

IS IT TIME TO TAKE HFNC SERIOUSLY?

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Aim

- To assess the efficacy and safety of HFNC in children admitted to PICU.
- To determine the rate of treatment failure and its predictors.

Introduction

- HFNC is an emerging modality of therapy in critically ill children.
- Early initiation of HFNC for acute respiratory failure appears to reduce the need for invasive ventilation
- Only few studies have reported on its clinical efficacy in Indian PICU setting.

Methods

Design - Prospective observational study

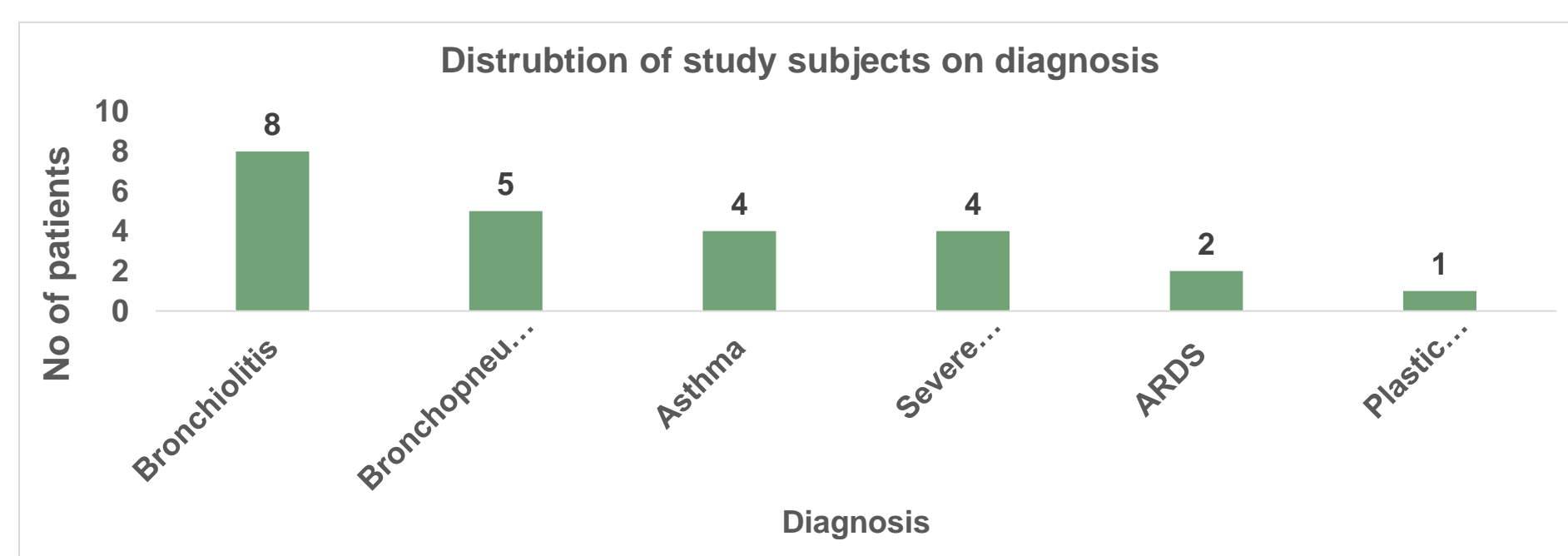
Study Duration - June 2017 to December 2017

Study Population and Setting - All consecutive patients (1 month to 18 years) who required HFNC for acute respiratory distress admitted in tertiary care PICU.

The clinical parameters and oxygen indices were evaluated at 0, 2, 12, 24 and 48 hours of presentation along with respiratory clinical score (RCS) and COMFORT scores.

Exclusion criteria – children with upper airway obstruction, apnea, hemodynamic instability, altered consciousness at the time of presentation.

figure 1. distribution of study subject on diagnosis



Comparison of variables at 0,2,12,24 and 48 hours

Factors	0min		2hr		12hrs		24hrs		48hrs	
	mean±SD	median (range)	mean±SD	median (range)	mean±SD	median (range)	mean±SD	median (range)	mean±SD	median (range)
heart rate* (n=18)	153.72±25.68	157 (104-184)	145.72±19.50	152 (110-180)	133.5±0.23	133 (86-162)	128.44±19.84	132 (96-160)	120.05±16.40	118.5 (90-144)
respiratory rate* (n=18)	48.28±9.14	46.5 (30-60)	42.05±13.82	40 (26-80)	37.83±7.49	36 (26-52)	35.56±8.25	33 (22-52)	32.28±6.17	31 (20-40)
spo2* (n=19)	88.68±4.04	90 (74-92)	96.74±1.99	97 (93-100)	96.18±1.80	96 (93-99)	96.95±1.22	97 (94-99)	97.10±1.45	97 (92-99)
fio2 %* (n=18)	47.78±6.47	45 (30-100)	42.94±17.08	40 (28-100)	35.67±3.46	35 (21-80)	28.39±9.38	29.5 (21-60)	22.56±4.84	21 (21-40)
sbp (n=18)	90.83±7.77	90 (74-102)	87.33±7.16	89 (76-98)	90.56±8.50	91 (72-106)	93.39±15.68	90 (78-151)	94.44±15.32	91.5 (78-151)
dbp (n=18)	53.56±6.90	55 (40-62)	50.72±4.44	50 (42-60)	54±8.60	52 (46-86)	52.56±6.68	50 (46-72)	52.78±7.30	50 (40-72)
respiratory score* (n=20)	4.10±0.85	4 (3-6)	3.4±0.82	3 (2-5)	2.6±0.89	2 (1-4)	0.5±0.89	0 (0-3)	0.05±0.22	0 (0-1)
comfort score* (n=20)	22.65±4.46	24 (12-27)	22.55±3.41	24 (14-27)	19.95±2.48	20 (14-24)	18.85±2.62	18 (16-25)	19.55±3.46	20 (15-25)

Results

- 24 children were included in study, 20 responded to HFNC therapy, however 4 (16.6%) children failed to improve requiring invasive ventilation.
- Median age of the study population was 22 months (2-120 months) with equal gender distribution (1:1)
- There was significant difference between HR and RR values at 0 mins, 2hrs, 12hrs, 24hrs and 48hrs (p < 0.00001, p < 0.00001)
- There was no statistical difference between HR at 12 and 24 hours (p value > 0.05) and between RR at 2 and 12 hours (p value 0.070)

Figure 2. HR and RR at measured time period

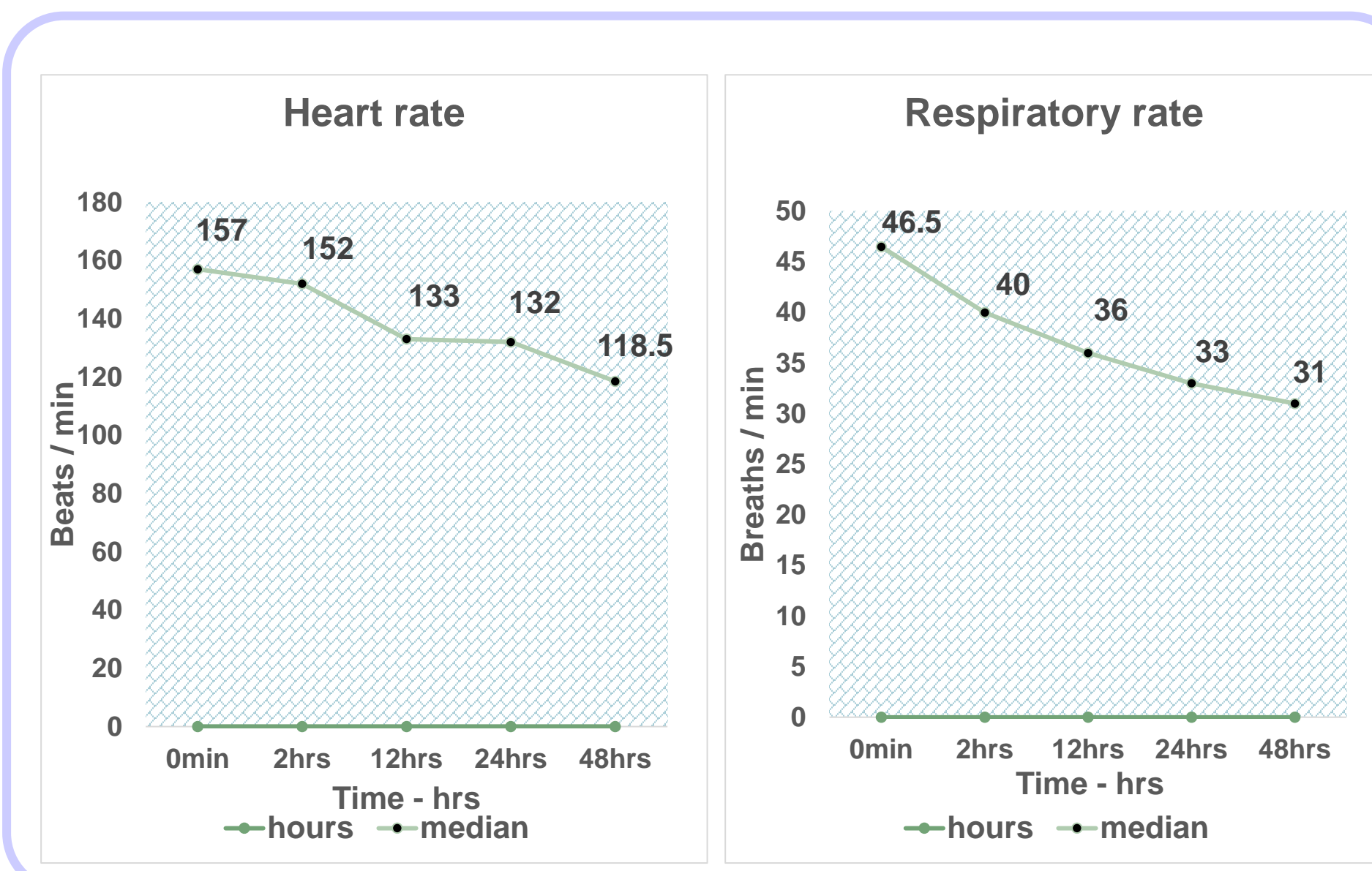


Figure 3. SpO2 and FiO2 at measured time period

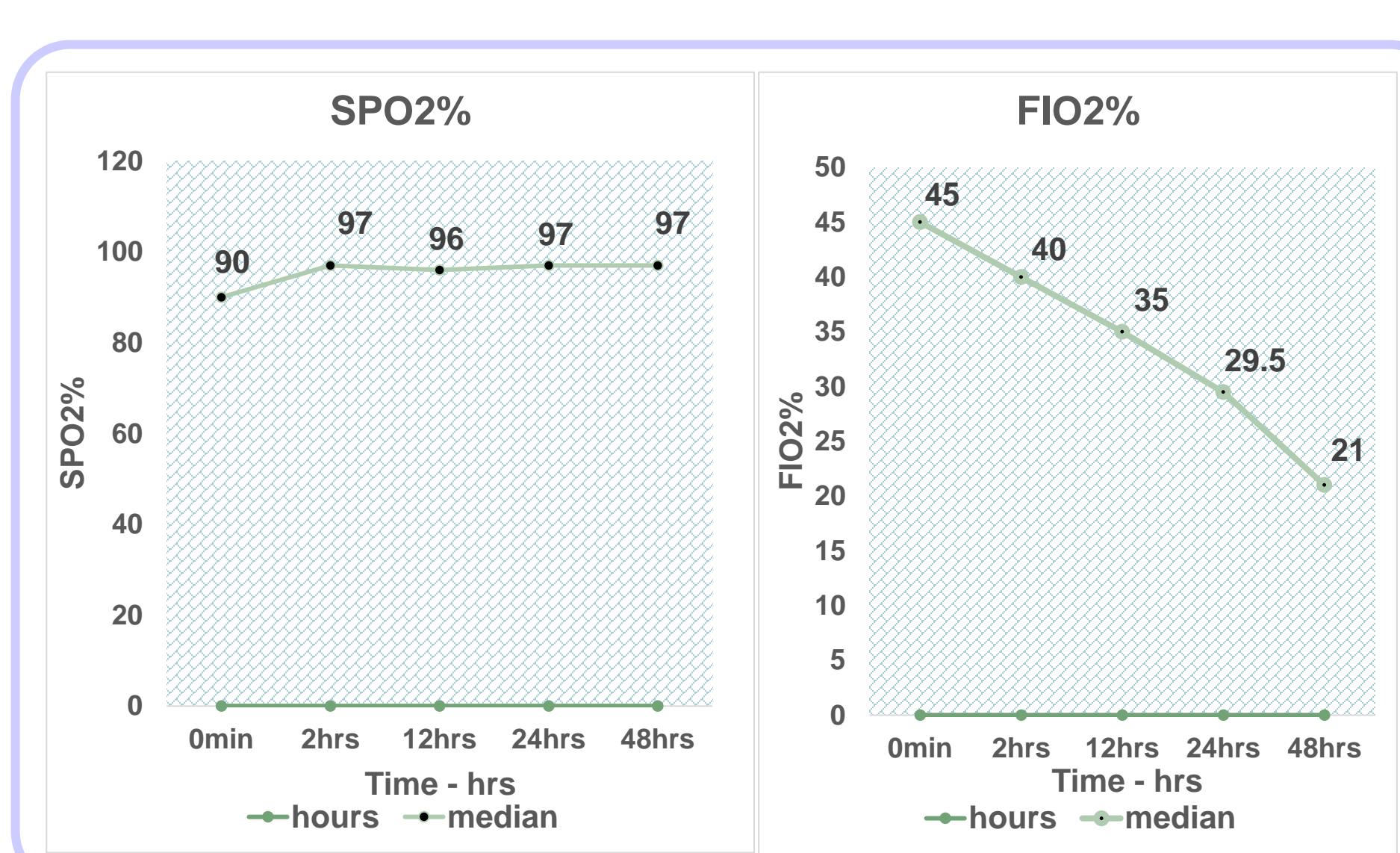


Figure 3. SBP and DBP at measured time period

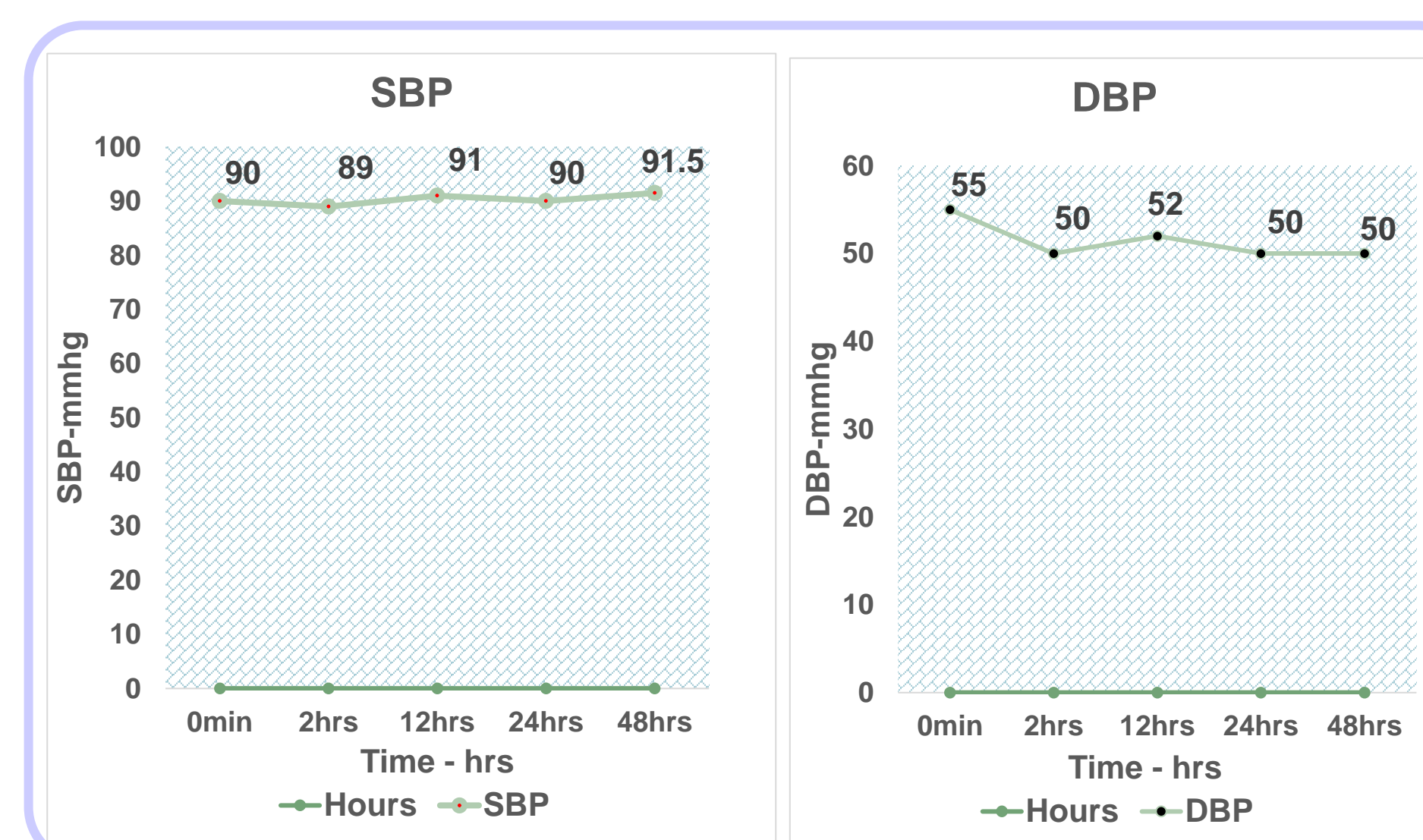
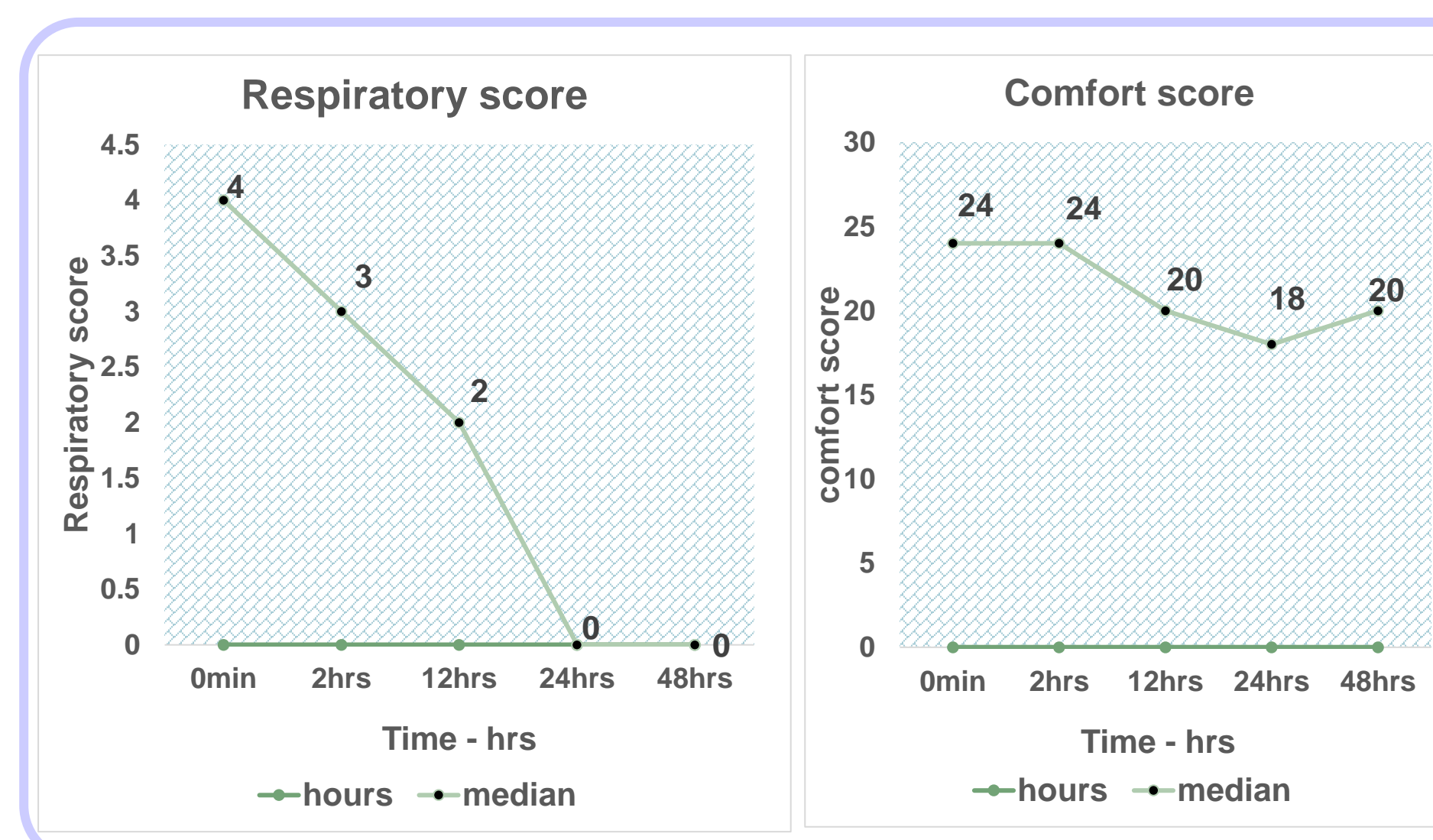


Figure 3. Respiratory and comfort score at measured time



Results contd.

- A significant increase was observed in SpO2 at 2 hours (p.0.001) and 12,24 hours (p:0.005) compared to that at 0 minute (p<0.05). No significant difference was found between mean spO2 levels at 2, 12, 24 and 48 hours.
- There was significant reduction in FiO2 requirement at 2 hours of HFNC (mean- 42.94±17.08, p value <0.05) compared to that at 0 hours (mean-47.78±16.47, p value >0.05) followed by steady decline for all measured time periods (p < 0.00001).
- No significant difference was noticed between SBP and DBP values at all measured time periods (p value- 0.12143, p value-0.07523).

There was significant difference between respiratory score at 0 mins, 2hrs, 12hrs, 24hrs and 48hrs (p < 0.00001). Paired analysis revealed that the statistical significance (p < 0.05) was due to drop in respiratory score at all the measured time periods.

- There was significant difference between comfort score at 0 mins, 2hrs, 12hrs, 24hrs and 48hrs (p= 0.00201). Paired analysis revealed that the statistical significance (p < 0.05) was due to drop in comfort score from 0min to 12hrs, 24hrs and 48hrs and 2hrs to 12hrs, 24hrs and 48hrs. However, there was no significant difference among 12hrs, 24hrs and 48hrs (P value > 0.05)

Therapy failure was not significantly related to the age of presentation.

The improvement in spo2, respiratory score and fio2 requirement over 2 to 12 hours (p:0.03, p: 0.00, p: 0.01) was positively correlated with treatment success however no improvement at 2 hours was associated with treatment failure.

Other variable did not differ among two groups.

Discussion

When HFNC administered to trachea, upper airway resistance is reduced and mean pressure and PEEP are elevated. HFNC failure in our study is 16.6% which is almost similar to other various studies.

Lengel et al and Mayfield et al reported that HFNC was well tolerated without side effects. RR, HR and Spo2 were improved significantly. Our study similarly demonstrated a drop in HR with HFNC from baseline (153) to 120 at 24 hours of HFNC and RR fell down from 48 to 31. Respiratory scores were also reduced from 4 at baseline to 0.06 at 48 hours.

Mackiernen et al reported that patients whose HR did not regress at 60 and 90 minutes needed intubation. Our study also support to it.

Spentaz et al reported that modified COMFORT score was improved with HFNC. Our study also revealed the improvement in COMFORT score after initiation of HFNC.

Conclusion

The HFNC therapy is efficient and well tolerated by children with acute respiratory failure.

SPO2, FIO2 and respiratory score improvement in initial 2 hours may indicate treatment success.

Limitation of the study- due small sample size estimates of comparison analysis is not reliable.

References

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