

Pilot study to evaluate the Effectiveness of Novel Designed Nebulizer (NDN) on Compliance among Preschoolers undergoing nebulization in selected Hospital, Salem.

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ABSTRACT

The present pilot study is as a part of Ph.D. Programme under THE TAMILNADU Dr. M.G.R Medical University. The study was designed to assess the effectiveness of Novel Designed Nebulizer (NDN) Compliance among Preschoolers undergoing nebulization in selected Hospital, Salem. Quasi experimental research design was adopted. 20 children (10 experimental, 10 control group) who were admitted in pediatric wards with respiratory conditions and receiving nebulization between the age group of 3 to 6 years were selected by purposive sampling. Nebulization was given to experimental group with Novel Designed Nebulizer (NDN) and control group with routine nebulization. The results showed that the post test scores reveal that experimental group all 10(10%) the preschoolers were having high level of compliance and in control group all 10(10%) the preschoolers were having Medium level of compliance to nebulization procedure. The Friedman test value is 9.235 which is greater than the table value which indicates that the Novel designed nebulization is effective in increasing the compliance in experimental group. overall mean and SD in Experimental group is 2.31 ± 0.23 and the overall mean and SD in control group is 4.19 ± 0.46 . The mean difference is 1.88. The Z value is 3.800 which is higher than the table value which shows that the Novel designed nebulization is effective in improving the compliance among Preschoolers in experimental group.

Keywords: Novel Designed Nebulizer, Preschoolers, Nebulization, Compliance.

OBJECTIVES

1. To assess the compliance among children undergoing nebulization in experimental and control group.
2. To determine the effectiveness of Novel Designed Nebulizer on compliance among children undergoing nebulization in experimental group.
3. To associate the compliance among children undergoing nebulization in

experimental and control group with selected demographic variables.

HYPOTHESES

1. There is a significant difference in the level of compliance after Novel Designed Nebulization among the children undergoing nebulization in the experimental group and control group at $P \leq 0.05$ level.

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2. There is a significant association between compliance among children undergoing nebulization in experimental and control group with selected demographic variables at $P < 0.05$ level.

BACKGROUND OF THE STUDY

Nebulizers are ubiquitous in the world of medicine. Any child diagnosed with asthma, pneumonia, cystic fibrosis, chronic obstructive pulmonary disorder (COPD), or any other severe lung disease often use a nebulizer in order to deliver medication to the lungs. The most commonly used nebulizers today are bulky, and produce lot of noise. These aspects of the nebulizer make it difficult to use even in an hospital environment and decrease the compliance of the child to the treatment.⁵ Respiratory conditions are the most common in childhood and the leading causes of childhood morbidity from chronic disease (GINA 2016). Inhaled aerosols is foundation of asthma treatment and all other respiratory conditions which was recommended both in Global Initiative for Asthma (GINA) and Chinese paediatric asthma diagnosis and treatment guideline¹. National Parents of Asthmatic Children KAP Project Team (China) showed that 66.0% asthmatic children had asthma attacks in the past 12 months, 26.8% asthmatic children had visited the emergency department and 16.2% asthmatic children had been hospitalized. (Asthmatic Children KAP project team, 2013). A few studies showed an increased risk of uncontrolled asthma or an asthma exacerbation in children with lower compliance (Jentsch NS, 2012; Milgrom H, 1996). Poor compliance to inhaled aerosol therapy may also contribute to high mortality (GINA 2016).¹ Nebulizer therapy has been recommended in GINA and Chinese Paediatric asthma diagnosis and treatment guideline. Compared to other inhalers, delivering medications through nebulizer therapy need minimal patient's cooperation and normal breathing pattern (Deborah Elliott, 2011), but there are no studies to show the compliance of nebulizer therapy in clinical practice. So the investigator aim to investigate the compliance of the treatment during the procedure in the admitted Preschoolers in hospital. The reality

strongly suggests that, despite medical advances and competence and progress in both therapy and technology which permit the administration of simple to use medicines such as aerosols, greater commitment and compliance is required in order to obtain better results which are consistent with the current availability of such technological and therapeutic measures.² Compliance with medical treatment was evaluated in 89 children with respiratory diseases using two methods of assessment: a double blinded covert recording of the use of an air compressor for nebulization of drugs and the determination of theophylline levels in serum. However, 72% prescribed doses which were substantially below the recommended amount of drug according to age and weight. It is, therefore, concluded that compliance of medication is based on the child's adherence to the treatment procedure, which depends on the efficacy of the drug.³

MATERIALS AND METHODS

Quasi experimental research design was adopted. Ethical clearance was procured from the Institutional Ethical committee of Sri Gokulam Hospital, Salem on 16.08.2021. (Ref No: 1400246) Written permission was obtained from the Managing Director of Ramalingam's Hospital, Salem. 20 children (10 experimental, 10 control group) who were admitted in pediatric wards with respiratory conditions and receiving nebulization between the age group of 3 to 6 years were selected by Convenient sampling. Informed consent and assent was obtained from parents and children respectively. Purpose and importance of the study was explained and also reassurance was given regarding the confidentiality of data. Data was collected using Semi structured interview schedule to collect the Socio demographic data and compliance scale was used to assess the level compliance during nebulization. Nebulization was given to experimental group with Novel Designed Nebulizer (NDN) - a modified treatment instrument to children during nebulization in experimental group and routine nebulization for control group. The researcher uses visual and auditory play model as treatment device

(Nebulizer) from which glowing lights and rhymes of child's choice are played to distract the child. And nebulizer itself is modified like a toy. The compliance of the child was assessed during the procedure

RESULTS

The table 1 and 2 depicts that, in control group, the overall post test mean, SD was 2.31 +0.24 and the mean percentage was 46 where as experimental group overall post test mean, SD was

Table 1 : Frequency and percentage distribution of Preschoolers according to their Demographic variables

Demographic variables	Control group (n=10)		Experimental group (n=10)	
	f	%	f	%
1.Age of the preschooler in years:				
3.1-4 years	1	10	6	60
4.1-5 years	7	70	1	10
5.1-6 years	2	20	3	30
2.Gender of the child:				
Male	7	70	4	40
Female	3	30	6	60
3.Birth order of the child:				
First	6	60	5	50
second	4	40	5	50
Third and above	0	0	0	0
4.Previous exposure of nebulization:				
Yes	1	10	1	10
No	9	90	9	90
4.1.If yes, frequency of exposure:				
Once	1	100	0	0
Twice	0	0	1	100
Thrice	0	0	0	0
5.Associated Illness:				
Fever	4	40	1	10
vomiting	3	30	2	20
Any other	2	20	1	10
None	1	10	6	60
6.Presence of IV line:				
Yes	6	60	3	30
No	4	40	7	70
7. Accompanying Person:				
Father	5	50	4	40
Mother	5	50	6	60
Guardian	0	0	0	0

Demographic variables	Control group (n=10)		Experimental group (n=10)	
	f	%	f	%
8.Age of the parent/Guardian:				
18-22 years	0	0	3	30
23-27 years	4	40	1	10
28-32 years	4	40	6	60
32 and above	2	20	0	0
9. Education of the parent / Guardian:				
No formal education	0	0	0	0
Primary education	5	50	7	70
Secondary education	3	30	3	30
Higher secondary	1	10	0	0
Graduate	1	10	0	0
Post graduate	0	0	0	0
Health professional	0	0	0	0

Table 2 : Overall and Domain wise Post test mean, SD and mean% of Compliance during nebulization among Preschoolers in experimental and control group

Compliance Scale	Max score	Control group- post test scores			Experimental group- Post test scores			Difference in Mean%
		Mean	SD	Mean%	Mean	SD	Mean%	
Day-1	5	2.27	0.39	45	3.85	0.57	77	32
Day-2		2.35	0.39	47	4.22	0.36	84	37
Day-3		2.30	0.19	46	4.50	0.71	90	44
Overall		2.31	0.24	46	4.19	0.46	84	38

4.19±0.46 and mean percentage was 84, revealing a difference in mean % of 38. It shows that there is significant difference in compliance after using a Novel Designed nebulizer. The above tables depict that there is significant increase in mean from day 1 3.85±0.57 to day 3 4.50±0.71 and the mean difference is 0.375 and 0.275 on day 1 and day 3 respectively in the experimental group. The Friedman test value is 9.235 which is greater than the table value which indicates that the Novel designed nebulization is effective in increasing the compliance in experimental group.

The table 4 depicts that the overall mean and SD in Experimental group is 2.31±0.23 and the overall

mean and SD in control group is 4.19 ±0.46. The mean difference is 1.88. The Z value is 3.800 which is higher than the table value which shows that the Novel designed nebulization is effective in improving the compliance among Preschoolers in experimental group.

The table 5 depicts that there association found post test score of Compliance and Gender of the child in experimental group. And there is no association found between post test scores of Compliance and selected demographic variables like Age of the Preschooler, Birth order of the child, Previous exposure to nebulization, Associated illness, Presence of IV Line, Person accompanying, Age of the parent/Guardian and Education of Parent/Guardian in both experimental and control group.

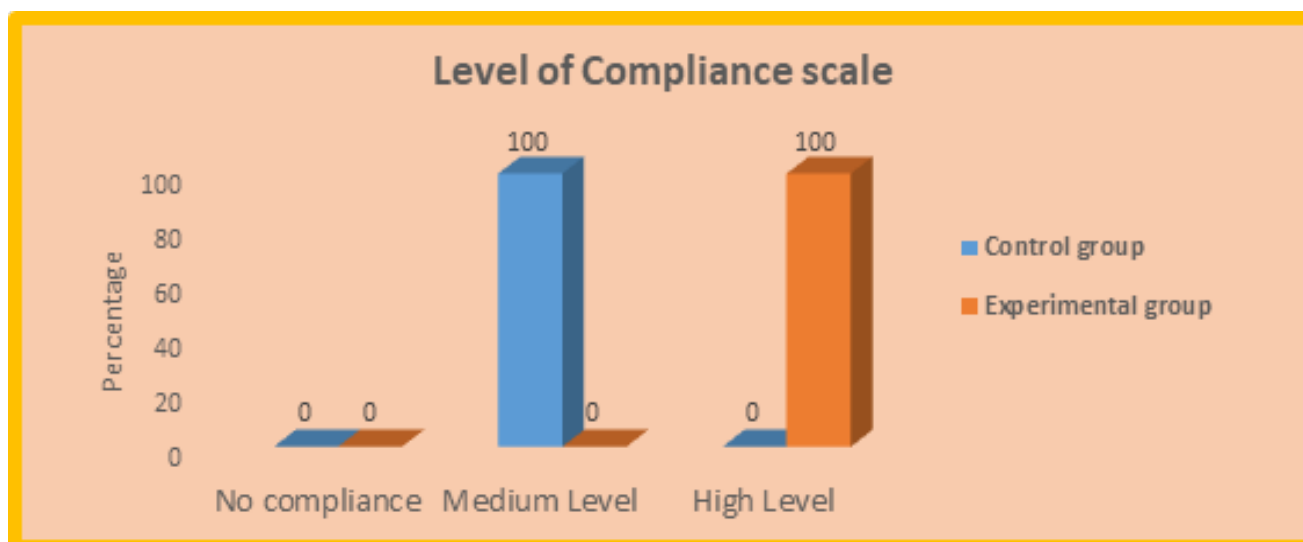


Fig. 1: Post test level of Compliance to nebulization in both Experimental and Control group.

Table 3: Effectiveness of Novel Designed Nebulization on Compliance among Preschoolers in Experimental group.

Experimental group Compliance scale	SCORE		Day-1 Vs Day-2		Day-1 Vs Day-3		Day-2 Vs Day-3	
	Mean±SD	MEDIAN (IQR)	Mean Difference	'Z' value p-value	Mean difference	'Z' value p-value	Mean difference	'Z' value p-value
Day-1	3.85±0.57	3.75 (4.12-3.25)	0.375	z=1.465 p=0.143 (NS)	0.65	z=2.275 p=0.023* (S)	0.275	z=1.529 p=0.126 (NS)
Day-2	4.22±0.36	4(4.56-4)						
Day-3	4.50±0.71	5(5-4)						
Friedman test	F=9.235 , p=0.01** , HS							

Table 4: Mann Whitney "u" test to assess the Effectiveness of Novel Designed Nebulization on Compliance among Preschoolers in Experimental and Control group.

Level of Compliance scale	Control group		Experimental group		Mean difference	'Z'-value	P-value
	Mean±SD	MEDIAN (IQR)	Mean±SD	MEDIAN (IQR)			
Day-1	2.27±0.39	2.12 (2.43-2)	3.85±0.57	3 . 7 5 (4.12-3.25)	1.575	3.829	p<0.001*** (HS)
Day-2	2.35±0.39	2.25 (2.75-2)	4.22±0.36	4(4.56-4)	1.875	3.820	p<0.001*** (HS)
Day-3	2.30±0.19	2.25 (2.31-2.25)	4.50±0.71	5(5-4)	2.2	3.922	p<0.001*** (HS)
Overall	2.31±0.23	2.25 (2.60-2.08)	4.19±0.46	4.37 (4.60-3.75)	1.88	3.800	p<0.001*** (HS)

Table 5: Association between the post test level of Compliance among Preschoolers in Experimental and control group with selected Demographic variables

Demographic variables	Experimental			Control		
	χ ² -value	df	Table value	χ ² -value	df	Table value
Age of Preschooler in years	1.14	2	5.99	2.85	2	5.99
Gender of the child	4.28	1	3.84	2.85	1	3.84
Birth order of the child	0	1	3.84	0.47	1	3.84
Previous exposure to nebulization	1.11	1	3.84	0.476	1	3.84
4.1 If yes frequency of exposure	0	1	3.84	0	1	3.84
Associated illness	4.33	3	7.81	6.03	3	7.81
Presence of IV line	1.67	1	3.84	0.023	1	3.84
Person Accompanying	0.40	1	3.84	1.27	1	3.84
Age of the parent/Guardian	3.0	2	5.99	3.65	2	5.99
Education of parent/Guardian	5.2	3	7.81	0.02	2	5.99

p <0.05*

DISCUSSION

The results of the study showed that the post test scores of compliance in the experimental group all 10(10%) the preschoolers were having high level of compliance and in control group all 10(10%) the preschoolers were having Medium level of compliance to nebulization procedure. The Friedman test value is 9.235 which was higher than the table value which indicates that the Novel designed nebulization is effective in increasing the compliance in experimental group. The overall mean and SD in Experimental group is 2.31±0.23 and the overall mean and SD in control group is 4.19 ±0.46. The mean difference is 1.88. The Z value is 3.800 which is higher than the table value which shows that the Novel designed nebulization highly is effective in improving the compliance among Preschoolers in experimental group.

CONCLUSION

Procedural anxiety in children is unavoidable and seen commonly in preschoolers. Play therapy has proven in reducing the anxiety of the children, yet during the procedure the sound and appearance of nebulizer is not accepted by the children. So when the nebulizer itself is modified and there visual and auditory distraction during the procedure

the children accepted the procedure well and compliance of the child for the treatment improved. The results of the Pilot study suggest that Novel designed Nebulizer is very effective in reducing in improving the compliance among children during the procedure. This kind of Nebulizer is easily modified, economical, and acceptable by the children and is highly recommended for future use.

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REFERENCES

1. Caramia G. Compliance with nebulized therapy in childhood. *Pediatr Med Chir.* 2002 Jul-Aug;24(4):267-73. Italian. PMID: 12197083.
2. Kurt Nikander, Lars Arheden, John Denyer, and Nicolas Cobos. Adherence with Nebulizer Treatment of the children when using aerosol delivery. *Journal of Aerosol Medicine* 2003 16:3, 273-281
3. Schöni MH, Horak E, Nikolaizik WH. Compliance with therapy in children with respiratory diseases. *Eur J Pediatr.* 1995;154(9 Suppl 4):S77-81. doi: 10.1007/BF02191512. PMID: 8529717.

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4. Tashkin DP. Multiple dose regimens. Impact on compliance. *Chest*. 1995 May;107(5 Suppl):176S-182S. doi: 10.1378/chest.107.5_supplement.176s. PMID: 7743823.
 5. Bartho, Murray & Breshock, Michael & Nolte, Megan & Asuri, Prashanth. (2019). NebuFlask: Advancing Usability of Nebulizers to Increase Patient Compliance.
 6. The Global Impact of respiratory Diseases. (2017). Second edition, Forum of International respiratory societies. 5 – 7