

A Study to Assess the Effectiveness of I COUGH Protocol on Reduction of Postoperative Pulmonary Complications Among Patients Undergoing Surgery with General Anesthesia in a Tertiary Care Centre at Puducherry

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ABSTRACT

Background: Postoperative pulmonary complications are broadly defined as conditions affecting the respiratory track that can adversely influence clinical course of the patient after surgery. Risk reduction strategies, performing short duration and/or minimally invasive surgery and use of anesthetic technique of combined regional with general anesthesia. Postoperative complications can be reduced by using I COUGH protocol, which includes Intensive spirometry, Coughing with deep breathing, Oral care, Understanding of postoperative pulmonary complications, Getting out of bed and Head- of- bed elevation to get better changes in their health.

Aim: The main aim of the study is to evaluate the effectiveness of I COUGH protocol on reducing post-operative pulmonary complications among patients undergoing surgeries with general anesthesia among study group.

Methodology: A quantitative approach with quasi experimental pretest and posttest design was adopted for the study. Pilot study was conducted for a week to assess the feasibility of the study. A total of 4 samples were selected by using Non-probability purposive sampling technique. The main study was conducted in a tertiary care centre at Puducherry among patients undergoing surgeries with general anesthesia, 20 subjects in study group and 20 subjects in control group. Pretest with the demographic variables, clinical variables and modified ARISCAT scale was used to collect the data. The I COUGH Protocol was given for 30 minutes each day to reduce the postoperative pulmonary complications among patient undergoing surgery with general anesthesia. Posttest was done to the group on the 7th day with the same scale. The collected data were analyzed using descriptive and inferential statistics.

Results: In present study, the results indicates that in the post test the calculated student independent “t” test value of $t=4.575$ at $p<0.05$ level. This clearly infers that there was significant difference in the level of pulmonary complications among the patients undergoing surgery between the groups in which the patients in the study group experience more reduction in the level of post-operative pulmonary complications than the patients in the control group who had undergone normal hospital routines.

Conclusion: The result of this study concluded that I COUGH protocol helps in reduction of post-operative pulmonary complications among patients undergoing surgeries with general anesthesia.

Keywords: Postoperative pulmonary complications, I COUGH Protocol, Surgery patients, general anesthesia.

How to cite this article: Subathra S, Chandralekha K, Rajeswari R, Malliga M. A study to assess the effectiveness of I COUGH protocol on reduction of postoperative pulmonary complications among patients undergoing surgery with general anesthesia in a tertiary care centre at Puducherry. Int J Drug Deliv Technol. 2026;16(73s): 1556-1572. DOI: 10.25258/ijddt.16.73s.165

INTRODUCTION

Postoperative pulmonary complications are a major determinant of outcome for patients and consume huge resources within hospital, particularly in critical care unit. Most of the postoperative complication encompasses

almost many complication affect the respiratory system after anesthesia and surgery. These complications are defined heterogeneously, occur commonly, have major adverse effects on patients, and are difficult to predict.⁽¹⁾

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General anesthesia is a state of controlled unconsciousness. Anesthesia hampers the normal breathing and stifles urge to cough. After chest or abdominal surgery, it could hurt to breathe in deeply or push air out. Mucus may build up in the lungs. Postoperative pulmonary complications are relatively common.⁽²⁾

Postoperative complications can be reduced by using I COUGH protocol, which includes Intensive spirometry, Coughing with deep breathing, Oral care, Understanding of postoperative pulmonary complications, Getting out of bed and Head- of- bed elevation to get better changes in their health⁽³⁾.

According to WHO (2022), in united states 4 million death every year results from postoperative pulmonary complications. This represents 41.85% deaths among this 23.32% are male and 18.53% are female. Overall 5.72% of global burden due to pulmonary complications.⁽⁴⁾

In China, 39.3% of the population under study had pulmonary problems, with a significant gender disparity in prevalence, according to the Union Health Ministry (2020). In particular, pulmonary problems affected 10.3% of females and 29.0% of males. The results indicate that among the 80 participants in the study, men may be more vulnerable to postoperative pulmonary problems than women.⁽⁵⁾

The National Institute of Health (NIH) Tamil Nadu (2020) revealed that among the sample of 120 people in the Madurai district, the prevalence of pulmonary problems was 22.1%. The incidence was higher in women (12.2%) than in men (9.9%). The frequency of pulmonary problems increased considerably with age, male sex, low BMI, and illiteracy.⁽⁶⁾

According to National Institute of Health (NIH) Puducherry (2020), prevalence was reported about pulmonary complications in the study population was notably high, with 72.4% of patients experiencing such issues. The data revealed a significant discrepancy between genders, with a prevalence of 62.2% among males compared to only 12.2% among females. The study, which included 146 individuals, underscores the heightened vulnerability of males to postoperative pulmonary complications compared to females.⁽⁷⁾

OBJECTIVES

- To assess the postoperative pulmonary complications among patients undergoing surgery with general anesthesia.

- To evaluate the effectiveness of I COUGH protocol on reducing postoperative pulmonary complications among patients undergoing surgery with general anesthesia among the study group.
- To associate the pretest level of pulmonary complications among patients undergoing surgery with general anesthesia with the selected demographic variables among the study and control group.
- To associate the pretest level of pulmonary complications among the patients undergoing surgery with general anesthesia with the selected clinical variables among the study and control group.

HYPOTHESES

H1: There is a significant difference in the pretest and posttest level of post-operative pulmonary complications among patient undergoing surgery with general anesthesia with the administration of I COUGH Protocol among the study and control group.

H2: There is a significant association between the pretest level of pulmonary complications among patient undergoing surgery with general anesthesia with the selected demographic variables among the study and control group.

H3: There is a significant association between the pretest level of pulmonary complications among patient undergoing surgery with general anesthesia with the selected clinical variables among the study and control group.

MATERIALS AND METHODS

Study Design: A Quasi- experimental pretest and posttest design was adopted for this study.

Study Population: The population of the study was patient undergoing surgery with general anesthesia who was admitted in a tertiary care centre at Puducherry.

Sample Size: Total sample size was 40. In that 20 sample for the study group and 20 sample for the control group.

Sampling Technique: Non- Probability purposive sampling technique was adopted for this study.

Sampling Criteria: Patients who are undergoing surgery with general anesthesia, patients with the age group of 19-59 years, patients who are available at the time of data collection and patients who are able to read and write tamil and /or English were included in the

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study. Patients who are with the chronic illness, patients who are critically ill with artificial ventilation support, patients who are not willing to participate in this study and patients who are already instructed to follow any other alternatives therapies before surgery were excluded from the study.

Data Collection: The data collection was started after obtaining permission from the Institutional Review Committee (IRC NO: ICON IRC-2022-2023-004). The data was collected over a period of four weeks from 17.06.2024 to 31.07.2024 in a tertiary care centre at Puducherry. Total sample size was 40, selected by using purposive sampling technique. In that, 20 sample for the study group and 20 sample for the control group. The investigator introduced herself and obtained written consent from the study participants. A pretest was conducted with demographic variables, clinical variables and modified ARISCAT scale. The researcher provided I COUGH Protocol on the 1st day of intervention. I COUGH Protocol was administered by providing Incentive Spirometry which was provided for 5 minutes. Additionally, the patient was asked to do coughing with deep breathing for 5 minutes. The patient was also advised for mouth wash for 5 minutes and the information regarding postoperative pulmonary complications was given to the patient for 5 minutes. And the patient was made to get out of bed and walk a hallway three times a day for 5 minutes and head of bed was elevated between 30-45 degree for 5 minutes. The post test was conducted after 7th day of intervention by using the same scale.

RESULTS

Table 1: Frequency and percentage distribution of demographic variables of patients undergoing surgery with general anesthesia among study and control group. N = 40

S E R I A L N O	D E M O G R A P H I C V A R I A	STUDY GROUP		CONTRO L GROUP	
		F R E Q U E N C Y (n)	P E R C E N T A G E (%)	F R E Q U E N C Y (n)	P E R C E N T A G E (%)

	B L E S		)		)
1	Age in years				
	1 9 - 2 9 y ea rs	3	1 5 . 0	4	2 0 . 0
	3 0 - 3 9 y ea rs	3	1 5 . 0	2	1 0 . 0
	4 0 - 4 9 y ea rs	8	4 0 . 0	9	4 5 . 0
	5 0 - 5 9 y ea rs	6	3 0 . 0	5	2 5 . 0
2	Gender				
	M a l e	1 4	7 0 . 0	1 4	7 0 . 0
	F e m a l e	6	3 0 . 0	6	3 0 . 0
3	Religion				
	H i n d u	1 7	8 5 . 0	1 8	9 0 . 0
	C h r i s t i a n	3	1 5 . 0	2	1 0 . 0
	M u s	-	-	-	-

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	lim				
	O th er s	-	-	-	-
4	Educational status				
	Pr i m ar y e d u c a t i o n	2	1 0 . 0	2	1 0 . 0
	S e c o n d ar y e d u c a t i o n	1 1	5 5 . 0	8	4 0 . 0
	U n d er gr a d u a t e/ P o s t gr a d u a t e	3	1 5 . 0	5	2 5 . 0
	N o n- fo r m al e d	4	2 0 . 0	5	2 5 . 0

	u c a t i o n				
5	Marital status				
	M ar r i e d	1 5	7 5 . 0	1 7	8 5 . 0
	U n m ar r i e d	5	2 5 . 0	3	1 5 . 0
	D i v o r c e	-	-	-	-
	W i d o w / S e p a r a t e d	-	-	-	-
6	Employment status				
	S e l f- e m p l o y e e	-	-	-	-
	Pr i v a t e e m p l o y e e	1 5	7 5 . 0	1 3	6 5 . 0
	G o v e r n m	-	-	-	-

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ent em plo y ee				
Un em plo y m ent	5	2 5 0	7	3 5 0
7	Income per month			
R s. B el ow 1 5, 0 0 0	5	2 5 0	5	2 5 0
R s. 1 5, 0 0 1 - 2 5, 0 0 0	3	1 5 0	2	1 0 0
R s. 2 5, 0 0 1 - 3 5, 0 0 0	1 2	6 0 0	1 3	6 5 0
R s. A bo	-	-	-	-

v e 3 5, 0 0 1				
8	Source of information			
S o ci al m e di a	6	3 0 0	5	2 5 0
P u bl ic h ea lt h w or k er s	1 4	7 0 0	1 5	7 5 0
S · N o	STUDY GROUP		CONTRO L GROUP	
	F R E Q U E N C Y (n)	P E R C E N T A G E (%)	F R E Q U E N C Y (n)	P E R C E N T A G E (%)
Fr ie n ds a n d re la ti v es	-	-	-	-

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	Others	-	-	-	-
9	Habits				
	Smoking	7	35.0	6	30.0
	Alcoholism	8	40.0	1	5.0
	Both A & B	5	25.0	4	20.0
	None of the above	-	-	-	-
10	Occupational status				
	Health care worker	2	10.0	2	10.0
	Agriculture worker	1	5.0	8	40.0
	Industrial	4	20.0	6	30.0

trial worker		0		0
Any other	3	15.0	4	20.0

The above table shows the frequency and percentage distribution of demographic variables among study group of patients undergoing surgery with general anesthesia, 8(40%) were belongs to the age group between 40 – 49 years, 14(70%) were male, 17(85%) samples were Hindus, 11(55%) had secondary education, 15(75%) were married, 15(75%) were under private employment. Regarding family income 12(60%) were earning between Rs.25,001 – 35,000 per month, 14(70%) received information through public health workers, 8(40%) samples had the habit of alcoholism and 11(55%) were agriculture workers.

In control group, 9(45%) were belongs to the age group between 40 – 49 years, 14(70%) were male, 18(90%) samples were Hindus, 8(40%) had secondary education, 17(85%) were married, 13(65%) were under private employment. Regarding family income 13(65%) were earning between Rs.25,001 – 35,000 per month, 15(75%) received information through public health workers, 10(50%) samples had the habit of alcoholism and 8(40%) were agriculture workers.

Table 2: Frequency and percentage distribution of clinical variables of patients undergoing surgery with general anesthesia among study and control group. N=40

S. No	CLINICAL VARIABLE	STUDY GROUP		CONTROL GROUP	
		FREQUENCY (n)	PERCENTAGE (%)	FREQUENCY (n)	PERCENTAGE (%)

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	E				
	S				
1	Postoperative day of the patient				
	1	2	1	2	1
	-	0	0	0	0
	5		0		0
	d		0		0
	a				
	y				
	s				
	6	-	-	-	-
	-				
	1				
	1				
	-				
	1				
	5				
	d				
	a				
	y				
	s				
2	Site of surgical incision				
	P	2	1	4	2
	e		0		0
	r		0		0
	i				
	p				
	h				
	e				
	r				
	a				
	l				
	U	1	5	8	4
	p	0	0		0
	p		0		0
	e				
	r				
	a				
	b				
	d				
	o				
	m				
	i				

n				
a				
l				
I	3	1	2	1
n		5		0
t		0		0
r				
a				
-				
t				
h				
o				
r				
a				
c				
i				
c				
O	5	2	6	3
t		5		0
h		0		0
e				
r				
s				
3	Duration of surgery (in hours)			
	<	9	4	8
			5	
	2		0	0
	>	6	3	7
	2		0	5
			0	0
	2	3	1	3
			5	1
	3		0	5
	>	2	1	2
	3		0	0
			0	0
4	Emergency procedure			
	Y	4	2	3
	e		0	
	s		0	
			0	
	N	1	8	1
	o	6	0	7
			0	5
			0	0
5	History of previous surgery			
	Y	5	2	6
	e		5	
	s		0	
			0	
	N	1	7	1
	o	5	5	4
			0	7
			0	0

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6	Is there any changes in the sleep duration of the patient				
	Yes	13	65	11	55
	No	7	35	9	45
7	BMI of the patient				
	< 18.5	2	10	3	15
	18.5 – 24.9	12	60	13	65
	≥ 25	4	20	2	10
	≥ 30	2	10	2	10

The above table shows the frequency and percentage distribution of clinical variables among study group of patients undergoing surgery with general anesthesia, all 20(100%) were in the post-operative day 1-5, 10(50%) had underwent upper abdominal surgical incision, 9 (45%) were done surgery for less than 2 hours, 16(80%)were done no emergency procedure, 15(75%) samples had no previous surgical history, 13(65%) sample had experienced disturbed sleep duration and 12(60%) had BMI between the range of 18.5 – 24.9.

In control group, all 20(100%) were in the post-operative day 1-5, 8(40%) had underwent upper abdominal surgical incision, 8(40%) were done surgery for less than 2 hours, 17(75%) were done no emergency procedure, 14(70%) samples had no previous surgical history, 11(55%) sample had experienced

disturbed sleep duration and 13(65%) had BMI between the range of 18.5 – 24.

Table 3: Frequency and percentage distribution of pretest level of pulmonary complications of patients undergoing surgery with general anesthesia in the study and control group. N =40

LEVEL OF PULMONARY COMPLICATIONS	STUDY GROUP		CONTROL GROUP		CHI SQUARE TEST & P-VALUE
	FREQUENCY (n)	PERCENTAGE (%)	FREQUENCY (n)	PERCENTAGE (%)	
Low risk	-	-	-	-	$\chi^2 = 0$
Moderate risk	13	65	11	55	$P = 0$
High risk	7	35	9	45	$P = 0.7975$
					NS

NS – Not Significant

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The above table shows that frequency and percentage distribution of pretest level of pulmonary complications of patients undergoing surgery with general anesthesia in the study and control group. In the study group, the pretest level of pulmonary complications 13(65%) had moderate risk and 7(35%) had high risk. Similarly, In the control group, the pretest level 11(55%) had moderate risk and 9(45%) had low and high risk.

Table 4: Frequency and percentage distribution of posttest level of pulmonary complications of patients undergoing surgery with general anesthesia in the study and control group. N =40

L E V E L O F P U L M O N A R Y C O M P L I C A T I O N S	STUDY GROUP		CONTR OL GROUP		C H I - S Q U A R E T E S T & P - V A L U E
	F R E Q U E N C Y (n)	P E R C E N T A G E (%)	F R E Q U E N C Y (n)	P E R C E N T A G E (%)	
Low risk	14	70	2	10	c 2 = 13 . 3 1 2 P = 0 . 0 0 1
Moderate risk	6	30	13	65	
High risk	-	-	5	25	

sk					2 S *
----	--	--	--	--	-------------

*p<0.05, S – Significant

The above table shows that the frequency and percentage distribution of post-test level of pulmonary complications of patients undergoing surgery with general anesthesia in the study and control group.

In the study group, the posttest level of pulmonary complications 14(70%) had low risk and 6(30%) had moderate risk. In the control group, the posttest level 13(65%) had moderate risk and 5(25%) had high risk and 2(10%) had low risk.

Table 5: Effectiveness of I COUGH protocol on reduction of post operative pulmonary complications among patients undergoing surgery with general anesthesia in the study group and comparison in control group. N = 40

POST OPE RATI VE PUL MON ARY COM PLIC ATIO NS	PRE TEST		POST TEST		P A I R E D “ t ” & P - V A L U E
	M E A N	S D	M E A N	S D	
STUD Y GRO UP	14 . 95	2 . 68	8 . 65	2 . 78	t = 7 . 499 p = 0 . 0001 , S

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CONTROL GROUP	15.6 1	21.1 1	13.2 2	34.7 7	t=3.237 p=0.001, S**

***p<0.001, S – Significant

The above table shows that in the study group, the pretest mean score of pulmonary complications was 14.95±2.68 and the post-test mean score was 8.65±2.78. The calculated paired “t” test value of t=7.499 was statistically high significant at p<0.001 level. This clearly infers that I COUGH Protocol was found to be effective in reducing the level of post-operative pulmonary complications among patients undergoing surgery in the post test.

Similarly, in the control group, the pretest mean score of pulmonary complications was 15.60±2.11 and the post-test mean score was 13.20±3.47. The calculated paired “t” test value of t=3.237 was statistically significant at p<0.001 level. This clearly infers that there was significant reduction in the level of post-operative pulmonary complications among the patients undergoing surgery who had undergone normal hospital routines. Hence the Hypothesis H1 was accepted.

Table 6: Comparison of pretest and posttest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia between the study group and comparison in control group. N = 40

POST OPERATIVE PULMONARY	STUDY GROUP		CONTROL GROUP		STUDENT INDEPENDENT
	MEAN	SD	MEAN	SD	TEST VALUE
	15.6	2.11	13.2	3.47	t=3.237, p=0.001, S**

PULMONARY COMPLICATIONS	STUDY GROUP	CONTROL GROUP	MEAN	SD	STUDENT INDEPENDENT “t” TEST & P-VALUE
PRETEST	16.25	21.2	16.9	1.41	t=0.8509, p=0.4002, NS
POSTTEST	8.65	27.8	13.2	3.47	t=4.575, p=0.001, S**

*p<0.05, S – Significant

The above table shows that in the pretest the calculated student independent “t” test value of t=0.8509 was not statistically significant at p<0.05 level. This clearly infers that there was no significant difference in the level of pulmonary complications among the patients undergoing surgery with general anesthesia between the study and control groups.

In the post test the calculated student independent “t” test value of t=4.575 was statistically significant at p<0.05 level. This clearly infers that there was significant difference in the level of pulmonary complications among the patients undergoing surgery between the groups in which the patients in the study group experience more reduction in the level of post-operative pulmonary complications than the patients in the control group who had undergone normal hospital routines. Hence the Hypothesis H1 was accepted.

Table 7: Association of pretest level of post operative pulmonary complications among patients undergoing surgery with selected demographic variables in the study and control group. N = 40

SEX	DEMOGRAPHIC	LOW	Moderate	HIGH	CHI-SQUARE

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	A P P H I C V A R I A B L E S	N		E n %		n %		A R E T E S T & P - V A L U E
1	Age in years							
	19 – 29 ye ars	2	5 .0	4	1 0 .0	0	0	c 2 = 1 5
	30 – 39 ye ars	4	1 0 .0	2	5 .0	0	0	. 9 3 2
	40 – 49 ye ars	1	2 .5	1 0	2 5 .0	5	1 2 .5	p = 0 .0 1 4 S *
	50 – 59 ye ars	1	2 .5	1 0	2 5 .0	1	2 .5	
2	Gender							c 2 = 1 .4 6 2 p = 0 .4 8 1 N S
	Male	7	1 7 .5	1 7	4 2 .5	4	1 0 .0	
	Female	1	2 .5	9 2 .5	2 2 .5	2	5 .0	
3	Religion							c 2
	Hindu	8	2 0	2 0	5 0	6	1 5	

	u		0		0		0	= 3
	Ch ris tia n	-	-	-	-	-	-	. 8 0 1
	M usl im	0	0	6	1 5 .0	0	0	p = 0
	Ot he rs	-	-	-	-	-	-	. 1 5 0 N S
4	Educational status							
	Pri m ar y ed uc ati on	0	0	4	1 0 .0	0	0	c 2 = 7 .7 8
	Se co nd ar y ed uc ati on	1	2 .5	3	7 .5	2	5 .0	p = 0 .0 2 1 S *
	U nd er gr ad ua te / Po st gr ad ua te	5	1 2 .5	1 3	3 2 .5	4	1 0 .0	
	N on - for mal ed uc ati on	2	5 .0	6	1 5 .0	0	0	
5	Marital status							
	M	5	1	2	5	5	1	c

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	arr ie d		2 . 5	0 0	0 . 0	2 . 5	2 . 0
	U n m arr ie d	3	7 . 5	6	1 5 . 0	1 . 5	2 . 5
	Di vo rc e	-	-	-	-	-	-
	W id o w / Se pa rat ed	-	-	-	-	-	-
6	Employment status						
	Se lf- e m pl oy ee	-	-	-	-	-	-
	Pri va te e m pl oy ee	5	1 2 . 5	2 0	5 0 . 0	5 . 5	1 2 . 5
	G ov er n m en t e m pl oy ee	-	-	-	-	-	-
	U ne m pl oy m en t	3	7 . 5	6	1 5 . 0	1 . 5	2 . 5
7	In co m						

	e pe r m on th						
	Rs . Be lo w 15 ,0 00	3	7 . 5	6	1 5 . 0	1 . 5	2 . 5
S . N o	D E M O G R A P H I C V A R I A B L E S	L O W		M O D E R A T E		H I G H	
		N	%	n	%	n	%
	Rs . 15 ,0 01 - 25 ,0 00	-	-	-	-	-	-
	Rs . 25 ,0 01 - 35 ,0 00	5	1 2 . 5	2 0	5 0 . 0	5 . 5	1 2 . 5
	Rs . A bo ve	-	-	-	-	-	-

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	35 .0 01							
8	Source of information							c² = 1.355
	Social media	2	5 .0	7	1 7 .5	3	7 .5	p = 0.508
	Public health workers	6	1 5 .0	1 9	4 7 .5	3	7 .5	0.875
	Friends and relatives	-	-	-	-	-	-	N
	Others	-	-	-	-	-	-	S
9	Habits							c² = 2.639
	Smoking	3	7 .5	1 0	2 5 .0	1	2 .5	p = 0.623
	Alcoholism	4	7 .5	1 1	2 7 .5	2	5 .0	0.900
	Both A & B	2	5 .0	5	1 2 .5	3	7 .5	0.620
	None	-	-	-	-	-	-	N

	of the above							
10	Occupational status							c² = 9.508
	Health care worker	1	2 .5	3	7 .5	0	0	p = 0.147
	Agriculture worker	5	1 2 .5	1 1	2 7 .5	6	1 5 .0	0.875
	Industrial worker	0	0	8	2 0 .0	0	0	N
	Any other	2	5 .0	4	1 0 .0	0	0	S

N.S – Not Significant, p>0.05

The above table shows the demographic variables, age and educational status (c²=15.932 P=0.014), (c²=7.78, P=0.021) respectively has shown statistically significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia in the study and control group at p<0.05 level. The other demographic variable has shown statistically not significant association with pretest level of post-operative pulmonary complications among patients

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undergoing surgery with general anesthesia in the study and control group.

Hence, Hypotheses H2 was accepted. There was significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia with selected demographic variables. Thus, administration of I COUGH protocol was effective in reduction in post-operative pulmonary complication among patient undergoing surgery with general anesthesia.

Table 8: Association of pretest level of post operative pulmonary complications among patients undergoing surgery with general anesthesia with the selected clinical variables in the study and control group. N = 40

S · N O	C L I N I C A L V A R I A B L E S	L O W		M O D E R A T E		H I G H		C H I - S Q U A R E T E S T & P - V A L U E
		n	%	n	%	n	%	
1	Postoperative day of the patient							
	1-5 days	8	20	2	6	6	15	-
	6-10 days	-	-	-	-	-	-	-
	11 days	-	-	-	-	-	-	-

	1-15 days							
	>15 days	-	-	-	-	-	-	
2	Site of surgical incision							
	Peri- pheral	2	50	3	75	1	25	$\chi^2 = 1.375$ $p = 0.967$ NS
	Upper abdominal	9	22.5	7	17.5	2	50	
	Intra- thoracic	2	50	2	50	1	25	
	Others	6	150	3	75	2	50	

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3	Duration of surgery (in hours)							c ₂ = 0 . 6 6 7 p = 0 . 9 9 5 N S
	< 2	7	1	6	1	4	1	
		7	5		5	0	0	
	> 2	5	1	4	1	4	1	
			2		0		0	
4	Emergency procedure							c ₂ = 0 . 9 5 8 p = 0 . 6 1 9 N S
	Yes	4	1	2	5	1	2	
			0		0		5	
	No	1	3	1	4	4	1	
		3	2	6	0		0	
5	History of previous surgery							c ₂ = 0 . 4 3 7 p = 0 . 8 0 3 N S
	Yes	8	2	2	5	1	2	
			0		0		5	
	No	1	4	6	1	5	1	
		9	7		5		2	
6	Is there any changes in the sleep pattern of the patient							c ₂ = 2 . 8
	Yes	1	3	5	1	4	1	
		5	7		2		0	
			5		5		0	

No	9	2	5	1	2	5	1
		2		2		0	6
		.5		.5			p
							=
							0
							.2
							4
							5
							N
							S
7	B M I l e v e l o f t h e p a t i e n t ?						c ₂
							=
							7
							.6
							4
	< 18.5						p
							=
							0
							.2
							6
	18.5 - 24.9						5
							N
							S
	25 - 29.9						
	≥ 30						

N.S – Not Significant, p>0.05

The above table shows that, the pretest level of post-operative pulmonary complications among patients undergoing surgery with their selected

clinical variables. It was observed that the clinical variables did not show statistically significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery at $p < 0.05$ level.

DISCUSSION

The first objective of the study was to assess the postoperative pulmonary complications among patients undergoing surgery with general anesthesia.

In present study result indicates that the, frequency and percentage distribution of pretest level of pulmonary complications of patients undergoing surgery with general anesthesia in the study and control group. In the study group, the pretest level of pulmonary complications 13(65%) had moderate risk, and 7(35%) had high risk and in the posttest 14(70%) had low risk and 6(30%) had moderate risk

Similarly, in the control group, the pretest level 11(55%) had moderate risk and 9(45%) had low and high risk and in the posttest level 13(65%) had moderate risk and 5(25%) had high risk and 2(10%) had low risk.

An observational study was carried out by Smith et al. (2020)⁽⁸⁾ to evaluate the postoperative pulmonary problems among New York postoperative patients. There were 500 participants in the sample. Spirometry was utilized to obtain data, and a random sample strategy was employed. Descriptive and inferential statistics were used to calculate the statistical analysis. The findings showed that 8% had a high risk and 22% had a moderate risk of pulmonary problems following surgery ($p = 0.05$). According to the study's findings, pulmonary problems are significantly more common in postoperative patients, indicating the need for better monitoring and intervention techniques.

The study's second goal was to assess how well the I COUGH protocol reduced postoperative pulmonary problems in individuals having general anesthesia.

In the present study, the results indicates that in the pretest the calculated student independent "t" test value of $t = 0.8509$ was not statistically significant at $p < 0.05$ level. This clearly infers that there was no significant difference in the level of pulmonary complications among the patients undergoing surgery with general anesthesia between the study and control groups.

In the post test the calculated student independent "t" test value of $t = 4.575$ was statistically significant at $p < 0.05$ level. This clearly infers that there was significant difference in the level of pulmonary complications among the patients undergoing surgery between the groups in which the patients in the study group experience more reduction in the level of post-operative pulmonary complications than the patients in the control group who had undergone normal hospital routines. Hence the Hypothesis H1 was accepted.

Johnson et al. (2019)⁽⁹⁾ assessed the effect of the I COUGH Protocol on postoperative lung health in London in a related study. Convenience sampling was used to choose samples from the 250 patients in the study. The data was evaluated using lung function tests. The findings showed a 20% decrease in the frequency of pulmonary problems following surgery. $t = 56.5$ was the pretest value, while $t = 25.6$ was the posttest result. According to the study's findings, following the I COUGH program greatly enhances lung health following surgery. Thus, Hypothesis H1 was approved.

The third objective of the study was to associate the pretest level of pulmonary complications among patients undergoing surgery with general anesthesia with the selected demographic variables.

In the current study, the result shows that the demographic variables, age and educational status ($c^2 = 8.55$, $P = 0.014$), ($c^2 = 7.78$, $P = 0.021$) respectively has shown statistically significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia in the study and control group at $p < 0.05$ level. The other demographic variable has shown statistically not significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia in the study and control group.

Hence, Hypotheses H2 was accepted. There was significant association with pretest level of post-operative pulmonary complications among patients undergoing surgery with general anesthesia with selected demographic variables. Thus, administration of I COUGH protocol was effective in reduction in post-operative pulmonary complication among patient undergoing surgery with general anesthesia.

A retrospective investigation on risk factors for postoperative pulmonary problems in elderly patients following video-assisted thoracoscopic surgery lobectomy under general anesthesia was carried out by Feng et al. (2024)⁽¹⁰⁾. Convenience sampling procedures were used to choose a sample of 322 patients, of whom 115 patients (35.7%) experienced postoperative pulmonary complications. Multivariate logistic regression was used to gather and analyze the demographic data in order to predict the risk variables for pulmonary complications following surgery. The results indicated a correlation between the patients' age, gender, and BMI ($p=0.001$).

The fourth objective of the study was to associate the pretest level of pulmonary complications among patients undergoing surgery with general anesthesia with the selected clinical variables.

The pretest level of postoperative pulmonary problems in patients undergoing general anesthetic surgery with the chosen clinical factors was examined in this study. Among patients undergoing surgery under general anesthesia, it was found that there was no statistically significant correlation between the clinical factors and the pretest level of postoperative pulmonary problems at the $p<0.05$ level.

Kumar et al. (2023)⁽¹¹⁾ carried out a retrospective review on the variables linked to immediate postoperative pulmonary problems following appendectomies performed under general anesthesia. Descriptive statistics were used to summarize demographic, clinical, surgical, and post-surgical outcomes. Result shows that there was a significant positive association with diabetes mellitus, bronchial asthma, number of intubation attempts, laparoscopic approach, and longer surgery patients at ($p=0.005$).

CONCLUSION

The study reveals that there was a significant reduction in the post-test level of study group, when compared to the control group. Hence it is concluded that I COUGH Protocol administered among the patients undergoing surgery was found to be effective in reduction the level of post-operative pulmonary complications among patients undergoing surgery in the post test.

IMPLICATIONS

The findings of the study have practical application in the field of nursing. The

implications of the study could be discussed in four areas namely: Nursing Practice, Nursing administration, Nursing education and Nursing research.

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