

A respiratory rate of ≥ 60 breaths per minute had high sensitivity for detecting hypoxia in infants

Rajesh VT, Singhi S, Kataria S. *Tachypnoea is a good predictor of hypoxia in acutely ill infants under 2 months.* Arch Dis Child 2000 Jan;82:46–9.

QUESTION: In ill infants <2 months of age, can the respiratory rate be used as an indicator of hypoxia?

Design

Blinded comparison of respiratory rate with oxygen saturation level.

Setting

A hospital paediatric emergency service in Chandigarh, India.

Participants

200 infants who were <2 months of age (mean age 28 d) and had symptoms of any acute illness. Exclusion criteria were age <24 hours, major congenital malformations, previous admission to hospital, or active cardiopulmonary resuscitation.

Description of test and diagnostic standard

The respiratory rate was counted for 1 minute while observing the infant's chest and abdominal movements when the infant was quiet. If the respiratory rate was ≥ 50 breaths/minute, the rate was counted again after 30 minutes. The diagnostic standard was the assessment of oxygen saturation, which was measured at the finger or toe with a pulse oximeter (BCI, Waukesha, WI, USA). Hypoxia was defined as an oxygen saturation level $\leq 90\%$.

Main outcome measures

Sensitivity and specificity for detecting hypoxia.

Main results

77 infants (39%) had hypoxia. The table shows sensitivities, specificities, and likelihood ratios. The cutoff point of ≥ 60 breaths/minute provided the best balance of sensitivity (81%) and specificity (68%).

Conclusion

In infants who were <2 months of age and had an acute illness, a respiratory rate of ≥ 60 breaths/minute had a sensitivity of 81% and a specificity of 68% for detecting hypoxia.

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Test characteristics for detecting hypoxia in infants with acute illnesses*

Respiratory rate	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
≥ 40 breaths/minute	96% (89 to 99)	37% (28 to 46)	1.5	0.1
≥ 50 breaths/minute	91% (82 to 96)	59% (50 to 68)	2.2	0.2
≥ 60 breaths/minute	81% (70 to 89)	68% (59 to 76)	2.5	0.3
≥ 70 breaths/minute	51% (39 to 62)	85% (77 to 90)	3.3	0.6
≥ 80 breaths/minute	22% (13 to 33)	93% (88 to 97)	3.4	0.8

*Abbreviations defined in glossary; CIs and LRs calculated from data in article.

COMMENTARY—continued from previous page

Therefore, many of the “false positives” who were tachypneic but not hypoxic probably had serious illness. Indeed, tachypnea identified 72% of infants who died, whereas hypoxia identified only 53%.

Both studies used the proper method for determining respiratory rate, as emphasised by others.^{1,2} The child should be observed in a quiet state, ideally when not febrile, and the respirations counted for a full 60 seconds by observing chest movement. In young children, the presence of fever and cough (without pneumonia) increases respiratory rate by approximately 10 breaths/minute.² A similar difference is found between wakeful (but quiet) and sleeping children.³ Respiratory rates obtained by auscultation are on average 2–3 breaths/minute higher than those obtained by observation, with greater differences (occasionally ≥ 10) seen in wakeful children.³

These studies support the use of tachypnea as a diagnostic test to identify pneumonia and hypoxia in areas where radiography and pulse oximetry are not widely available. In areas with better access to these technologies, confirmatory tests should be used to guide treatment to avoid unnecessary treatment. This is especially true when patient populations have lower rates of serious illness, as is often the case in developed countries. Regardless of practice setting, all clinicians will improve their care of sick children by remembering to carefully assess respiratory status.

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1 Margolis P, Gadomski A. Does this infant have pneumonia? *JAMA* 1998;279:308–13.

2 Dai Y, Foy HM, Zhu Z, et al. Respiratory rate and signs in roentgenographically confirmed pneumonia among children in China. *Pediatr Infect Dis J* 1995;14:48–50.

3 Rusconi F, Castagneto M, Gagliardi L, et al. Reference values for respiratory rate in the first 3 years of life. *Pediatrics* 1994;94:350–5.