Original Article

Effect of Combination of Different Postures and Pursed Lips Breathing on Dyspnea and Pulmonary Functions among Patients with Asthma

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ABSTRACT

Objective: To evaluate the effect of tripod and prostration positions with pursed-lip breathing on dyspnea and pulmonary function in adult asthma patients.

Study Design: Quasi-experimental study

Place and Duration of Study: This study was conducted at the emergency units of Imam Hussein Medical City in Karbala, Iraq 1st December 2024 to 30th September 2025.

Methods: In this study 90 adult asthma patients were enrolled. The patients were divided into control, tripod, and prostrate groups (n=30 for each group).

Results: The significant improvements in the intervention groups: tripod positioning reduced respiratory rate by 45.4% ($p<.001$, $d=2.23$) and increased SpO_2 by 3.8% ($p<.001$, $d=1.46$), while prostrate positioning showed moderate effects (respiratory rate $d=0.67$, peripheral oxygen saturation $d=0.86$). Dyspnea severity decreased markedly, with tripod positioning doubling mild dyspnea cases (16.7% to 40%) and halving severe cases (43.3% to 20%).

Conclusion: The tripod positioning, when combined with pursed-lip breathing, offers superior clinical benefits for acute asthma management compared to prostrate positioning.

Key Words: Asthma, Prostration position, Tripod position, Pursed-lip breathing

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INTRODUCTION

Globally, nearly 300 million individuals had been identified as having asthmatic as of 2005 and 400 million people are predicted to have the illness by 2025. While asthma is more common in high-income nations, the majority of deaths from the condition happen in third-world, low-income nations.[1,2] Asthma is a heterogeneous disease, varying greatly among individuals in symptoms, severity, triggers, and responses to treatment. This variability complicates diagnosis and necessitates individualized management plans, as a one-size-fits-all approach is ineffective.[3] Asthma is classified into four categories, with intermittent asthma featuring symptoms occurring less than twice a week, nighttime symptoms occurring less than twice a month, and minimal interference with daily activities.[4] Adults with asthma were more likely than adults without asthma to report limits in daily activities, missed workdays, and decreased productivity. In order to manage their disease, people with asthma may need to take time off from work or school due to symptoms and exacerbations that interfere with everyday routines.[5]

Mild persistent asthma: Symptoms in this category occur more than twice a week but not every day, nighttime symptoms occur more than twice a month, and minor limitations in daily activities are present.[6] Moderate persistent asthma features daily symptoms and nighttime symptoms more than once a week with moderate activity limitations, while severe persistent asthma entails constant symptoms, frequent nighttime occurrences, and severe activity limitations.[4]

Body postures significantly influence lung volumes, making them clinically relevant in various activities, including surgery and therapy. Poor patient positioning can worsen V/Q matching, whereas optimal positions may lead to improved PaO_2 levels and are essential in managing pulmonary dysfunction by reducing shunt or dead space effects.[7] Non-pharmacological therapies for asthma, like positional changes to improve lung function, lack adequate evidence.[6-7] The purpose was to identify the more effective positions (prostrating vs.

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tripod) for alleviating dyspnea and enhancing respiratory parameters [respiratory rate (RR) and peripheral oxygen saturation (SPO_2)] in asthma patients.

METHODS

This quasi-experimental study was conducted at emergency units of Imam Hussein Medical City, Karbala, Iraq 1st December 2024 to 30th September 2025 vide letter 77 dated 24/3/2025. A total of 90 patients with asthma who selected purposively and divided into 3 groups (control, tripod, and prostrate), 30 patients in each groups were included. Data was collected from three groups before the interventional procedure and re-evaluated dyspnea level and pulmonary parameters for patients in the study groups (tripod or prostrate) after asked them to do the pursed lip breathing exercise 3 times in a row, then apply the (tripod or prostrate position) for 5 minutes, and then re-apply the pursed lip breathing exercise 3 times in a row. The hospitalized patients who were already diagnosed with asthma, both male and female sex, those who had dyspnea, and patients who are willing to participate in the study were included. The participants in the experimental study, patients who did not have shortness of breath, those who refused to participate, children under the age of 18, the elderly who could not tolerate prone positions, and individuals with various health conditions or fever were excluded. Pursed lip breathing is a basic technique that involves inhale slowly through the nose to the count of tow then utilizing mouth to exhale via pursed lips to the count of four (Fig. 1). The patient lies down so that his knees, forehead, and hands are close to the ground and the elbows are flexed and relaxed to bear the weight of the patient. The abdominal area remains unsupported so that the position of the patient is the same as the position of prostrate during prayer.

Tripod position also called orthopnic or leaning forward position, places the patient either sitting in chair or on the side of the bed, with many pillows resting on the over bed table in front for them to rely on (Fig. 2). The data was entered and analyzed through SPSS-25.

RESULTS

The mean age was 54.4±14.0 years. 46.7% of the patients in control & tripod group and 50% of them in prostrate group were age of 30-49 years. Males of the control, tripod and prostrate group were 53.3%, 53.3%, and 56.7% respectively. 36.7% of control group and 30% of prostrate group were educated, while 36.7% of tripod group had intermediate education. A 26.7% of patients in tripod group were factory workers and the same percent for cleaners and Janitors while 40% of control group were retired and 23.3% of prostrate group were factory workers. 43.4%, 36.7, and 40% of asthmatic patients in control, tripod, and prostrate groups, respectively, were previously smokers with p-values were significance (0.05). There are no statistically significant differences in demographic characteristics (age, sex, education, occupation, or smoking status) between the control, tripod, and prostrate groups (Table 1).

36.7%, 26.7%, and 30% of the patients in the control, tripod and prostrate group respectively had obesity class I.

Table No. 1: Demographical characteristics of the asthmatic patients

Variable		Control group		Tripod group		Prostrate group		P value
		No.	%	No.	%	No.	%	
Age (years)	30-49	14	46.7	14	46.7	15	50.0	.346
	50-69	11	36.7	15	50.0	12	40.0	
	≥ 70	5	16.6	1	3.3	3	10.0	
Educational status	Illiterate	-	-	-	-	-	-	.542
	Educated	11	36.7	4	13.3	9	30.0	
	Primary	6	20.0	8	26.7	8	26.7	
	Intermediate	9	30.0	11	36.7	8	26.7	
	Institute	2	6.7	4	13.3	2	6.7	
	Collage or more	2	6.7	3	10.0	3	10.0	
Occupation	Construction Workers	4	13.3	1	3.3	3	10.0	.976
	Factory Workers	4	13.3	8	26.7	7	23.3	
	Cleaners and Janitors	4	13.3	8	23.7	4	13.3	
	Agriculture Workers	3	10.0	3	10.0	3	10.0	
	Retired	12	40.0	6	20.0	7	23.3	
	Housewife	3	10.0	4	13.3	6	20.0	
Smoking status	Never	10	33.3	12	40.0	12	40.0	.624
	Previously	13	43.4	11	36.7	12	40.0	
	Currently	7	23.3	7	23.3	6	20.0	

Table No. 2: Distribution of the asthmatic patients according their clinical data

Clinical data		Control group		Tripod group		Prostrate group		P value
		No.	%	No.	%	No.	%	
Body mass index	Normal	5	16.7	6	20.0	8	26.7	.489
	Overweight	4	13.3	8	26.7	5	16.7	
	Obesity I	11	36.7	8	26.7	9	30.0	
	Obesity II	8	26.7	7	23.3	7	23.3	
	Obesity III	2	6.7	1	3.3	1	3.3	
Duration of suffering from asthma (years)	1-10	8	26.7	10	33.3	10	33.3	.744
	11-20	11	36.7	13	43.3	12	40.0	
	≤ 21	11	36.7	7	23.3	8	26.7	
Chronic medication use of asthma	Inhaled corticosteroids (ICS)	3	10.0	1	3.3	3	10.0	.746
	Long-acting beta-agonists (LABAs)	11	36.7	12	40.0	11	36.7	
	Short-acting beta-agonists (SABAs)	2	6.7	2	6.7	3	10.0	
	Inhaled ICS + (LABAs)	12	40.0	13	43.3	12	40.0	
	Inhaled ICS + Leukotriene receptor antagonists	2	6.7	2	6.7	1	3.3	
Type of current asthma attack	Allergic asthma	10	33.3	5	13.7	9	30.0	.386
	Non- allergic asthma	16	53.3	21	70.0	19	63.3	
	Exercise-induced asthma	4	13.3	4	13.3	2	6.7	

Table No. 3: Effect of combination of different postures and pursed lip breathing on pulmonary parameters

Groups	Cardiopulmonary parameters	Paired sample t test					
		Mean		df	t value	p value	Sig.
		Pre-test	Post-test				
Control	HR	92.3	91.7	29	.088	.123	NS
	RR	25.8	25.7	29	.093	.926	NS
	SPO_2	92.2	92.3	29	5.56	.582	NS
Tripod	HR	96.3	90.1	29	6.12	.012	S
	RR	28	15.3	29	12.21	.000	S
	SPO_2	91.2	95	29	7.99	.000	S
Prostrate	HR	94.7	90.3	29	2.88	.042	S
	RR	24.7	20.1	29	3.65	.001	S
	SPO_2	91.7	93.5	29	4.69	.000	S

Table No. 4: Levels of dyspnea in two tests (pre & post) for three groups

Level of dyspnea	Control Group		Tripod Group		Prostrate Group	
	Pre-test (%)	Post-test (%)	Pre-test (%)	Post-test (%)	Pre-test (%)	Post-test (%)
Mild	16.7	13.3	167	40.0	13.3	36.7
Moderate	60.0	66.7	40.0	40.0	56.7	50.0
Severe	23.3	20.0	43.3	20.0	30.0	13.3

Table No. 5: Effect Size of application of tripod position or prostration and breathing with pursed lips on HR, RR, SPO_2 and dyspnea comparing with control group

Dependent variables	Tripod group		Prostrate group	
	d	Effect Size	d	Effect Size
HR	0.526	Medium	0.234	Small
RR	2.230	Large	0.666	Medium
SPO_2	1.458	Large	0.856	Large
Dyspnea	0.598	Medium	0.474	Small

d: Cohen's d, Small effect size: d ≈0.2, Medium effect size: d ≈0.5, Large effect size: d ≈0.8)[9]

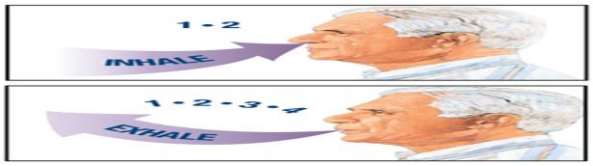

Figure No, 1: Pursed lips breathing

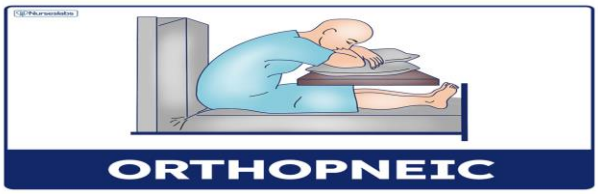

Figure No. 2: Tripod position[8]

Also it revealed that 36.7%, 43.3%, and 40% of the patients in the control, tripod and prostrate group respectively had (11-20 years) as duration of suffering from asthma. 40% of patients in each group (control and prostrate) were use inhaled (ICS) & (LABAs) as a chronic medication use for asthma while 43% in tripod group. 53.3%, 70%, and 63.3% of the patients in the control, tripod and prostrate group respectively had non-allergic asthma attack. There is no statistically significant (>0.05) differences in BMI, asthma duration, medication use, or asthma type between the control, tripod and prostrate groups (Table 2).

There is no statistically significant (.123) difference in heart rate between pretest and posttest in the control group, while there is a clear difference at the p value of .012 and .001 in the two experimental groups (tripod and prostrate groups) respectively. There is no statistically significant difference in respiratory rate between pretest and posttest in the control group at the p value of .926, while there is a clear difference at the p value of .000 and .001 in the two experimental groups (tripod and prostrate groups) respectively. Regarding SPO_2 this study indicates that there is no statistically significant (.582) difference in SPO_2 readings between pretest and posttest in the control group while there is a clear difference at the p value of .000 in the both experimental groups (tripod and prostrate groups) [Table 3].

As for as change in dyspnea level due to application of change position and breathing with pursed lips, at pretest was 16.7% of asthma patients in control group had mild dyspnea and become 13.3% at pretest, while there was a significant change in the tripod group, as 16.7% of them had mild dyspnea in the pretest and 40% in the posttest, as well as in the prostrate group, 13.3% and 36.7% in the pretest and posttest, respectively. The moderate level of dyspnea at pretest was 60% of asthma patients in control group had moderate level of dyspnea and become 66.7% at pretest, and in tripod group, 40% of patients had moderate dyspnea in both tests (pretest and posttest). In prostrate group, 56.7% of patients had moderate dyspnea at pretest and 50% at posttest. As for severe level dyspnea, there was no change in the percentage of patients in the control group within this level in the pre- and post-tests, where the results were 23.3% and 20%, respectively, while there was a change in the percentage of patients in the tripod group, as it was in the pre-test 43.3% and in the post-test, it was 20%. The prostration group showed that 30% in the pre-test and 13.3% in the post-test {Table 4).

Effect sizes are expressed using Cohen's d, which serves as an indicator of the strength of the interventions' impacts on the dependent variables studied. Regarding heart rate, the tripod group demonstrated a medium effect size (d=0.526), signifying a moderate impact on reducing heart rate. In contrast, the prostrate group showed a smaller effect size (d=0.234), indicating a less significant influence on this metric. The tripod position may be more effective in managing heart rate than the prostration position. The respiratory rate, the tripod group exhibited a substantial large effect size (d=2.230), indicating a strong reduction in respiratory rates. The prostrate group also presented a medium effect size (d=0.666), albeit significantly weaker than that of the tripod position and underscores the effectiveness of the tripod position in promoting a more favorable respiratory outcome. Oxygen saturation (SPO_2), both groups demonstrated large effect sizes, with the tripod group at d=1.458 and the prostrate group at d=0.856. This indicates that both positions are effective in enhancing oxygen levels, although the tripod position appears to yield a more pronounced improvement. Regarding dyspnea, the tripod group displayed a medium effect size (d=0.598), suggesting a notable reduction in the perception of breathlessness. The prostrate group reported a smaller effect size (d=0.474), indicating that while both interventions provide some relief, the tripod position is more effective in alleviating dyspnea (Table 5)

DISCUSSION

The mean age was 54.4±14 years, with 46.7%–50% aged 30–49, aligning with asthma exacerbation peaks in middle adulthood.[10] Gender distribution was balanced (~53% male, ~47% female), consistent with asthma epidemiology[14]. Former smokers (36.7–40%) and occupational exposures (13.3–26.7%) were noted but did not differ between groups, supporting internal validity. The tripod position may optimize accessory muscle use[11], while prone positioning (analogous to prostrate) could improve ventilation-perfusion matching.[12] Combining these with pursed-lip breathing known to reduce dynamic hyperinflation offers a novel comparison in asthma management.[13]

The study found no significant differences (p>0.05) in clinical characteristics between groups. Obesity class I was prevalent (26.7-36.7%), consistent with known asthma-obesity links.[14] Most participants 36.7-43.3% had 11-20 years' asthma duration, indicating chronic

disease management. Medication patterns reflected standard care, with 40-43.3% using ICS+LABA combination therapy.[4] Non-allergic asthma predominated (53.3-70%), aligning with adult-onset asthma phenotypes.[15] The body mass index, duration of illness, medication use, and type of asthma, suggesting that the intervention's effects are attributable to positioning, which supports the generalizability of the findings to diverse groups of adults with asthma.

The pulmonary parameters improved when combining body positioning with pursed-lip breathing while control group showed no significant changes (HR p=.123, RR p=.926, SpO_2 p=.582), both intervention groups achieved clinically meaningful improvements. The tripod position showed particularly robust effects, reducing RR by 12.7 breaths/min (45.4% reduction, p<.001) and increasing SpO_2 by 3.8% (p<.001). Prostrate positioning also showed significant benefits (RR reduction 4.6 breaths/min, p=.001; SpO_2 increase 1.8%, p<.001). These findings align with previous research showing tripod positioning optimizes respiratory mechanics by reducing accessory muscle work[16,17] while prone/prostrate positions improve ventilation-perfusion matching.[18] The greater improvement in tripod position may relate to its ability to decrease intrinsic PEEP in obstructive lung disease.[13] These results suggest that tripod positioning; can relief during asthma exacerbations when combined with pursed-lip breathing, offering nurses an effective non-pharmacological intervention.

The dyspnea severity improved when combining body positioning with pursed-lip breathing while the control group showed minimal change (severe dyspnea: 23.3% vs. 20%), both intervention groups achieved clinically meaningful reductions. The tripod position produced good effects, with mild dyspnea increasing from 16.7% to 40% and severe dyspnea decreasing from 43.3% to 20%. The prostrate position also showed benefits, with severe dyspnea dropping from 30% to 13.3%. These findings support previous research showing tripod positioning reduces dyspnea by decreasing accessory muscle work[10], while prone/prostrate positions improve breathing efficiency.[18,19] The improvement in tripod positioning may relate to its ability to optimize thoracic mechanics in obstructive lung disease.[13,20] These results suggest that nurses can effectively use these positions, particularly the tripod stance, to rapidly alleviate dyspnea during asthma exacerbations.

For heart rate, the tripod position showed a large effect (d=0.526), which was twice the effect of the prostate position (d=0.234). Also for respiratory rate (RR), the tripod position showed an exceptionally large effect (d=2.23), nearly three times greater than the prostrate position's medium effect (d=0.67). Similarly, SpO_2 improvements were substantial in both interventions, though tripod positioning again showed superior effects (d=1.46 vs. 0.86). These findings align with Watson's[9] framework, suggesting tripod positioning may be more effective for acute physiological stabilization. The moderate effect on dyspnea (d=0.60) in the tripod group versus small effect (d=0.47) in prostrate group suggests additional psychological benefits from this position. The differential effects may relate to tripod positioning's ability to optimize thoracic biomechanics[17,22], while prostrate positioning primarily affects ventilation distribution.[19,23] These effect sizes support prioritizing tripod positioning in acute asthma management, particularly when rapid RR reduction and oxygenation improvement are needed.

CONCLUSION

Combining tripod/prostrate positions with pursed-lip breathing significantly improves cardiopulmonary parameters and reduces dyspnea in asthma patients, with tripod positioning showing superior effects (large effect sizes: HR d=0.526, RR d=2.23, SpO2 d=1.46). Asthma patients often experience symptoms like decreased SpO_2 levels, tachypnea, tachycardia, and dyspnea. Nurses should teach strategies to minimize symptoms and enhance quality of life. Integrating tripod or prostrate posture with pursed-lip breathing into routine care can improve patient condition and reduce dyspnea.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Haider Nawaf Abed-Ali, Shatha Saadi Mohammed
Drafting or Revising Critically:	Haider Nawaf Abed-Ali, Shatha Saadi Mohammed
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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