British Journal of Medicine & Medical Research
2(2): 216-227, 2012

SCIENCEDOMAIN *international*
www.sciencedomain.org

Assessment and Classification of Acute Respiratory Tract Infections among Egyptian Rural Children

Nadia Montasser[1], Randah Helal[2*] and Rasha Rezq[3]

[1]Professor of Public Health, Department of Community Medicine, College of Medicine, Mansoura University, Egypt.
[2]Lecturer of Public Health, Department of Community Medicine, College of Medicine, Mansoura University, Egypt.
[3]Specialist of Family Medicine, Ministry of Health and Population, Egypt.

Research Article

Received 22nd December 2011
Accepted 22nd February 2012
Online Ready 5th March 2012

ABSTRACT

Aim: To study the problem of ARI (Acute respiratory tract infection) according to IMCI (integrated management of childhood illness) guidelines and find its relation with different related factors.
Study Design: Cross sectional study followed by comparative study to the different classifications of ARI.
Place and Duration of Study: Met-Mazah Integrated Hospital in Met-Mazah village, Dakahlia governorate, Egypt. The study carried out on one hundred children below 5 years selected by systematic sampling through a period of 6 months.
Methodology: A questionnaire was used to assess different factors such as sociodemographic factors, feeding habits and immunization history then detailed general and pulmonary examination of patients was done.
Results: The majority of ARIs cases were below two years. Severe pneumonia or very severe disease was slightly higher among male children and those had birth order 6 and more with no significant difference. More than half (60%) of those with family size ≥ 6 had severe pneumonia or very severe disease with significant statistical difference (p=0.005). About half of the children with very low social score were classified as pneumonia (46%) with no significant statistical difference. Total cases of ARIs and those classified as severe pneumonia or very severe disease were higher among those

**Corresponding author: Email: ranhel2000@yahoo.com;*

receiving mixed breast feeding and artificial feeding, among weaned children receiving starchy food and among those had partial immunization. All the children who had measles were classified as severe pneumonia or very severe disease with no significant differences. The majority of ARIs cases received hospital treatment and referred to specialist, also the majority of those referred to hospital were classified as pneumonia and severe pneumonia or very severe disease (44%) for both with significant statistical difference ($p<0.001$).

Conclusion: ARIs were significantly related to the age of the child, family size, and history of immunization.

Keywords: ARIs; preschool child; serious infectious diseases.

1. INTRODUCTION

Acute respiratory infections and diarrheal diseases represent about half of the deaths in under-five children in Egypt and are responsible for 39% and 20% of outpatient consultations at PHC (primary health care) facilities, respectively; they are also a common reason for hospital admissions (MOHP, 2000). Untreated ARI infections often lead to pneumonia, which is more serious and causes 15 percent of under-five deaths in Egypt (UNICEF, 2008). Early intervention and prompt treatment of ARI and pneumonia are the easiest ways to prevent death (WHO 2009).

The proportion of children ill with ARI for whom medical advice was sought ranged from less than 60 percent in rural Upper Egypt to more than 80 percent in urban Lower Egypt. Urban children are most likely to receive proper management and antibiotics prescription (El-Zanaty and Way, 2001).

Acute respiratory infections (ARIs) include infections in any area of respiratory tract lasting less than 30 days. ARIs may be classified into acute upper respiratory infections (AURI) and acute lower respiratory infections (ALRI), depending on the main organs affected (nose, sinuses, middle ear, larynx and pharynx versus trachea, bronchi and lungs). AURIs are generally mild in nature and most often caused by viruses, sometimes with a bacterial component as in some cases of sinusitis and otitis media (Simoes et al., 2006). The overwhelming majority of ARIs deaths and severe illness episodes are due to ALRIs, consisting mainly of pneumonia (Rudan et al., 2008).

Acute respiratory infections (ARIs) are considered the leading cause of acute illnesses worldwide and remain the most important cause of infant and young children mortality, accounting for about two million deaths (20% of all child deaths) each year (Kieny and Girard, 2005; Mizgerd, 2006) and ranking first among causes of disability-adjusted life-years (DALYs) lost in developing countries (94.6 millions, 6.3% of total) (Williams et al., 2002). The populations who are at higher risk for developing a fatal respiratory disease are the very young, the elderly, and the immune-compromised. While upper respiratory infections (URIs) are very frequent but seldom life-threatening, lower respiratory infections (LRIs) are responsible for more severe illnesses such as influenza, pneumonia, tuberculosis, and bronchiolitis that are the leading contributors to ARIs' mortality (Scott et al., 2008).

WHO has developed and supported the use of case management of pneumonia through the ARIs Program and later WHO integrated the ARIs guidelines, without changes, into the clinical protocol of IMCI (Integrated Management of Childhood Illness) (Gove, 1997). Although IMCI stresses the promotion of care-seeking by families with sick children, in general, the clinical management of such children is offered at the first level health facility. Surveys done in a few countries following the introduction of IMCI have shown significant improvements in the capacity for and practice of appropriate case management for ARIs in first level health facilities (WHO, 2002).

Our study aims to study the problem of ARIs according to IMCI guidelines, to find its relation with certain factors such as personal data, social determinant, pattern of feeding, medical and immunization history, and the treatment received.

2. SUBJECTS AND METHODS

2.1 Study Location

The study carried out in Met-Mazah Integrated Hospital in Met-Mazah village, Dakahlia governorate, Egypt. This hospital is serving about 20000 populations from Met-mazah and surrounding villages.

2.2 Study Design

The study included two parts:

Part1: A Cross sectional study carried out on children below 5 years suffering from ARIs through a period of 6 months from November 2009 up to the end of April 2010. The number of children attending the outpatient clinics with different conditions in the previous year during similar period nearly equal 1000, from the weekly and monthly report, 2007, the mean proportion of ARIs among consultations during the period of study was 15.2% and by using EpiInfo version 6 with this expected frequency, the total sample calculated was 99 that increased to 100. The children were selected out from 550 cases of ARIs by systematic sampling every 5^{th}. Infants below 2 months were excluded as they have different classification of ARIs than those from 2m up to 5 years.

2.3 Measures and Data Management

A well-structured questionnaire was designed including the following; Personal data as: name, age, sex and birth order of the child. Social score was assessed according to modified Fahmy and El-Sherbini, 1983 which included Father education, Father occupation, Mother education, Mother occupation, per capita monthly income in “Egyptian pounds”, Family size, number of rooms, Crowding index, detailed history of previous diseases such as Measles, Chicken pox, Diarrheal diseases, Anemia and history of immunization.

Detailed general physical and chest examination of patients was performed by well trained physician with stress on the following points:

- Temperature.
- Respiratory rate: was determined by inspection of the child chest for 60 seconds, the RR was counted twice and the average count was recorded.

- Chest indrawing: by observing the subcostal and intercostals space.
- Stridor in calm child.
- Wheeze

- Cases were classified according to IMCI guidelines into:

1. Severe pneumonia or very severe disease (in child who was unable to drink or breastfed, vomit everything, had convulsions, lethargic or unconscious, convulsing during visit).
2. Pneumonia depending on fast breathing which is
   From 2m up to one year: 50 breathes per minutes or more
   From one year up to 5 years: 40 breathes per minutes or more
3. No pneumonia cough or cold (no signs of pneumonia or very severe disease)

According to the classification of the cases, the guidelines for proper case management of every classification were followed.

Part Ⅱ: comparative study was done between different classifications of ARI.

2.4 Statistical Techniques

The questionnaires were filled by the investigators after taking oral consent of the mothers and the collected data were coded, processed and analyzed through SPSS (Statistical Package for Social Sciences) (Standard version release 10.0).

Chi Square was used for testing the association of categorical data as different age groups, sex and crowding index in relation to the different classifications of ARI. The significance level was considered at $P<0.05$.

3. RESULTS

The studied group included 49 males (49.0%) and 51 females (51.0%), their age ranged from 2 months to 5 years. From this study, we found that the total proportion of No pneumonia cough or cold among cases of ARIs was 41%, followed by pneumonia (36%) and severe pneumonia or very severe disease represented by 23% of the total cases (table 1).

Table 1. Description of the studied group suffering from ARIs according to severity of ARIs

Total cases of ARIs N=100					
No pneumonia cough or cold		**Pneumonia**		**Severe pneumonia or very severe disease**	
No	**%**	**No**	**%**	**No**	**%**
41	41.0	36	36.0	23	23.0

The personal data of the studied group suffering from ARIs (table 2), revealed that there is highly significant difference detected between different severity groups related to age as the majority of cases was below two years (67%). Also severe pneumonia or very severe disease was slightly higher among male children and those had birth order 6 and more with no significant statistical difference detected.

Table 2. Distribution of personal data of the studied group suffering from ARIs according to severity of ARIs

Personal data		Severity of ARIs						Total		Test of significance Chi-square
		No pneumonia cough or cold		Pneumonia		Severe pneumonia or very severe disease				
Age per months		No	%	No	%	No	%	No	%	
	2-	19	59.4	4	12.5	9	28.1	32	32.0	
	12-	7	20.0	18	51.4	10	28.6	35	35.0	P<0.001*
	24-	15	60.0	8	32.0	2	8.0	25	25.0	
	36-	0	00.0	4	80.0	1	20.0	5	5.0	
	48-	0	00.0	2	67.0	1	33.0	3	3.0	
	Total	41	41.0	36	36.0	23	23.0	100	100.0	
Gender	Male	22	45.0	15	31.0	12	24.0	49	49.0	P=0.54
	Female	19	37.0	21	41.0	11	22.0	51	51.0	
Birth order	1	5	39.0	6	46.0	2	15.0	13	13.0	P=0.07
	2-3	10	28.0	18	50.0	8	22.0	36	36.0	
	4-5	24	52.0	12	26.0	10	22.0	46	46.0	
	6+	2	40.0	0	00.0	3	60.0	5	5.0	

** indicates significant difference*

Table 3. Distribution of social determinant of the studied group suffering from ARIs according to severity of ARIs

Social determinant		No pneumonia cough or cold		Pneumonia		Severe pneumonia or very severe disease		Total		Chi-square
		No	%	No	%	No	%	No	%	
Family size	≤ 3	9	27.0	12	35.0	13	38.0	34	34.0	P=0.005*
	4-5	30	49.0	24	39.0	7	12.0	61	61.0	
	≥ 6	2	40.0	0	00.0	3	60.0	5	5.0	
Crowding index	≤ 2	13	42.0	12	39.0	6	19.0	31	31.0	P=0.14
	3	15	36.0	18	43.0	9	21.0	42	42.0	
	4	12	64.0	2	10.0	5	26.0	19	19.0	
	≥ 5	1	13.0	4	50.0	3	37.0	8	8.0	
Per capita income	More than enough	15	46.0	12	36.0	6	18.0	33	33.0	P=0.61
	Just enough	13	45.0	11	38.0	5	17,0	29	29.0	
	Less than Enough	13	34.0	13	34.0	12	32.0	38	38.0	
Total social score	High	9	64.0	3	22.0	2	14.0	14	14.0	P=0.104
	Middle	12	52.0	8	35.0	3	13.0	23	23.0	
	Low	11	46.0	7	29.0	6	25.0	24	24.0	
	Very low	9	23.0	18	46.0	12	31.0	39	39.0	

Table 4. Distribution of feeding habits of the studied group suffering from ARIs according to severity of ARIs

			No pneumonia cough or cold		Pneumonia		Severe pneumonia or very severe disease		Total		Chi-square
			No	%	No	%	No	%	No	%	
Feeding habits	**Breast fed**	Absolute breast fed	1	50.0	1	50.0	0	00.0	2	2.0	P=0.48
		Mixed	5	31.5	4	25.0	7	43.5	16	16.0	
		Total	6	33.3	5	27.8	7	38.9	18	18.0	
	Non breast fed	Milk & milk product	7	32.0	12	55.0	3	13.0	22	22.0	P=0.16
		Starchy food	10	36.0	13	46.0	5	18.0	28	28.0	
		Protein	11	52.0	5	24.0	5	24.0	21	21.0	
		Mixed	7	64.0	1	9.0	3	27.0	11	11.0	
		Total	35	42.7	31	37.8	16	19.5	82	82.0	

Table 5. Distribution of the medical and immunization history of the studied group suffering from ARIs according to severity of ARIs

		No pneumonia cough or cold		Pneumonia		Severe pneumonia or very severe disease		Total		Chi-square
		No	%	No	%	No	%	No	%	
Medical `history	Measles	0	00.0	0	00.0	3	100.0	3	3.0	P = 0.78
	Chick pox	1	12.5	2	25.0	5	62.5	8	8.0	
	Diarrheal diseases	3	25.0	3	25.0	6	50.0	12	12.0	
	Anemia	4	17.5	7	30.0	12	52.5	23	23.0	
**Immunization history	Complete	32	77.0	9	21.0	1	2.0	42	42.0	P < 0.001*
	Partial	9	15.0	27	47.0	22	38.0	58	58.0	

***all the children had either partial or complete immunization according to their age and no one had no immunization*

Table 6. Distribution of ARIs Treatment of the studied group suffering from ARIs according to severity of ARIs

ARI treatment		No pneumonia cough or cold		Pneumonia		Severe pneumonia or very severe disease		Total		Chi-square
		No	%	No	%	No	%	No	%	
Non referred cases	Home treatment	10	8.0	2	17.0	0	00.0	12	12.0	P<0.001*
	Center treatment	26**	55.0	16	34.0	5	11.0	47	47.0	
	Total	36	61.0	18	30.5	5	8.5	59	59.0	
Referral to specialist		5***	12.00	18	44.0	18	44.0	41	41.0	

*** According to IMCI case management, cases with wheezes should receive rapid acting bronchodilator*

**** A child who had cough lasting more than 3 weeks or recurrent wheezing needs to be referred to hospital for further assessment for tuberculosis, asthma or whooping cough.*

Table 3 showed that 60% of those with family size≥6 classified as severe pneumonia or very severe disease with significant statistical difference (p=0.005). About half of the children with very low social score were classified as pneumonia (46%) followed by severe pneumonia or very severe disease (31%) with no significant statistical difference. Thirty seven percent of the children from families with crowding index ≥5 were classified as severe pneumonia or very severe disease with no significant statistical difference detected. Other determinants showed no significant difference.

Regarding feeding habits, total cases and those classified as severe pneumonia or very severe disease were higher among those receiving mixed breastfeeding and artificial feeding and also among weaned children receiving starchy food. Also most of the absolute breastfed babies had no severe pneumonia or very severe disease with no significant statistical difference detected (Table 4).

Concerning medical history, the children with ARIs were higher among those with history of anemia. All the children who had measles were classified as severe pneumonia or very severe disease with lower incidence among those had other diseases but the differences was statistically non significant. Both total cases of ARIs and those classified as severe pneumonia or very severe disease were significantly higher among those had partial immunization (p<0.001) (table 5).

The majority of ARIs cases received center treatment and referred to specialist, also the majority of those referred to specialist were classified as pneumonia and severe pneumonia or very severe disease (44%) for both with significant statistical difference (p<0.001) (table 6).

4. DISCUSSION

Acute respiratory infections (ARIs), principally pneumonia, account for approximately 1.9 million (1.6 - 2.2 million) deaths globally in children under 5 years of age each year, 90% of which occur in the developing world. The present study revealed that the proportion of ARIs significantly reached its peak below 36m then decreased with increasing of age of child and these findings were in agreement with the result found by Hortal et al., 2000; AL-Azzawi et al., 2003 and Siziya et al., 2009 in Iraq. The increased risk of ARIs among young aged children (in the first two years) may be due to poorly developed immune system and maternally acquired (passive) immunity was waning. Also the immaturity of CNS respiratory derive system, anatomic features of upper air way that predispose to collapse or obstruction, a compliant thoracic cage, poorly developed respiratory muscles and limited available energy stores may be risk factors (Wenger and Levine, 1997).

Although severe ARIs (severe pneumonia or very severe disease) was slightly higher among male patients, there was no significant association between gender and the severity of ARIs. These findings were consistent with AL-Karaguily, 1998 in Iraq; WHO, 2004 and Yousif and Khaleq, 2006 in Iraq, but against the result found by Zhang et al., 1985 in Beijing, and AL-Humairy, 1998 in Iraq, who found that male gender was highly significantly associated with ARIs severity. However Siziya et al., 2009 reported that child's gender was associated with ARIs only and not diarrheal disease.

As regard family size the proportion of severe ARIs (severe pneumonia or very severe disease) increased significantly with higher family size probably because big family size is usually associated with overcrowding which promotes transmission of respiratory pathogens,

less nutritional and medical care given to each child in large families. This result coincided with Sikolia et al., 2002.

The results of this study found that the severity related to the increased crowdedness'. This is in agreement with Nilay et al., 2002 and Siziya et al., 2009, however both the proportion and the severity were significantly related to crowdedness in the studies carried by AL-Shahabi et al., 2001 and Yousif and Khaleq, 2006 in Iraq.

As regard percapta income per month the proportion of ARIs was not significantly influenced by family income, a finding contrasting that reported by Kartasasmita (2003).

Regarding type of feeding no significant association had been observed regarding type of feeding and the development of ARIs. This is similar to the finding of Qasim and AL-Jassar, 1994; Chisti et al., 2008 and this is in contrast to the finding of Nilay et al., 2002 in Turkey and Yousif and Khaleq, 2006 who reported that breast feeding appeared to be highly protective against the occurrence of ARIs due to its content of bacterial and viral antibodies, macrophages synthesizing complement and lysozymes.

Immunization status showed no significant association with the proportion of ARIs, however it is related to severity. This result was in agreement with results found by Broor et al., 2001 in India and Sikolia et al., 2002, in Kenya and Yousif and Khaleq, 2006 and this in contrast to what reported by Zwi et al., 1999 who found that lack of immunization or poor vaccination compliance is a risk factor for ARIs.

About 88% of total cases were treated at the center and referred to specialist as the majority of the cases (50.9%) were classified as pneumonia and severe pneumonia or very severe disease and even those with no pneumonia represented with other conditions that required center treatment as wheezes. As the majority of our studied group were low and very low social class, they don't ask medical care for their children except when the condition become worse and many of them prefer to treat their children at home or take consultation from pharmacies.

5. CONCLUSION AND RECOMMENDATION

From the present study, we can conclude that ARIs were significantly related to the age of the child, family size, history of immunization. And so some recommendations must be considered in order to control the problem of ARIs such as promotion of family planning since large family size was found to be significantly associated with higher proportion of ARIs, encouragement of EPI immunizations especially against measles proper housing conditions to prevent overcrowdings, improvement of the standard of living,. Also, increase coverage of IMCI even in private clinics with proper training and supervision of physician practice to assure compliance with ARIs guidelines to achieve higher cure rates.

6. LIMITATIONS OF THE STUDY

This study included small sample size according to our target population and so we need other researches with larger sample size with better to examine the effectiveness of implementation of the IMCI in the management of ARI cases and its role in achieving high cure rate.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Al- Azzawi, H.K., Saadallah, S., Mukhlis, F.A., et al. (2003). Bacterial etiology of acute lower respiratory tract infections in young Iraqi children. The Iraqi Journal of Medical Science, 3, 314-319.

Al- Shahabi, S.J., Niazi, A.D., Al-Obeidy, A. (2001). The role of passive smoking in children with lower respiratory disease: a case control study. The Iraqi Journal of Medical Science, 1, 306-311.

Al-Karaguily, T.S. (1998): Risk factors of pneumonia in children under 6 years of age. Journal of Saddam University, 2, 103-111.

Broor, S., Pandey, R.M., Ghosh, M., et al. (2001). Risk factors for severe acute lower respiratory tract infection in under five years children. India, university of Neodelhi, 38, 1361-1369.

Chisti, M., Huq, S., Sumon Kumar, D. et al. (2008). Predictors of severe illness in children under age five with concomitant infection with pneumonia and diarrhea at a large hospital in Dhaka, Bangladesh Southeast. Asian J Trop med public health, 39(4), 719-727.

El- Zanaty, F., Way, A., (2001). Egypt Demographic and Health Survey 2000. Calverton, Maryland [USA]: Ministry of Health and Population [Egypt], National Population Council and ORC Macro.p, 160-162.

Gove, S. (1997). For the WHO Working Group on Guidelines for Integrated Management of the Sick Child. Integrated management of childhood illness by outpatient health workers: technical basis and overview. Bull World Health Organ, 75 Suppl 1, 7-16.

Hortal, C., Mogdasy, J.C., Russi, C., Deleon, A., Suarez. (2000). Microbial Agents Associated with Pneumonia in Children from Uruguay. Rev Infect Dis, 12, Suppl. 8 S915 – 22.

Kartasasmita, C. (2003). Three versus Five Days Oral Cotrimoxazole for Nonsevere Pneumonia. Paper presented at the World Health Organization Consultative Meeting on Reviewing Current Research and Management of Acute Respiratory Infections, Geneva, September 29–October.

Kieny, M.P., Girard, M.P. (2005). Human vaccine research and development: An overview. Vaccine, 23, 5705-7.

Mizgerd, J.P. (2006). Lung infection--a public health priority. PLoS Med, 3, e76.

Rudan, I., Boschi-Pinto, C., Biloglav, Z., Mulholland, K., Campbell, H. (2008). Epidemiology and etiology of childhood pneumonia. Bull World Health Organ, 86, 408-16.

MOHP, (2000). Report on IMCI early implementation phase – December 1996 – March 2000, PHC sector, MOHP, Cairo, April 2000.

Nilay, E., Velipasaglu, S., Aktekin, M. (2002). Incidence of acute respiratory infection and the relationship with some factors in infancy in Antalya 44. Turkey, International publication, 64-69.

Qasim, N.A., Al-Jassar, N.F. (1996). Risk factors of acute respiratory infection (ARI) in children under 5 years of age. Iraqi Journal of community medicine, 9, 109-116.

Scott, J.A., Brooks, W.A., Peiris, J.S., Holtzman, D., Mulhollan, E.K. (2008). Pneumonia research to reduce childhood mortality in the developing world. J Clin Invest,118, 1291-300.

Sikolia, D.N., Mwololo, K., Cherop, H., Hussein, A., Juma, M., Kurui, J. (2002). The Prevalence of acute respiratory infections and the associated risk factors: A Study of children under five years of agein Kibera Lindi Village, Nairobi, Kenya J. Natl Ins. Public Health, 51, (1).

Simoes, A.F., Cherian, T., Chow, J., Shahid-Salles, S., Laxminarayan, R., John, T.J. (2006). Acute Respiratory Infections in Children. In Disease Control Priorities in Developing Countries. second edition. Washington: Oxford University Press.

Siziya, S., Muula, A.S., Rudatsikira, E. (2009). Diarrhoea and acute respiratory infections prevalence and risk factors among under-five children in Iraq in 2000. Ital J Pediatr, 35, 8.

UNICEF. (2008). Countdown to 2015, Maternal, Newborn and Child Survival: tracking progress in Maternal, Newborn and Child Health. www.countdown2015mnch.org

Weekly and monthly report, (2007). Diseases early warning system published at http://www.emro.who.int/afghanistan/pdf/dews_26_07.pdf.

Wenger, J.D., Levine, M.M., eds. (1997). Epidemiological Impact of Conjugate Vaccine on Invasive Disease Caused by Haemophilus influenzae Type B. In: LevineMM, Woodrow, G.C., Kaper, J.B., Cobon, G.S. eds. New Generation Vaccines, 2nd edn. New York: Marcel Dekker, Inc, 489.

WHO (WHO Department of Child and Adolescent Health and Development (CAH)), (2002). Evidence base for the community management of pneumonia. June 11-12, 2002, Stockholm, Sweden.

WHO (World Health Organization). (2004). The global burden of disease: 2004 update. [http:/ / www.who.int/ healthinfo/ global_burden_disease/ GBD_report_2004update_full.pdf]

World Health Organization (WhO) 2009. Acute Respiratory Infections in Children. www.who.int/fch/depts/cah/resp_infections/en/.

Williams, B.G., Gouws, E., Boschi-Pinto, C., Bryce, J., Dye, C. (2002). Estimates of worldwide distribution of child deaths from acute respiratory infections. Lancet Infect Dis, 2, 25-32.

Yousif, T., Khaleq, B. (2006). Epidemiology of acute respiratory tract infections (ARI) among children under five years old attending Tikrit General Teaching Hospital. MEJFM, 4, (3).

Zwi, J.M., Pettifior, Soderlund, N. (1999). Paediatric Hospital Admissions at a South African Urban Regional Hospital: The Impact of HIV, 1992-1997. Ann Trop Paediatr, 19(2), 135 – 42.