International Journal of Current Research in Medical Sciences
ISSN: 2454-5716
www.ijcrims.com
Volume 2, Issue 7 -2016

Original Research Article

SOI: http://s-o-i.org/1.15/ijcrms-2016-2-7-8

Prevalence of acute respiratory infection and related risk factors in school-age children in Egypt: a cross-sectional study

Fouad M. A. Yousef* and Ahmed Fathy Hamed

Public Health and Community Medicine Department, Sohag Faculty of Medicine, Sohag University.
***Corresponding author:** Dr. Fouad M.A. Yousef,
Assistant professor Public Health and Community Medicine
E mail: *fouad3s@yahoo.com*, **Tel:** +201277601847

Abstract

The aim of this study is to detect the prevalence of ARI in school children and their related risk factors. This cross-sectional study was conducted in Sohag and Qena governorates, Upper Egypt. A questionnaire was presented to randomly selected students. The questionnaire consisted of two domains to find the prevalence of ARI and to examine their potential risk factors. The prevalence of ARI in school children was 44.86%. Common symptoms were runny nose (39.49%), cough (38.95%), fever (32.17%) and sore throat (27.93%). The associated risk factors were young age, urban residence, passive smoking, exposure to infection, parents' education, overcrowding, family history of allergy or asthma, no special place for kitchen, absence of window in bedroom, absence of smoke outlet and presence of pets in the house. There was no significant relation between gender, building or floor material and type of fuel used and risk of ARI. In conclusion**,** ARI infection is an important health problem in school children. Many environmental factors were associated with increased risk of ARI. Improvement of kitchen facilities, proper ventilation of houses and school classes and housing environment and health education on the preventive measure of ARI may help in reduction of ARI infection among school children.

Keywords: ARI, prevalence, risk factors, school, and Egypt**.**

Introduction

Acute respiratory tract infection (ARI) is a common health problem and one of the leading causes of infectious disease morbidity and mortality in the world (WHO., 2007). Approximately one in three respiratory episodes were associated with a doctor's visit, and one in four necessitated time off school or work (Leder et al., 2003). Inappropriate antibiotic use for treating ARI is an important contributor to antibiotic resistance (CDC., 2013). The risk factors of ARI include young age (Nasanen-Gilmore et al., 2015), parental smoking (Bielska et al., 2015; Cook and Strachan, 1997; Pandey et al., 2016; Sikolia DN and Kurui J, 2002; Ujunwa and Ezeonu, 2014) and exposure to persons with respiratory complaints (van Gageldonk-Lafeber et al., 2007). Parents' education (Goel et al., 2013; Pandey et al., 2016; Prajapati et al., 2011; Savitha et al., 2007; Suguna et al., 2014; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014), family history of allergy (Suguna et al., 2014) or bronchial asthma (Mathew et al., 2015; Suguna et al., 2014) were reported as a risk factors for ARI.

Many environmental risk factor related to overcrowded houses (Goel et al., 2013; Montasser et al., 2012; Pandey et al., 2016; Prajapati et al., 2011; Savitha et al., 2007; Sikolia DN and Kurui J, 2002; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014), inadequate ventilation (Claudio et al., 2016; Goel et al., 2013; Savitha et al., 2007; Sikolia DN and Kurui J, 2002; Suguna et al., 2014; Taksande and Yeole, 2015), improper housing condition (Taksande and Yeole, 2015), use of household biomass fuel (Nasanen-Gilmore et al., 2015; Po et al., 2011; Ramani et al., 2016; Savitha et al., 2007; Sikolia DN and Kurui J, 2002; Smith et al., 2000; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014), presence of hey or farm animal, birds and pets (Ramani et al., 2016) were also reported to be risk factors of ARI. Many studies were reported the prevalence of ARI and their risk factors in children under-five worldwide (Goel et al., 2013; Pandey et al., 2016; Prajapati et al., 2012; Prajapati et al., 2011; Ramani et al., 2016; Sikolia DN and Kurui J, 2002; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014; Vardanyan et al., 2013) and in Egypt (Khalek and Abdel-Salam, 2016; Montasser et al., 2012). In spite of being common in school children, only few studies (Mandlik et al., 2015; Mathew et al., 2015; Suguna et al., 2014) reported the prevalence of ARI in school children. The prevalence of ARI in school children were high ranged from 46-51%. To our knowledge no study reported the prevalence of ARI in school children in Egypt. The aim of this study is to detect the prevalence of ARI in school children in Sohag and Qena governorates, upper Egypt and their related risk factors.

Participants and Methods

Study design

This was a cross-sectional study.

Study setting

The study was conducted during the academic school year 2015-2016 in Sohag and Qena Governorates -two of the nine governorates in the south of Egypt - Egypt consists of 27 governorates. Sohag consists of 12 municipalities; the total surface area of Sohag is 11,218 km^2 with a total population of 4,694,768 citizens according to Egyptian Central Agency for Public Mobilization and Statistics report in 2015. The total number of students in primary schools in Sohag was 171,468 students in 2014–2015. The total surface area of Qena is 10,798 Km^2 with a population of 3,102,665 citizens. Qena consists of 2 big cities and 11 districts. The total number of students in primary schools in Qena was 132,659 students in 2014–2015.

Questionnaire

A questionnaire was designed for this study after examining previous studies (Koch et al., 2003; Ramani et al., 2016; Sikolia DN and Kurui J, 2002; Suguna et al., 2014; van Gageldonk-Lafeber et al., 2007) on prevalence and risk factors of ARI in children. After obtaining approval of the local ethical committees of Sohag faculty of medicine, and the concerned education authorities in both governorates, the questionnaire was first presented to a small sample of 100 students to test its validity. After making necessary changes, the final version of the questionnaire was presented to randomly selected students who were willing to participate in the study. The questionnaires were completed by the students themselves or by their parents anonymously. An informed consent was obtained from parents of the participants. The questionnaire consisted of two domains. The first domain included questions about presence of any ARI symptoms in the preceding two weeks before the interview. The second domain included questions about potential risk factors for ARI. Student-related factors included: age of the student, gender, residence, exposure to passive smoker and exposure to infection at home or at school. Family related factors included: parents' level of education and work, number of person per room, and family history of asthma or allergy. Environment related factors included: building and ground material, type of fuel used, kitchen location, presence of window in bedroom, presence of source of smoke as oven, smoke outlet, hey, pets, bird or farm animals in the house.

Sample size calculation

Using intercooled STATA program version 12.1., Sample size was calculated for one-sample comparison of proportion to hypothesized value. Based on the prevalence of ARI 51% (Suguna et al., 2014) and alternative prevalence of 46% (Mandlik et al., 2015) with assumptions of α = 0.05 (two-sided), power = 0.90, the estimated required sample size was 1048 subjects. For robust result, twelve school were selected randomly from three districts in Sohag (Akmeim, El-Balina, and Gehena) and three districts in Qena (Abo teshet, Qena, and Quoes); two schools from each district (rural and urban) were included. One class from each grade was randomly selected (i.e. eight classes were selected from each school, two from kindergarten and six from primary grade). The total number of the students from these twelve primary schools was 5368 of them 4822 students were participate with response rate of 89.83%.

Statistical analysis

Statistical analysis was performed using intercooled STATA program version 12.1. Categorical variables were examined using Pearson Chi-square test. Univariate and multivariate logistic regression analyses was used to calculate the odds ratio (95 % confidence interval) to determine different risk factors of ARI. Level of significance was set to 0.05.

Results

The study included 4822 students, 8.22 ± 2.39 years old (range 4-12), from twelve primary schools in Sohag and Qena. There were 2443 (50.66 %) student from Sohag and 2379 (49.34 %) from Qena. There were 2383 (49.42%) students from rural areas and 2439 (50.58%) from urban areas. The number of male students was 2461 (51.04%), while the number of female students was 2361 (48.96%). A total of 2163 out of the 4822 students (44.86%) had ARI. The prevalence of ARI was 45.35% in Sohag and 44.35% in Qena, with no significant difference between the two governorates (p = 0.48).

The manifestations of ARI during last two weeks before the interview were shown in table (1). Common symptoms were runny nose (39.49%), cough (38.95%), fever (32.17%) and sore throat (27.93%).

Table (1): Manifestation of respiratory tract infection among studied population

Manifestation of ARI	Number (%)
Runny nose	1904 (39.49%)
Cough	1878 (38.95%)
Fever	1551 (32.17%)
Sore throat	1347 (27.93%)
Chest tightness	720 (14.93%)
Ear discharge	530 (10.99%)
Wheezing	486 (10.08%)
Any ARI manifestation	2163 (44.86%)

Table (2) shows the distribution of ARI and its association to students related risk factors. The younger age categories showed higher prevalence of ARI than in older age categories. There was no significant relationship between gender and prevalence of ARI. The prevalence of ARI was higher in urban than rural area, the adjusted odds ratio was 1.26. Exposure to passive smoking, to ARI in home or school were also associated with increased risk of ARI. The adjusted odds were 1.67, 2.04 and 5.27 respectively.

Table (2): Association between students related risk factors and ARI

Characteristics	Total Number (%)	Prevalence of ARI Number (%)	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
Age/ year						
4-	728 (15.10%)	363 (49.86%)	1.44 (1.22-1.71)	<0.0001	1.60 (1.32-1.95)	<0.0001
6-	1872 (38.82%)	894 (47.76%)	1.33 (1.17-1.50)	<0.0001	1.32 (1.02-1.72)	0.04
≥9	2222 (46.08%)	906 (40.77%)	Reference		Reference	
Gender						
Females	2361 (48.96%)	1063 (45.02%)	Reference		Reference	
Males	2461 (51.04%)	1100 (44.70%)	0.99 (0.88-1.10)	0.82	0.95 (0.80-1.11)	0.51
Residence						
Rural	2383 (49.42%)	997 (41.84%)	Reference		Reference	
Urban	2439 (50.58%)	1166 (47.81%)	1.27 (1.14-1.43)	<0.0001	1.26 (1.04-1.53)	0.02
Passive smoking						
No	1362 (28.25%)	305 (22.39%)	Reference		Reference	
Yes	3460 (71.75%)	1858 (53.70%)	4.02 (3.48-4.64)	<0.0001	1.67 (1.41-1.99)	<0.0001
Home exposure to ARI						
No	2881 (59.75%)	796 (27.63%)	Reference		Reference	
Yes	1941 (40.25%)	1367 (70.43%)	6.24 (5.49-7.08)	<0.0001	2.04 (1.64-2.52)	<0.0001
School exposure to ARI						
No	2478 (51.39%)	427 (17.23%)	Reference		Reference	
Yes	2344 (48.61%)	1736 (74.06%)	13.71 (11.93-15.76)	<0.0001	5.27 (4.21-6.62)	<0.0001

CI=confidence interval

Table (3) shows that the father education and mother education were inversely related with the prevalence of ARI. There was no relationship between father or mother work and the occurrence of ARI. The higher the number of persons per room the higher the prevalence of ARI. Family history of bronchial asthma and allergy were also associated with increased risk of ARI in school students.

Table (3): Association between family related risk factors and ARI

Characteristics	Total Number (%)	Prevalence of ARI Number (%)	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
Father education						
Illiterate	627 (13.00%)	427 (68.10%)	3.47 (2.88-4.20)	<0.0001	3.56 (2.60-4.88)	<0.0001
Read and write	1007 (20.88%)	486 (48.10%)	1.52 (1.30-1.77)	<0.0001	1.58 (1.35-2.08)	<0.0001
Primary-preparatory	1039 (21.55%)	432 (41.58%)	1.16 (0.99-1.35)	0.06	1.02 (0.92-1.30)	0.45
Secondary and higher	2149 (44.57%)	818 (38.06%)	Reference		Reference	
Mother education						
Illiterate	640 (13.27%)	430 (67.19%)	3.23 (2.67-3.91)	<0.0001	3.45 (2.18-4.23)	<0.0001
Read and write	921 (19.10%)	436 (47.34%)	1.42 (1.21-1.67)	<0.0001	1.58 (1.35-1.85)	<0.0001
Primary-preparatory	1531 (31.75%)	626 (40.89%)	1.09 (0.95-1.26)	0.71	1.09 (0.92-1.28)	0.33
Secondary and higher	1730 (35.88%)	671 (38.79%)	Reference		Reference	
Father work						
Not work for cash	93 (1.93%)	41 (44.09%)	Reference		Reference	
Work for cash	4729 (98.07%)	2122 (44.87%)	1.03 (0.68-1.56)	0.88	1.01 (0.55-1.86)	0.96
Mother work						
Not work for cash	3320 (68.85%)	1495 (45.03%)	Reference		Reference	
Work for cash	1502 (31.15%)	668 (44.47%)	0.98 (0.86-1.11)	0.72	1.21 (0.97-1.46)	0.16
Persons/room						
1	525 (10.89%)	156 (29.71%)	Reference		Reference	
2	2246 (46.58%)	778 (34.64%)	1.25 (1.02-1.54)	0.03	2.24 (1.64-3.04)	<0.001
≥3	2051 (42.53%)	1229 (59.92%)	3.53 (2.88-4.35)	<0.0001	2.37 (1.70-3.30)	<0.0001
Family history of allergy						
No	3736 (77.48%)	1374 (36.78%)	Reference		Reference	
Yes	1086 (22.52%)	789 (72.65%)	4.57 (3.93-5.30)	<0.0001	1.67 (1.32-2.13)	<0.0001
Family history of bronchial asthma						
No	3643 (75.55%)	1278 (35.08%)	Reference		Reference	
Yes	1179 (24.45%)	885 (75.07%)	5.57 (4.80-6.46)	<0.0001	1.69 (1.34-2.13)	<0.0001

Table (4): Association between family related risk factors and ARI

Characteristics	Total Number (%)	Prevalence of ARI Number (%)	Odds ratio (95% CI)	P value	Odds ratio (95% CI)	P value
Building material						
Cemented	4409 (91.44%)	1967 (44.61%)	1.12 (0.92-1.37)	0.27	1.09 (0.88-1.36)	0.43
Mud	413 (8.56%)	196 (47.46)				
Ground material						
Tiles or ceramic	4387 (90.98%)	1945 (44.34%)	Reference		Reference	
Soil	435 (9.02%)	218 (50.11%)	1.26 (1.04-1.53)	0.02	1.25 (0.93-1.78)	0.24
Fuel used						
Gas/LPG	4343 (90.07%)	1816 (41.81%)	Reference		Reference	
Kerosene/others	479 (9.93%)	347 (72.44%)	3.65 (2.96-4.51)	<0.0001	1.17 (0.87-1.57)	0.30
Kitchen location						
Separate place	2372 (49.19%)	450 (18.97%)	Reference		Reference	
Not separate	2450 (50.81%)	1713 (69.92%)	9.93 (8.68-11.35)	<0.0001	7.34 (5.19-10.38)	<0.0001
Presence of source of smoke						
No	1301 (26.98%)	501 (38.51%)	Reference		Reference	
Yes	3521 (73.02%)	1662 (47.20%)	1.43 (1.25-1.63)	<0.0001	1.28 (1.10-1.51)	0.002
Window in bed room						
Yes	3879 (80.44%)	1330 (34.29%)	Reference		Reference	
No	943 (19.56%)	833 (88.34%)	14.51 (11.77-17.90)	<0.0001	3.07 (2.35-4.01)	<0.0001
Hey in house						
No	1951 (40.46%)	542 (27.78%)	Reference 3.37	<0.0001	Reference 1.28	0.29
Yes	2871 (59.54%)	1621 (56.46%)	(2.98-3.81)		(0.81-2.01)	
Pets,Bird or animal farm						
No	1798 (37.29%)	415 (23.08%)	Reference		Reference	
Yes	3024 (62.71%)	1748 (57.80%)	4.56 (4.00-5.21)	<0.0001	1.71 (1.23-2.38)	0.002
Smoking outlet						
Yes	2507 (51.99%)	609 (24.29%)	Reference		Reference	
No	2315 (48.01%)	1554 (67.13%)	6.36 (5.61-7.22)	<0.0001	1.77 (1.44-2.16)	<0.0001

Table 4 shows that, after adjustment to other factors, there was no association between building or floor material and type of fuel used and risk of ARI in school children. Children living in houses where Kitchen was not separated from living room had eight times increased risk than those separate from living rooms. Absence of window in bed room was associated with four times increased risks of ARI. Presence of source of smoke, hey, pets, birds or animal farms and absence of smoking outlet were also associated with increased risk of ARI.

Discussion

Acute respiratory tract infection (ARI) is a common health problem and one of leading causes of infectious disease morbidity and mortality in the world (WHO., 2007). In spite of being common in school children, only few studies (Mandlik et al., 2015; Mathew et al., 2015; Suguna et al., 2014) reported the prevalence of ARI in school children. The prevalence of ARI in school children reported by these studies were high ranged from 46-51%. Our study is the first study that report the prevalence of ARI in Egypt and it showed high prevalence of ARI in school children (51.23%). However, our study was based on symptoms that were reported by participant two week before interview, not on clinical diagnosis by physician.

Many studies reported decrease incidence of ARI with increased age in under-five children (Nasanen-Gilmore et al., 2015; Ramani et al., 2016) and one study (Suguna et al., 2014) showed similar finding in school children. Our study also showed that younger age categories showed higher prevalence of ARI than in older age categories. Similar to a previous study (Suguna et al., 2014), our study showed no significant relationship between gender and prevalence of ARI.

In this study, the prevalence of ARI was higher in urban than rural area. This finding is similar to finding from a study in Egypt (Khalek and Abdel-Salam, 2016). Studies from other countries showed contrary results, some showed high prevalence of ARI in rural areas (Deb, 1998; Goel et al., 2013; Prajapati et al., 2012) and others in urban area (Deb, 1998; Ujunwa and Ezeonu, 2014). This may be due to difference in weathers, location or population characteristics.

Only one study (Suguna et al., 2014) examined the risk factors of ARI in school children and reported mother's education, family history of allergic disorder and asthma, absence of smoke outlet in kitchen and windows in sleeping room as risk factors of ARI children. Our results showed similar finding. We found that parents' education, family history of bronchial asthma and allergy were also associated with increased risk of ARI in school students. We also found that children living in houses where Kitchen was not separated from living room had eight times increase risk than those separate from living rooms. Absence of window in bed room was associated with four times increased risks of ARI. Similar to our results, previous studies about risk factors of ARI in infant and preschool children were also reported parent education (Goel et al., 2013; Pandey et al., 2016; Prajapati et al., 2011; Savitha et al., 2007; Suguna et al., 2014; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014), family history of bronchial asthma and allergy (Mathew et al., 2015; Suguna et al., 2014) , overcrowding (Goel et al., 2013; Montasser et al., 2012; Pandey et al., 2016; Prajapati et al., 2011; Savitha et al., 2007; Sikolia DN and Kurui J, 2002; Taksande and Yeole, 2015; Ujunwa and Ezeonu, 2014) , inadequate ventilation (Claudio et al., 2016; Goel et al., 2013; Savitha et al., 2007; Sikolia DN and Kurui J, 2002; Suguna et al., 2014; Taksande and Yeole, 2015) as risk factors of ARI.

On the other hand, the study examined risk factors of ARI (Suguna et al., 2014) showed no significant association between ARI, pets, passive smoking. Our study showed different finding, we found the presence of pets, bird and any of animal farms or passive smoking were associated with increased risk for ARI. Many studies that examined risk factors of ARI in infant and preschool children supported our finding as regard association of passive smoking (Bielska et al., 2015; Cook and Strachan, 1997; Pandey et al., 2016; Sikolia DN and Kurui J, 2002; Ujunwa and Ezeonu, 2014) and presence of pets (Ramani et al., 2016) with the increased risk of ARI.

Other studies that examined risk factors of ARI in infant and preschool also identified that exposure to infection in home or day care centers (Koch et al., 2003; Nafstad et al., 1999; van Gageldonk-Lafeber et al., 2007), improper housing condition (Taksande and Yeole, 2015), presence of source of smoke (Nasanen-Gilmore et al., 2015; Smith et al., 2000) were also associated with increased risk of ARI. Similar findings were found in our study especially for exposure to ARI in school (the adjusted odds was 5.27). Presence of source of smoke, absence of smoking outlet also associated with increased risk of ARI.

In this study there was no relationship of the risk of ARI and parent's work, between building or floor material or type of fuel used and risk of ARI in school children. This may differ from other studies. Our finding may be due to improved housing construction material and type of fuel used.

Conclusion

The prevalence of symptoms of ARI infection in school children was high (51%). May risk factors were found. The most import factors were no separation of kitchen, exposure to ARI at school, and absence of window in bed room. Improvement of kitchen facilities, proper ventilation of houses and school classes and housing environment and health education on the preventive measure of ARI such as living in well-ventilated houses, opening the windows, avoidance of overcrowding and the of indoor air pollution may help in reduction of ARI infection among school children.

References

Bielska, D.E., D. Kurpas, A. Nitsch-Osuch, E. Gomolka, E. Oldak, S. Chlabicz, and A. Owlasiuk. 2015. Exposure to environmental tobacco smoke and respiratory tract infections in pre-school choldren-a cross-sectional study in Poland. Annals of Agricultural and Environmental Medicine. 22.

CDC. 2013. Antibiotic resistance threats in the United States, 2013. Centres for Disease Control and Prevention, US Department of Health and Human Services.

Claudio, L., G.A. Rivera, and O.F. Ramirez. 2016. Association Between Markers of Classroom Environmental Conditions and Teachers' Respiratory Health. Journal of School Health. 86:444-451.

Cook, D.G., and D.P. Strachan. 1997. Health effects of passive smoking. 3. Parental smoking and prevalence of respiratory symptoms and asthma in school age children. Thorax. 52:1081-1094.

Deb, S.K. 1998. Acute respiratory disease survey in Tripura in case of children below five years of age. Journal of the Indian medical association. 96:111-116.

Goel, K., S. Ahmad, G. Agarwal, P. Goel, and V. Kumar. 2013. A cross sectional study on prevalence of acute respiratory infections (ARI) in under-five children of Meerut district, India. Journal of Community Medicine & Health Education. 2012.

Khalek, E.M.A., and D.M. Abdel-Salam. 2016. Acute respiratory tract infections in children under 5 years of age in Upper Egypt. International Journal of Community Medicine and Public Health. 3:1161-1166.

Koch, A., K. Mølbak, P. Homøe, P. Sørensen, T. Hjuler, M.E. Olesen, J. Pejl, F.K. Pedersen, O.R. Olsen, and M. Melbye. 2003. Risk factors for acute respiratory tract infections in young Greenlandic children. American Journal of Epidemiology. 158:374-384.

Leder, K., M.I. Sinclair, T.Z. Mitakaki, M.E. Hellard, A. Forbes, and C.K. Fairley. 2003. A community-based study of respiratory episodes in Melbourne, Australia. Australian and New Zealand journal of public health. 27:399-404.

Mandlik, R., S. Chiplonkar, V. Khadilkar, S. Phanse-Gupte, Z. Mughal, V. Patwardhan, and A. Khadilkar. 2015. Prevalence of infections among 6-16 years old children attending a semi-rural school in Western Maharashtra, India. Indian Journal of Child Health. 2:182-186.

Mathew, P., E. Indiradevi, U. Soniya, S.B. Poonnen, S.T. Alex, and S. Solomon. 2015. Prevalence and risk factors for respiratory morbidity, among high school students of South India.

Montasser, N., R. Helal, and R. Rezq. 2012. Assessment and classification of acute respiratory tract infections among Egyptian rural children. British Journal of Medicine and Medical Research. 2:216.

Nafstad, P., J.A. Hagen, L. Øie, P. Magnus, and J.J. Jaakkola. 1999. Day care centers and respiratory health. Pediatrics. 103:753-758.

Nasanen-Gilmore, S., S. Saha, I. Rasul, and E.K. Rousham. 2015. Household environment and behavioral determinants of respiratory tract infection in infants and young children in northern bangladesh. American Journal of Human Biology. 27:851-858.

Pandey, D.C., J. Abbas, and A.K. Agrawal. 2016. A Hospital Based Cross Sectional Study on Prevalence of Acute Respiratory Infections (ARI) in Under Five Children of Lucknow District. International Journal of Scientific Research. 4.

Po, J.Y., J.M. FitzGerald, and C. Carlsten. 2011. Respiratory disease associated with solid biomass fuel exposure in rural women and children: systematic review and meta-analysis. Thorax. 66:232-239.

Prajapati, B., N. Talsania, M. Lala, and K. Sonalia. 2012. A study of risk factors of acute respiratory tract infection (ARI) of under five age group in urban and rural communities of Ahmedabad District, Gujarat. Health line. 3:16-20.

Prajapati, B., N. Talsania, and K. Sonaliya. 2011. A study on prevalence of acute respiratory tract infections (ARI) in under five children in urban and rural communities of Ahmedabad district, Gujarat. Natl J Community Med. 2:255-259.

Ramani, V.K., J. Pattankar, and S.K. layanapaapalya Puttahonnappa. 2016. Acute Respiratory Infections among Under-Five Age Group Children at Urban Slums of Gulbarga City: A Longitudinal Study.

Savitha, M., S. Nandeeshwara, M.P. Kumar, and C. Raju. 2007. Modifiable risk factors for acute lower respiratory tract infections. The Indian Journal of Pediatrics. 74:477-482.

Sikolia DN, M.K., Cherop H, Hussein A, Juma M,, and B.A. Kurui J, Seki I, Osaki Y. 2002. The prevalence of acute respiratory infections and the associated risk factors: a study of children under five years of age in Kibera Lindi village, Nairobi, Kenya. J. Natl. Inst. Public Health. 51:1.

Smith, K.R., J.M. Samet, I. Romieu, and N. Bruce. 2000. Indoor air pollution in developing countries and acute lower respiratory infections in children. Thorax. 55:518-532.

Suguna, E., S.G. Kumar, and G. Roy. 2014. Prevalence and risk factors of acute respiratory infection among school children in coastal South India. Journal of global infectious diseases. 6:95.

Taksande, A.M., and M. Yeole. 2015. Risk factors of Acute Respiratory Infection (ARI) in under-fives in a rural hospital of Central India. Journal of Pediatric and Neonatal Individualized Medicine (JPNIM). 5:e050105.

Ujunwa, F., and C. Ezeonu. 2014. Risk Factors for Acute Respiratory Tract Infections in Under‐five Children in Enugu Southeast Nigeria. Annals of medical and health sciences research. 4:95-99.

van Gageldonk-Lafeber, A.B., M.A. van der Sande, M.-L.A. Heijnen, M.F. Peeters, A.I. Bartelds, and B. Wilbrink. 2007. Risk factors for acute respiratory tract infections in general practitioner patients in The Netherlands: a case-control study. BMC infectious diseases. 7:1.

Vardanyan, L., A. Demirchyan, and A. Giloyan. 2013. Risk Factors Related to Complications of Acute Respiratory Infections among Children under Five Years Old in Yerevan, Armenia.

WHO. 2007. Infection prevention and control of epidemic-and pandemic-prone acute respiratory diseases in health care: WHO interim guidelines.

How to cite this article:
Fouad M. A. Yousef and Ahmed Fathy Hamed. (2016). Prevalence of acute respiratory infection and related risk factors in school-age children in Egypt: a cross-sectional study. Int. J. Curr. Res. Med. Sci. 2(7): 50-58.