Hypoxemia among infants with bronchiolitis in Al-Anbar governorate

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Abstract:

Objective: To study the predictors of hypoxaemia In a sample children with bronchiolitis admitted to maternity and children hospital in Al-Ramadi, Al-Anbar governorate.

Materials & Methods: A total of 154 infants with bronchiolitis were admitted during the period 1st Dec. 2002 to 1st March 2003, inclusive. Information about infant's feeding and sleeping was taken from mothers. All infants were examined for cynosis, level of consciousness, hypotonia, use of accessory muscles of respiration and respiratory rate. The heart rate and the arterial oxygen saturation (SaO_2) were measured by pulse oximetry. SaO_2 less than 95% was regarded as hypoxaemia.

Results: SaO_2 was significantly associated with level of consciousness, use of accessory muscles of respiration, ability to feed, ability to sleep, hypotonia, and cynosis. A significant negative association was found between SaO_2 and respiratory rate. Similar association was demonstrated between SaO_2 and heart rate.

Conclusion: Studied signs and symptoms reflect the SaO_2 level. Health care worker could assess them for proper selection of patients for oxygen therapy.

Key words: Bronchiolitis, hypoxaemia, infants, predictors

Introduction:

Bronchiolitis is an acute inflammatory disease of lower respiratory tract [1]. It is the most common respiratory tract infection in infancy [2]. Up to 2.5% of infants with bronchiolitis require hospital admission during winter epidemic[3]. Hpoxaemia is the most common abnormality detected in bronchiolitis which requires oxygen therapy [4]. In 1990s, it was accepted to detect hypoxaemia by pulse oximetry [5,6]. Predictors of severity of the disease or indicators for hospitalization (rapid respiratory and heart rates, cynosis, use of accessory muscles of respiration, hypotonia, irritability and sleep disturbance) were established.

This study was carried out to study the predictors of hypoxaemia in a sample of children with bronchiolitis admitted to the Maternity and Children hospital in Al-Ramadi, Al-Anbar governerate.

Materials & Methods:

A total of 154 infants with bronchiolitis admitted to the Maternity and Children hospital in Al-Anbar governerate, during the period 1st December 2002 to 1st March 2003, inclusive, were included in the study. Their age was 4.8 ± 3.2 months, with male to female ratio of 1.4:1. The diagnosis of bronchiolitis was made according to the classical clinical picture[7]. All infants were examined for cynosis, level of consciousness, hypotonia, use of accessory muscles of respiration [8]. Respiratory rate was counted in a complete one minute while the infant was quiet. The heart rate and arterial oxygen saturation (SaO_2) were measured by appropriate size sensor applied to the little finger of the right hand using pulse oximetry (Kontrom Medical BP78185 Type: 7840 SN 2000-0255 France). It was standarized before each use. SaO_2 less than 95% were regarded as hypoxaemia [10]. Information about ability of infant to feed and sleep was taken from the mother.

Analysis of variance was done to find out which variables are significantly and independently associated with SaO_2. Regression analysis was used to evaluate the association between variables [11]. P value less than 0.05 was regarded as statistically significant.

Results:

SaO_2 less than 95% was demonstrated in 143 (93%) of the infants. SaO_2 was significantly associated with level of consciousness, use of accessory muscles, ability to feed, ability to sleep, muscular tone and cynosis ($p < 0.05$) (Table 1). A significant negative association was detected between SaO_2 and respiratory rate (Fig.1) and between SaO_2 and heart rate (Fig.2).

Table 1. Distribution of levels of SaO_2 in relation to significant signs and symptoms of the studied infants.

Sign and symptoms	Category	SaO_2	*P value*
		Mean ± SD	
Level of consciousness	**Normal**	87 ± 8.1	*< 0.05*
	Irritable	82 ± 11.5	
	Drowsy	79 ± 11.1	
Use of accessory muscles	**Mild**	88 ± 4.7	*< 0.05*
	Moderate	82.6 ± 7.2	
	Sever	72 ± 8.6	
Ability to feed	**Normal**	83.5 ± 4.8	*< 0.05*
	Reduced	83 ± 7.9	
	Unable	74 ± 11.6	
Ability to sleep	**Normal**	84 ± 32.3	*< 0.05*
	Reduced	83 ± 7.5	
	Unable	62 ± 17.3	
Muscular tone	**Normal**	85 ± 10.3	*< 0.05*
	Hypotonia	77.5 ± 9	
Cynosis	**Absent**	84.5 ± 10.3	*< 0.05*
	Present	*75 ± 4.2*	

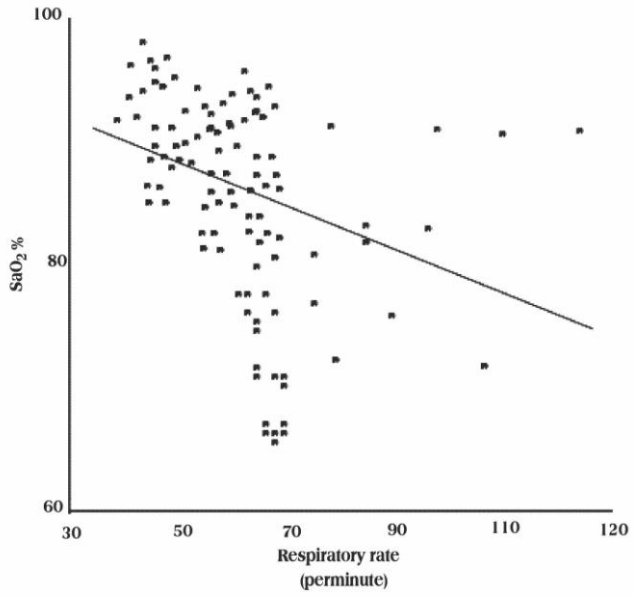

Fig.1 The relationship between SaO_2 and respiratory rate of children with bronchiolitis

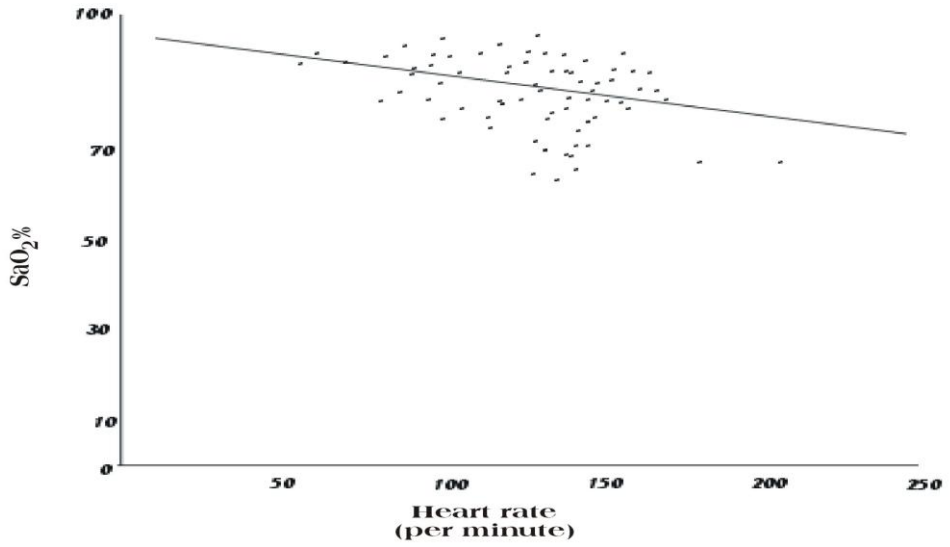

Fig. 2 The relationship between SaO_2 and heart rate among children with bronchiolitis

Discussion:

Acute respiratory infections (ARI) are among the most common diseases of children in the East Mediterranean Region (EMR), accounting for about 30% of all deaths in children under five years [12].

The finding that level of consciousness, use of accessory muscles of respiration, ability to feed, ability to sleep, cynosis and muscular tone were associated with SaO_2 is in agreement with that of several workers [4,8,13]. They stated that the mentioned signs and symptoms were changed during the respiratory illness. Our findings indicate that the mentioned signs and symptoms reflect the state of SaO_2 level.

This study revealed that SaO_2 level was negatively associated with respiratory rate. This result is consistent with that of David [15], who found that the higher respiratory rate is the lower arterial oxygen tension. However, Martin et al [4] and Mulholand et al [5] found that respiratory rate is a poor predictor of hypoxaemia. This difference is due to the fact that the mentioned workers studied bronchiolitis with several respiratory diseases like pneumonia, which is associated with fever and in turn affect the respiratory rate while the current study was on bronchiolitis only which is usually afebrile illness.

In agreement with other studies this study revealed that heart rate was negatively associated with SaO_2 level [17,18]. Increased heart rate is a physiological response to hypoxaemia [17].

Identification of clinical conditions, supportive treatment at home or in primary health center, and appropriate referral for second line of intervention are elements of case management of Acute Respiratory Infection Program [12]. Simplification of medical knowledge and the use of appropriate technology are the major tasks of primary health care [19]. Our findings indicate that the studied signs and symptoms reflect the SaO_2 level, and could be assessed by the health care worker for proper selection of patients for oxygen therapy.

References:

1-Jansiri TG, Nichols D, Rogers MC. Lower airway disease bronchiolitis and asthma. In: Mark C, Rogers MC (eds.). Text book of paediatrics intensive care. Williams and Wilkins 1987. pp.200.

2-Grenville FF, Mark LE, Micheal JM, Authony M. Randomized controlled trial of budesinide for prevention of post bronchiolitis wheeze. Arch Dis Child 1990; 80: 343-347.

3-Holberg CT, Wright AL, Martines FD, Ray CH, Tanssing LM, Lebwotz MD. Risk factors for RSV – associated lower respiratory illness in the first year of life. Am J Epidemiol 1991; 133: 1135-1151.

4-Martin WW, Stanly U, Ayo P, Shabber J, Mulholland EK. Predictors of hypoxaemia in hospital admission with acute lower respiratory

tract in developing countries. Arch Dis Child 1997; 76: 310 – 314.
5-Mulholland EK, Olinsky A, Sharan FA. Clinical finding and severity of acute bronchiolitis. Lancet 1990;335: 1259-1261.
6-Onyango FE, Steintioff MC, Wafulla EM, et al. Hypoxaemia in young Kenyan children with acute respiratory infection. B M J 1993; 145:1137-1140.
7-Barny W, Cockburn F, Price JF et al. Ribavirin aerosol for acute bronchiolitis. Arch Dis Child 1986; 61: 593-597.
8-Wang EEL, Milner RA, Navas I et al. Observer agreement for respiratory signs and oximetry in infant hospitalization with lower respiratory infection. Am Rev Resp Dis 1992; 145: 106-109.
9-Cade AC, Brownlee KG, Conway SP et al. Randomized placebo controlled trial of neublised corticosteriod in acute respiratory syncytial viral bronchiolitis. Arch Dis Child 2000; 82: 126-130.
10-Lary RF. Monitoring of crtically ill infants and children. In: Berhman RE, Kleigman RM, Jenson HR (editors). Nelson text book of Paediatrics. 16th edition. WB Saunders co. 2000. pp.249.
11-Daniel WW. Biostatistics: A foundation for analysis with health sciences, 7th edition. New York, John Wley & sons Inc. 1999.
12-Harfouche JK, Verhoestrate LT, Al-Shalazi H. The state of child health in Eastern Mediterranean Region. WHO (EMRO) (editor), 2nd edition, Alexandria. 1995.
13-Stanly V, Marten W, Kim M et al. Clinical predictors of hypoxaemia in Gambian children with acute lower respiratory tract infection. Prospective cohort study. B M J 1999; 318: 86-91.
14-Glenn F, Ralph I. Efficacy of B_2 against bronchiolitis. Arch Dis Child 2000; 82:126-130.
15-David MO. Bronchiolitis. In: Berhman R, Kleigman RM, jenson HR (editors).Nelson text book of Paediatrics. 16th edition.WB Saunders co. 2000.pp 1285
16-Kim HW, Arrabio JD, Brandt CD. Epidemiology of respiratory syncytial virus in Washington DC. Importance of virus in different respiratory disease syndrome and temporal distribution of infection. Am J Epidemiol 1973; 98: 216-225.
17-Mai TV, Selby AM, Simpson JM, Issac D. Use of simple clinical parameters to assess severity of bronchiolitis. J Paediatr Child Health 1995; 31: 495-498.
18-Hestad DD, Abbad FM. Circulatory adjustment to hypoxia. Circulation 1980; 62 : 461-463.
19- IbrahimGT, Ranken JP. Primary health care. 1st edition. London . Macmillan Publisher Ltd. 1988.

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