on perceived self-efficacy.

Similarly, longitudinal study among total 23 healthcare professionals found that the knowledge mean scores before and after the training increased from 9.60 to 13.60 (95% CI: -5.900; -2.099, $p < 0.001$), and in 2018, the scores increased from 10.80 to 15.44 (95% CI: -6.062; -3.217, $p < 0.001$). The mean knowledge scores post-training over time were 13.60 in 2017 and 15.44 in 2018 (95% CI: -3.489; 0.190, $p = 0.030$). The resuscitation skills performance between the two time periods increased from a mean of 32.26 (SD = 2.35) to a mean of 42.43 (SD = 1.73) (95% CI: -11.402; -8.945, $p < 0.001$).⁴

Similarly study conducted among nursing students found statistical significant improvement after participation in the simulation program in the intervention group with higher learning outcomes in communication skills $t=-32.64$, $p=0.001$, self - efficacy $t=-19.9$, $p=0.001$ and clinical competencies $t=16.4$; $p=0.001$.⁹

Regarding, comparison on initial steps on Helping Baby Breathe skills practices before and after Interventions. Before Intervention, skills practice ranged from 57.5% to 97.5% whereas after intervention the result ranged from 72.5% to 100%. Regarding, steps performed on preparation for birth (57.5%), keep baby warm (67.5%), keep slight extent of baby' head (77.5%), suction if needed (75%) before intervention which significantly increased after intervention.

Another study found among 105 participants showed that training had improved the pass rate from 74% to 99% ($p < 0.001$). Only 5% could ventilate a newborn mannequin correctly before initial training but 97% passed the post-initial ventilation training test ($p < 0.0001$) and 99% passed the OSCE B resuscitation evaluation.⁶

Similar study found that among 39 participants, as the effect of training the percentages of correct answers on a written test significantly increased from 82% to 99% after training. Cent

percentage of the trainees achieved passing scores and the trainees who participated in HBB training had significant improve their knowledge and skills.¹¹

Likewise, another quasi-experimental study conducted among 105 nursing students with two group the control and intervention group in which the intervention group participated in a simulation-based mastery learning intervention, and the control group received no intervention except for traditional training showed no significant differences between the two group before the intervention ($p > 0.05$). In addition, students' performance in the intervention and control groups improved significantly at the post-test compared with the baseline ($p < 0.05$).¹² Another study conducted among community midwives also consistent to this study findings with significant higher score on post - test score for performing HBB skills.¹³ The limitation of the study includes HBB skills score was observed at simulation lab only not in clinical settings.

CONCLUSIONS

Increased post- test scores on performing Helping Babies Breathe (HBB) skills than pre-test score on all aspects of skills scores inferences that skills practice on HBB has positive impact on increasing skills competencies among nursing students and also enhancing their perceived self-efficacy for performing HBB. The study finding recommends skills practice on Helping Babies Breathe (HBB) is recommended to promote among nursing students in simulation labs in their pre-service course. Also, collaborative research with maternity team members for simulation education is recommended to promote in future days.

ACKNOWLEDGEMENTS

Research Management Cell of Maharajgunj Nursing Campus for providing financial support to conduct Departmental Research of Women

Health and Development (WHD) and to all the students of BSc third year for their participation.

SOURCE OF FINANCIAL SUPPORT : None

CONFLICT OF INTEREST: None

REFERENCES

1. Mothiba TM, MCur Mbombi, B Nurs MCur. The emergence of clinical skills laboratory and its impact on clinical learning: Undergraduate nursing students' perspective in Limpopo Province, South Africa. Department of Nursing Science, Faculty of Health Sciences, University of Limpopo, Polokwane, South Africa. *Afr J Health Professions Educ* 2020;12 (4):197- 20 <https://doi.org/10.7196/AJHPE.2020.v12i4.1375>.
2. Valizadeh L, Amini A, Fathi-Azar E, Ghiasvandian S, Akbarzadeh B. The Effect of Simulation Teaching on Baccalaureate Nursing Students' Self-Confidence Related to Peripheral Venous Catheterization in Children: A Randomized Trial. *J Caring Sci* 2013 2, 157-164.
3. Gantt L.T. Using the Clark Simulation Evaluation Rubric with Associate Degree and Baccalaureate Nursing Students. *Nurs Educ Perspect*. 2010. 31, 101-105.
4. Ding et al. Evaluation of Neonatal Resuscitation Training program for health professionals in Zanibar, Tanzania. A pre-post Intervention study. *Frontiers in Pediatric*. 2021. 4 (3): 2-12. Doi: 10.3389/ paed.2021.693585.
5. Cordeau M.A. Linking the Transition. A Substantive Theory of High-Stakes Clinical Simulation. *ANS Adv Nurs Sci*, 2012, 35 (3): E90-E102
6. Bang et al. Helping Babies Breathe (HBB) training: What happens to knowledge and skills over time? *BMC* . 2016.16: 364. doi: 10.1186/s12884-016-1141- 3
7. American Academy of Pediatrics. Guide for Implementation of Helping Babies Breathe strengthening neonatal resuscitation in sustainable programs of essential newborn care. 2011. Elk Grove Village, IL: <https://www.healthynewbornnetwork.org/partner/helping-babies-breathe/>
8. Government of Nepal. Ministry of Health and Population. National Health Training Center. Training Guide on Helping Babies Breathe & Helping Mothers Survive, Trainers Guide.
9. Mohamed SA , Fashafsheh IH. The Effect of Simulation-Based Training on Nursing Students' Communication Skill, Self-Efficacy and Clinical Competence for Nursing Practice. *Open Journal of Nursing*. 2019. 9, 855-869. Doi:104236/ojn 201998064
10. Kelly, S.H. Evaluation Methods Used In Simulation: A Survey of Faculty and Student Perceptions in an Undergraduate Nursing Program. 2014, University of Pittsburgh, Pittsburgh, PA.
11. Maharjan U, L Rajbanshi , G Dhungana. Effectiveness of Helping Babies Breathe Training On Knowledge for Health Professionals And Medical Students At Chitwan Medical College. *Journal of Chitwan Medical College*. 2014; 4(8): 17-19
12. Madaripur R. Simulation -based mastery improves nursing skills in Bsc nursing students. A quasi-experimental study. *Biomed Medical Central Nursing*. 2021; 20 (10): 2-7. doi.org?10.1186/s12912020-00532-9
13. Mubeen Metal. Helping babies breathe: assessing the effectiveness of simulation-based high frequency recurring training in a community based setting of Pakistan. *Biomed Central pediatric*. 2021. 21.555. doi.Org/10.1186 2857/-021-030142.