

# Modified Respiratory Distress Assessment Instrument Score, Predictor of Outcome of Acute Lower Respiratory Tract Infections in Children

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## ABSTRACT

**Objective:** To determine the clinical utility of modified Respiratory Distress Assessment Instrument (RDAI) score in predicting the short-term outcome of acute lower respiratory tract infections (ALRTIs) in children two months to two years of age.

**Subjects and methods:** This Cross-sectional study was conducted in the Department of Paediatrics, Services Hospital, Lahore from 04-08-2008 to 03-02-2009. A total 140 patients of acute lower respiratory tract infection (ALRTIs) in children from 2 months to 2 years of age were selected. ALRTI was diagnosed on the basis of fast breathing and lower chest indrawing as per WHO protocol system. Modified RDAI scoring was applied at the time of admission or soon after, before instituting treatment.

**Results:** Mean age of the patients was observed as 7.94±6.4 months. Total 99.3% patients were discharged and among those 77.9% were discharged within 72 hours of admission in hospital while 22.1% patients were discharged after 72 hours of hospital stay. There was only one expiry amounting to 0.7% of all cases.

**Conclusion:** It is concluded that modified RDAI score may serve as a guide to clinician in recognizing categories of patients who require general or intensive care.

**Key words:** Acute respiratory infection, RSV, Pneumonia, Bronchiolitis.

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## INTRODUCTION

Acute respiratory tract infections are one of the major causes of morbidity and mortality among young children in developing countries. Information on the viral aetiology of acute respiratory infections in developing countries is very limited<sup>1</sup>.

Because of the risk of developing hyponatremia, intravenous hydration prescription in children with lower respiratory tract disease (LRTD) is challenging<sup>2</sup>.

Severity of acute respiratory infection is higher in developing countries, especially among the socioeconomically underprivileged. Viral pneumonias are more common, especially among children<sup>3</sup>.

Children with acute respiratory infections (ARI) account for 20% to 40% of the children attending outpatient clinics and 12% to 35% of admissions into hospitals<sup>4</sup>.

It is estimated that 500 to 900 million ARI episodes occur per year in developing countries<sup>5</sup>. About 5 million under five children die of ARI annually, of which 90% deaths occur in developing

countries<sup>5</sup>. Out of these acute respiratory illness, pneumonia is primarily the main cause of mortality in children under five years in most developing countries and is responsible for 1.9 million deaths each year<sup>6</sup>. Pneumonia may be community-acquired or nosocomial. Community-acquired pneumonia (CAP) remains an important cause of morbidity and mortality. Streptococcus pneumoniae is the most common bacterial pathogen and respiratory syncytial virus (RSV) the most important viral pathogen in children<sup>7</sup>. Worldwide RSV is by far the most common cause of viral lower respiratory tract infection in infants and young children<sup>8</sup>. An estimated 75% of all admissions for bronchiolitis in children under five years of age are related to RSV<sup>9</sup>.

The World Health Organization (WHO) has developed an ARI case management strategy that employs simple clinical signs to diagnose pneumonia, followed by empirical antimicrobial treatment.<sup>10</sup> WHO considers all acute lower respiratory tract infections (ALRTI) including bronchiolitis, as pneumonia. The main objective of the ARI programme is to reduce pneumonia related mortality in developing countries.<sup>11</sup> This needs administration of antibiotics to all children, including those with viral ALRTI.

In an attempt to target appropriate cases for early intensive intervention one study was done in young Malaysian children. Authors used modified

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Respiratory Distress Assessment Instrument (RDAI) score to assess the respiratory distress at admission in children suffering from RSV infection. Four parameters (respiratory rate, colour of the patient, use of accessory muscles of respiration and auscultatory findings in chest) were taken and given a particular score according to severity, to define respiratory distress as mild, moderate and severe.<sup>12</sup> Using the modified RDAI score in a total of 185 children, it was found that 117(63%) patients had mild and 53 (29%) patients had moderate respiratory distress. All 15 (8%) patients who had severe respiratory distress were admitted to the paediatric intensive care unit (PICU), of whom 12(80%) required assisted ventilation for respiratory failure. It was concluded that RDAI may serve as a guide to clinicians in recognizing categories of patients who require general or intensive care<sup>12</sup>.

### SUBJECTS AND METHODS

One hundred and forty cases, of ALRTI's in children from 2 months to 2 years of age, recruited through emergency or out-patient department (OPD), Services Hospital, Lahore were registered for the study. An informed consent was taken from the parents or guardian of the child to include him/her in the study. Demographic information including name, age, sex and address was recorded. A detailed history was taken from parents/guardian and a thorough physical examination was done with special attention given to respiratory system. ALRTI was diagnosed on the basis of fast breathing (as mentioned in the operational definition) and lower chest indrawing. Modified RDAI scoring was applied at the time of admission or soon after, before instituting treatment. Patient was classified as having mild (score 0-4), moderate (score 5-8) and severe (score 9-12) respiratory distress on the basis of modified RDAI score, attached as annexure-I. Progress of the patients was noted during their stay in the ward while management was carried out according to the hospital, protocol. Outcome was assessed on the basis of discharge or death and length of stay in the hospital. All of this information was recorded on a pre-designed proforma attached as annexure-II. Effect modifiers like age, mode of admission (emergency/OPD) and categories (mild, moderate and severe) on modified RDAI score were addressed in data analysis.

Age was presented as mean and standard deviation. Respiratory distress (mild, moderate and severe) and outcome was presented as proportions and percentages. Death and discharge was presented as frequency and length of stay in hospital was presented as mean and standard deviation. Data

were stratified for age, sex, mode of admission (emergency/OPD) and mild, moderate and severe categories of respiratory distress on modified RDAI score.

### RESULTS

Mean age of the patients was 7.94 ± 6.4 months (Table 1). Gender distribution showed 85 males (60.7%) while females were 55 (39.3%) (Table 2). Prediction of Modified RDAI score showed 62 patients (44.3%) were discharged with mild score, 73 patients (52.2%) discharged with moderate, 4 patients (2.8%) discharged with sever modified RDAI score and 1 patient (0.7%) expired (Table-3). Stratification of sex according to RDAI score's outcome showed; male patients suffering from mild respiratory distress were 43, moderate respiratory distress 39 and severe respiratory distress 03 and female patients having mild respiratory distress were 19, moderate respiratory distress 35 and severe respiratory distress 3 (Table 4). Stratification of age according to RDAI score's outcome showed; patients between 2-11 months of age suffering from mild respiratory distress were 41, moderate respiratory distress 54 and severe respiratory distress 04 while patients between 12-24 month old had mild respiratory distress in 21 and moderate respiratory distress 20 (Table 5).

Table-1: Distribution of cases by age

| Age (months) | Number            | Percentage |
|--------------|-------------------|------------|
| 2-11         | 99                | 70.7       |
| 12-24        | 41                | 29.3       |
| Mean ± SD    | 7.94 ± 6.4 months |            |

Table 2: Distribution of cases by sex

| Sex    | Number | Percentage |
|--------|--------|------------|
| Male   | 85     | 60.7       |
| Female | 55     | 39.3       |

Table-3: Prediction of Modified RDAI score

| Modified RDAI   | Outcome    |      |         |      |
|-----------------|------------|------|---------|------|
|                 | Discharged |      | Expired |      |
|                 | No.        | %    | No.     | %    |
| Mild            | 62         | 44.3 | -       | -    |
| Moderate        | 73         | 52.2 | 01      | 0.71 |
| Severe          | 04         | 02.8 | -       | -    |
| P value = 0.638 |            |      |         |      |

Table 4: Stratification of sex according to RDAI score outcome

| Gender | Modified RDAI Score |          |        | Total |
|--------|---------------------|----------|--------|-------|
|        | Mild                | Moderate | Severe |       |
| Male   | 43                  | 39       | 03     | 85    |
| Female | 19                  | 35       | 01     | 55    |

Table-5: Stratification of age according to RDAI score outcome

| Age (months) | Modified RDAI Score |          |        | Total |
|--------------|---------------------|----------|--------|-------|
|              | Mild                | Moderate | Severe |       |
| 2-11         | 41                  | 54       | 04     | 99    |
| 12-24        | 21                  | 20       | -      | 41    |
| Total        | 62                  | 74       | 04     | 140   |

## DISCUSSION

ALRTIs are the main cause of morbidity and mortality in younger children. It accounts for 33-50% mortality in children below 5 years of age, most of them in underdeveloped countries<sup>13</sup>. Pneumonia is primarily the main cause of mortality in children under five years in most developing countries and is responsible for 1.9 million deaths each year<sup>14</sup>. Viruses occur in 30-40% of ARI's in hospitalized children.<sup>3</sup> Bacterias accounted for 60% of community acquired pneumonia<sup>15</sup>.

In developed countries, viruses are the most common cause of LRTI<sup>16</sup>. WHO considers all ALRTIs including bronchiolitis as pneumonia and recommends administration of antibiotics to all children including these with viral ALRTI. There is a concern that a large number of children are getting antibiotics unnecessarily since they may have viral pneumonia<sup>10</sup> or bronchiolitis. It is observed that respiratory distress may serve as a guide to clinician in recognizing categories of patients who require general or intensive care<sup>12</sup>.

It is presumed that modified RDAI score is able to predict the outcome of ALRTIs and unnecessary admission and hospital management can be avoided in cases of pneumonia having mild respiratory distress, and most of these patients can be managed on the outdoor basis.

Studies reveal that the application of standardized case management protocols can produce up to 50% reduction in mortality due to childhood ALRTIs in the developing countries. The success of the programme depends upon detection of high risk cases and timely referral to hospitals with secondary and tertiary level care<sup>17</sup>.

The majority of our patients were less than one year of age. 70.7% of patients belonged to 2-11 months age group included 29.3% patients of mild respiratory distress, 38.6% patients of moderate respiratory distress and 2.8% patients of severe respiratory distress. Patients who belonged to age group 12-24 months were 29.3% and included 15% patients of mild respiratory distress and 14.3% patients of moderate respiratory distress with no patient of severe respiratory distress in this age group. This is comparable with a similar study done by Mansbach et al, They concluded that most of their patients i.e., 73% were less than 12 months old<sup>18</sup>.

There was a preponderance of male patients which is comparable to previously published study<sup>19</sup>. In current study, males were 60.7% and included 30.7% patients of mild respiratory distress, 27.9% patients of moderate respiratory distress and 2.1% patients of severe respiratory distress. Females were 39.3% patients and included 13.6% patients of mild respiratory distress, 25% patients of moderate respiratory distress and 0.7% patients of severe respiratory distress. This is also comparable to a study of Mansbach et al in which it was observed that overall males were 58% who predominate in patients with ALRTIs under 2 years of age<sup>18</sup>.

In current study, when examined for respiratory distress with modified RDAI score it was found that only 2.9% of patients belonged to severe respiratory distress group while most of the patients (97.1%) belonged to mild and moderate respiratory distress, collectively, including 44.3% patients of mild respiratory distress and 52.9% patients of moderate respiratory distress. These results are supported by studies of Kristjansson et al<sup>19</sup>, Dobson et al<sup>20</sup>, Reijonen et al.<sup>21</sup> and Shann et al<sup>22</sup>.

## CONCLUSION

The patients belonging to mild and moderate respiratory distress according to modified RDAI score, responded well to the conservative management provided at the hospital and managed adequately on the outpatient basis without any intensive intervention and antibiotics. This approach helps in reducing hospital admissions and is also cost effective as this involves use of antibiotics in only selective cases and not in every cases of ALRTI.

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