Original Article

Determinants of acute respiratory infections among under five children in a rural area of Tamil Nadu, India

A. K. Savitha[1], S. Gopalakrishnan[1]

[1]Department of Community Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India

Abstract

Introduction: Acute respiratory infection (ARI) is an infection of the respiratory tract. It may interfere with normal breathing of the individual and is communicable in nature. There are several modifiable risk factors that predispose younger age group of children to ARI. The aim of this study is to evaluate the risk factors that contribute to occurrence of ARI among the under 5 children. **Methods:** This community based cross sectional study was carried out among 380 rural under five children in Kancheepuram district, by systematic random sampling method. A pretested structured questionnaire was used for data collection that was analyzed using SPSS software version 16. The analytical statistics such as Chi – square test, Odds Ratio, and Confidence Interval were used to determine the association of ARI with its determinants. **Results:** In this study, the prevalence of ARI among under five children was 41.6%.The prevalence of ARI was predominant among boys (50.6%) and those residing in semi pucca and kutcha type of house (50.3%) with poor ventilation (61.3%), history of parental smoking (57%), respiratory infection among family members (51.1%) children who did not cry immediately after birth because of any complication (60.9%), and malnourished children (66.4%). These factors contributed to increased prevalence of ARI with a statistically significant association with a *P* value < 0.05. **Conclusion:** The high prevalence of ARI in this study was contributed by multiple factors. The primary care physician can play a vital role to create awareness on hazards because of exposure to the various contributing factors by lifestyle modifications, good nutrition, and healthy and safe environment.

Keywords: Acute respiratory infection, preschool children, risk factors

Introduction

Acute respiratory infection (ARI) is an infection of the respiratory tract. It may interfere with normal breathing of the individual and is communicable in nature.[1] Every year ARIs account for over 12 million hospital admissions among children below five years of age.[2] Globally, lower respiratory infections caused more than 2 to 6 million death, attributing to fifth leading cause of death overall and the leading cause of death in children below five years of age.[3] Upper respiratory tract infections such as common cold, pharyngitis, and otitis media are more common among children and few such conditions peak from infancy to 5 years. Boys below 3 years of age are more affected frequently and severely.[4]

There are risk factors that predispose younger age group of children to ARI. Majority of the risk factors are modifiable. The environmental factors and housing standards play a major role in acquiring ARI among children. Children are more affected especially in developing countries because of low-birth weight and malnutrition is a major problem.[4] The various risk factors for acute respiratory infections is given in Table 1.[5,6]

Vaccines are available against the causative organisms of ARI that are a potential intervention against ARI. The vaccines available for ARI in universal immunisation program are for Diphtheria,

Address for correspondence: Dr. A. K. Savitha, Department of Community Medicine, Sree Balaji Medical College and Hospital, Bharath Institute of Higher Education and Research, Chrompet, Chennai - 600 044, Tamil Nadu, India.
E-mail: drsavitha22@gmail.com

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_131_18

How to cite this article: Savitha AK, Gopalakrishnan S. Determinants of acute respiratory infections among under five children in a rural area of Tamil Nadu, India. J Family Med Prim Care 2018;7:1268-73.

Pertussis, Measles, and Hemophilus influenza b (Hib). Vitamin A solution is administered from 9 months of age along with measles rubella vaccine.[4,7]

The target of the fourth Millennium Development Goals (MDGs) was to reduce the mortality among children below five years of age in India by two thirds between 1990 to 2015.[8] As remarkable milestones have been achieved through the MDGs, the Sustainable Developmental Goals (SDGs) will favor in reducing ARI among children by ending all forms of hunger and malnutrition (Goal 2), by providing access to safe and effective medicines and vaccines to all (Goal 3) and access to clean water and sanitation (Goal 6).[9]

Many proven strategies have been implemented to combat the burden of ARI. The Global Action Plan for Prevention and Control of pneumonia and Expert group on childhood pneumonia are two such strategies.[10] The Integrated Management of Childhood Illness is a strategy developed by WHO and UNICEF for management of childhood illness such as ARI, and other preventable disease by appropriate prevention and promotion activities. It is one of the main interventions under Reproductive child health II/National Rural Health Mission and is implemented at the level of household, through Auxillary nurse midwifery at sub-center level and through medical officers and nurse at primary health-care level.[4]

Because the epidemiology of ARI is associated with so many modifiable risk factors and more data are not available regarding its present status in the study area, this study was done to evaluate the risk factors that contribute to occurrence of ARI among the under 5 children in the field practice area of a medical college in Kancheepuram district of Tamil Nadu.

Methods

Study design

This study is a community based cross–sectional descriptive study.

Study area and study population

The study was done in Sripuram, rural field practise area attached to a Medical College and Hospital. The total population of Sripuram is 36,830. The study was done among under five children (0–60 months) in the study area. The number of under 5 children residing in this area is 3,494. The informant was the mother of the child. The study was carried out from August 2016 to August 2017.

Sample size and sampling technique

The sample size was calculated to be 380 using the formula $Za^2pq/[L]^2$ with an allowable error of 10% of P, at 95% CI, and 10% for non-response. This was calculated from the reference value from another study done in a similar setting by Kumar *et al*.[11]

The sampling method used was Systematic Random Sampling. The total population of Sripuram is 36,830. The number of under 5 children residing in this area is 3,494. The sampling interval (3,494/380) is 9. A random number below 9 was drawn by lottery method and chosen as 5. The first sampling unit was the 5th child enumerated in the list. Then it was preceded by adding 9 to it to select rest of the children from the sampling frame enlisted in geographical order until the sample size of 380 was obtained.

Inclusion and exclusion criteria

The inclusion criteria for the study were any child belonging to 0–60 months of age residing with their families in Sripuram area, and whose parents were willing to participate in the study. The exclusion criteria for not including in the study were of those parents who were unwilling to participate in the study with their child, and those who are not permanent residents of the study area.

Study tool and data collection

A pretested semi-structured questionnaire was used to interview the child's mother, who was the informant in the study. The data were collected by the investigators by making house to house visit of the study participants. In case the child was admitted in an Anganwadi center or school, a cumulative list was made by the field staff, and they were interviewed at their respective house during the weekends. Data were collected for a period of 4 months from September 2016 to December 2016.

Statistical analysis

The data analysis was carried out using SPSS for Windows, version 16.0 (Manufactured by SPSS Inc. Chicago, USA). The analytical statistics used were Chi – square test, Odds Ratio (OR), and Confidence Interval to determine the association of ARI with its determinants. Differences in proportions were compared using the Chi-square test, and the significance level was set at $P < 0.05$.

Ethical approval, Informed consent, and support

The study was carried out after obtaining approval from the Institutional Ethics Committee. The parents were briefed

Table 1: Risk factors for acute respiratory infection

Definite risk factors	Likely risk factors	Possible risk factors
Malnutrition	Zinc deficiency	Vitamin A deficiency
Non-exclusive breast feeding practices	Parental smoking	Day care attendance
Lack of measles immunisation	Mothers inexperience in raising the child	Young age
Exposure to air pollution such as biomass smoke	Other concomitant diseases such as asthma and diarrhea	Birth order
Low-birth weight		Cold weather or rainfall
Crowding		Outdoor pollution

about the study, and informed consent was obtained before data collection. As part of the logistics support, the materials, manpower, and other resources required for conducting the study was provided by the institution.

Results

In this study, the prevalence of ARI among 380 under five children is 41.6% (158) depending on presence of any symptoms of ARI, two weeks prior to the date of visit. There is a statistically significant association between gender and occurrence of ARI. Approximately, 50.6% of male children had ARI when compared to 33.5% of female children with an OR of 2.0 (1.3–3.0) that was statistically significant ($x^2 = 11.3$, $P = 0.001$) [Table 2].

Approximately, 50.3% of children residing in a semi pucca or kutcha type of house had ARI compared to 35% of children with ARI living in pucca houses, which is statistically significant ($x^2 = 8.9$, $P = 0.003$) with OR of 1.8 (1.2–2.8). Among the study subjects, 61.3% of children were without a source of air exhaust and 39.8% with a source of air exhaust had ARI, and this association was statistically significant ($x^2 = 5.3$, $P = 0.020$) with an OR of 2.3 (1.1 – 5.0) [Table 3].

A significant association was found between history of parental smoking and occurrence of ARI ($x^2 = 4.3$, $P = 0.038$) with an OR of 1.6 (1.0–2.6).There was a significant association between history of family members who had respiratory infection and ARI among under five children residing in the same house ($x^2 = 20.5$, $P = 0.000$) with an OR of 2.6 (1.7–4.1) [Table 4].

Among the study subjects, 43.4% of children with delayed initiation of breast feeding and 40.5% of children with early initiation of breast feeding had ARI. However, this was not statistically significant ($x^2 = 0.2$, $P = 0.585$).

Approximately, 45.5% of children who were above 6 months of age and not exclusively breastfed had ARI compared to 42.2% of children who were exclusively breastfed. There was no statistical significant association between both ($x^2 = 0.1$, $P = 0.690$) [Table 5].

Table 6 shows that about 60.9% of children who did not cry immediately after birth due to respiratory difficulties and 39.3% children who cried immediately after birth had ARI. This association was statistically significant ($x^2 = 4.1$, $P = 0.041$) with an OR of 2.4 (1.0–5.7). Approximately, 66.4% of malnourished children and 26.6% of children who were of normal weight for age had ARI. A statistically significant association was found between the occurrence of ARI and malnutrition ($x^2 = 58.3$, $P = 0.001$) with an OR of 5.4 (3.4 – 8.5).

Discussion

This study done among 380 children in the age group of 0 to 60 months in the study area of Sripuram shows the prevalence of ARI to be 41.6%. Among the children affected with ARI, various risk factors were evaluated, and statistically significant association was found between them.

In this study, higher proportion of boys (50.6%) was reported to have ARI when compared to girls (33.5%). The association between gender and ARI is statistically significant. Various studies carried out by Choube *et al.*, Prajapati *et al.*, Goel *et al.*, and Leeder *et al.* report that male children are more prone to ARI when compared to female children.[12-14] The probable reason that there is predominance among male children could be because of the tendency of male children to play outside home gets them exposed to infected aerosols from the surrounding outdoor environment when compared to female children.

Regarding the association between history of parental smoking and ARI, higher proportions (51.1%) of children were reported to suffer from one or more symptoms of ARI when compared to children (38.7%) with no such history. In a study done by Sharma *et al.*, 55.6% of children with history of parental smoking were reported to have ARI, and this association was statistically significant (*P* value – 0.03).[15] In a study carried out by Goel

Table 2: Association between acute respiratory infection and socio-demographic variables of the study participants

Characteristics	*n*=380	ARI among under 5 children, *n* (%)	χ^2	*P*	OR	95% CI
Age of child (years)						
<2	262	111 (42.4)	0.2	0.643	1.1	0.7-1.7
2-5	118	47 (39.8)				
Sex						
Male	180	91 (50.6)	11.3	0.001*	2.0	1.3-3.0
Female	200	67 (33.5)				
Educational status of mother						
Illiterate	23	11 (47.8)	0.3	0.531	1.3	0.5-3.0
Literate	357	147 (41.2)				
Socio-economic status						
Upper class	41	13 (31.7)	4.3	0.222	-	-
Upper- middle class	153	59 (38.6)				
Middle class	126	56 (44.4)				
Lower-middle class	60	30 (50.0)				

*P value statistically significant at <0.05; ARI: Acute respiratory infection; CI: Confidence interval; OR: Odds ratio

Table 3: Association between acute respiratory infection and housing characteristics of the study participants

Characteristics	*n*=380	ARI among under 5 children, *n* (%)	χ^2	*P*	OR	95% CI
Type of house						
Semi pucca/kutcha	163	82 (50.3)	8.9	0.003*	1.8	1.2-2.8
Pucca	217	76 (35)				
Cooking fuel						
Others (coal, wood, etc.)	37	18 (48.6)	0.8	0.358	1.3	0.6-2.7
LPG/electricity	343	140 (40.8)				
Chimney/window in kitchen						
Not available	31	19 (61.3)	5.3	0.020*	2.3	1.1-5.0
Available	349	139 (39.8)				
Cross ventilation						
Inadequate	90	43 (47.8)	1.8	0.172	1.3	0.8-2.2
Adequate	290	115 (39.7)				
Overcrowding						
Yes	324	137 (42.3)	0.4	0.502	1.2	0.6-2.1
No	56	21 (37.5)				

**P* value statistically significant at <0.05; LPG: Liquefied petroleum gas; ARI: Acute respiratory infection; CI: Confidence interval; OR: Odds ratio

Table 4: Association between acute respiratory infection and environmental characteristics of the study participants

Characteristics	*n*=380	ARI among under 5 children, *n* (%)	χ^2	*P*	OR	95% CI
House located close to main road						
Yes	161	72 (44.7)	1.1	0.287	1.2	0.8-1.8
No	219	86 (39.3)				
Parental smoking (passive smoking)						
Yes	88	45 (51.1)	4.3	0.038*	1.6	1.0-2.6
No	292	113 (38.7)				
Pet animal						
Yes	85	39 (45.9)	0.8	0.361	1.2	0.7-2.0
No	295	119 (40.3)				
Respiratory infection among family members						
Yes	135	77 (57.0)	20.5	0.000*	2.6	1.7-4.1
No	245	81 (33.1)				

**P* value statistically significant at <0.05; ARI: Acute respiratory infection; CI: Confidence interval; OR: Odds ratio

Table 5: Association between acute respiratory infection and breast feeding practices among the study participants

Characteristics	*n*=380	ARI among under 5 children, *n* (%)	χ^2	*P*	OR	95% CI
Early initiation of breast feeding (within 1 h of birth)						
Delayed initiation	143	62 (43.4)	0.2	0.585	1.1	0.7-1.7
Early initiation	237	96 (40.5)				
Exclusive breast feeding (up to 6 months) (*n*=303)						
Not given	46	20 (43.5)	0.08	0.777	1.1	0.5-2.1
Given	257	106 (41.2)				

ARI: Acute respiratory infection; CI: Confidence interval; OR: Odds ratio

et al., prevalence of ARI was more (78.2%) among children with a parental history of smoking.[14] In a study conducted by Mahyavanshi *et al.*, the proportion of children with history of parental smoking had higher prevalence of ARI, and it was statistically significant.[16] This is because of exposure of the child to the passive smoke from the men in the family who have the habit of tobacco smoking that makes the child more susceptible to ARIs.

In this study, statistically significant association was found between history of ARI among family members and children suffering from one or more symptoms of ARI. The proportion of children with ARI was more (57%) with history of respiratory infection among family members compared to those (33.1%) with no such history. This result was consistent with studies carried out by Yadav *et al.* and Savitha *et al.*[17,18] As children tend to spend more time with their family at home and is in close proximity with them, it is easy for them to contract the infection from any of their family members suffering from a respiratory infection. The indoor hygiene practices of the family members could also contribute to this association.

Regarding ARI and type of house the children resided with their family, there was statistically significant association between them. The proportion of children with ARI was more (50.3%) among the ones living in semi pucca and kutcha type of house when

Table 6: Association between acute respiratory infection and postnatal particulars of the study participants

Characteristics	*n*=380	ARI among under 5 children, *n* (%)	χ^2	*P*	OR	95% CI
Age of mother at the time of delivery (years)						
<20	32	18 (56.2)	3.7	0.154	-	-
20-30	316	125 (39.6)				
>30	32	15 (46.9)				
Cry immediately after birth (*n*=364)						
Not cried	23	14 (60.9)	4.1	0.041*	2.4	1.0-5.7
Cried	341	134 (39.3)				
Birth weight (kg)						
<2.5	67	29 (43.3)	0.09	0.755	1.08	0.6-1.8
>2.5	313	129 (41.2)				
Birth order						
2 children or more	162	72 (44.4)	0.9	0.329	1.2	0.8-1.8
One child	218	86 (39.4)				
Birth spacing (*n*=162)						
<2 years	26	12 (46.2)	0.03	0.848	1.08	0.4-2.5
>2 years	136	60 (44.1)				
Immunisation status						
Partially immunized	28	14 (50.0)	0.8	0.348	1.4	0.6-3.1
Immunized till date	352	144 (40.9)				
Vitamin A (*n*=283)						
Not taken	131	60 (45.8)	1.4	0.235	1.3	0.8-2.1
Taken	152	59 (38.8)				
Nutritional status based on weight for age						
Malnutrition (Grade I, II, III, IV)	143	95 (66.4)	58.3	0.001*	5.4	3.4-8.5
Normal	237	63 (26.6)				

**P* value statistically significant at <0.05. ARI: Acute respiratory infection; CI: Confidence interval; OR: Odds ratio

compared to children residing in pucca type of house (35%). In a study conducted by Fekadu *et al*., the chances of getting ARI among children was more among those who resided in thatched roof house compared to the ones residing in corrugated iron roofed house.[19] In a study conducted by Sharma *et al*., ARI was more among children residing in a kutcha house compared to children living in a pucca or semi pucca type of house.[15] Our study results were consistent with another study carried out by Islam *et al*.[20] The probable reason would be because of the inhalation of dust particles that disseminate from any of the material used to construct a semi pucca or kutcha type of house that might accumulate indoors, which affects the local defense mechanism of respiratory tract of children.

This study shows a statistically significant association between ARI and unavailability of smoke outlets such as a chimney or exhaust fan or window in the cooking room. Approximately, 61.3% of children reported with ARI whose house did not have a smoke outlet facility when compared to children (39.8%) with availability of such facility at home. In a study done by Choube *et al*., 0 the proportion of children with ARI was significantly higher among those not having a smoke outlet compared to the children who had one in their house.[12] Presence of a smoke outlet in the form of a window or exhaust fan protects the individuals inside the house from inhaling harmful substances generated through indoor smoke or any dust particles generated and circulated within the house.

This study also found out that there was statistically significant association between ARI and children who did not cry immediately after birth due to any post natal complication. Although no such findings have been shown in other similar studies, there are literatures that have given information about post natal respiratory infections that can lead to surfactant dysfunction, which represents a major complication in respiratory illnesses of neonates.[21] However, another study by Wu *et al*. reveals that episodes of respiratory tract infection in early life are associated with development of asthma during childhood by impairing the developing immune and pulmonary system. However, more research is needed to understand how such infections interact with genetic and environmental risk factors and also select high risk populations for implementing primary prevention interventions.[22]

This study also shows a statistically significant association between ARI and malnutrition. Approximately, 66.4% of malnourished children had ARI when compared to 26.6% of children who were of normal weight for age. Such finding was consistent with other studies done by Prajapati *et al*. and Sharma *et al*.[13,15] Infections such as ARI contribute to malnutrition and malnutrition contributes to more infections. Inadequate intake of food will decrease the absorption of nutrients, while infections will demand more nutrients in the body. Hence, there will be a gross nutritional deficiency which will contribute to this vicious cycle of infection – malnutrition-infection.

Limitations

Constraints in logistics, time, and resources, the study was limited to the children residing in the rural field practice area

of a medical college covering a total population of 36,830 and under 5 children of 3494. Only about 10% of this population was taken for the study depending on previous reference value. So, the results reveal the status of the study area population only and cannot be generalized to the whole population.

Conclusion

The study reveals that the proportion of children who suffered from ARI preceding 2 weeks of the study was high (41.6%) among those who were exposed to various risk factors. Government initiatives such as housing subsidies or relocation assistance and nutritional supplementation will help to improve physical health. The primary care physicians play a vital role to create awareness on hazards owing to exposure to passive smoke, indoor smoke, importance of proper hygiene practices that needs emphasis and reinforcement through Information, Education and Communication (IEC) activities. They also have a major role to create awareness to sustain optimal breast feeding practices, appropriate immunization, Vitamin A administration, proper maternal, and child nutrition to prevent the incidence of ARI because they serve as the first contact person for management at community level.

Acknowledgment

The author acknowledges the faculty members of Department of Community medicine and field staff of RHTC for guiding and supporting to successfully carry out this study in the field practice area of rural health training center.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. The Health Line Editorial Team. Acute Respiratory Infection Causes, Symptoms and Diagnosis. Available from: http://www.healthline.com/health/acute-respiratory-disease. [Last accessed on 2018 May 11].
2. Nair H, Simões EA, Rudan I, Gessner BD, Azziz-Baumgartner E, Zhang JS, *et al.* Global and regional burden of hospital admissions for severe acute lower respiratory infections in young children in 2010: A systematic analysis. Lancet 2013;381:1380-90.
3. GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: A systematic analysis for the Global Burden of Disease Study 2013. Lancet 2015;385:117-71.
4. Park K. Textbook of Preventive and Social Medicine. 23rd ed., Ch. 5. India: M/s Bhanot Publishers; 2015. p. 178.
5. World Health Organization. Outpatient management of young children with ARI. A Four Day Clinical Course. Visual Materials: Program for the Control of Acute Respiratory Infections; 1993. p. 1-12.
6. WHO. Epidemiology and Etiology of Childhood Pneumonia. Bulletin of the World Health Organisation. Available from: http://www.who.int/bulletin/volumes/86/5/07-048769/en/. [Last accessed on 2018 May 11].
7. Selvaraj K, Chinnakali P, Majumdar A, Krishnan IS. Acute respiratory infections among under-5 children in India: A situational analysis. J Nat Sci Biol Med 2014;5:15-20.
8. Press Information Bureau: Achievements under Millennium Development Goals. Available from: http://www.pib.nic.in/newsite/PrintRelease.aspx?relid=123669. [Last accessed on 2018 May 11].
9. UNDP in India. Sustainable Developmental Goals: A New Sustainable Development Agenda. Available from: http://www.in.undp.org/content/india/en/home/post-2015/sdg-overview.html. [Last accessed on 2018 May 11].
10. UNICEF. Global Action Plan for Prevention and Control of Pneumonia. Geneva: WHO, UNICEF; 2009. p. 2. Available from: https://www.unicef.org/media/files/GAPP3_web.pdf. [Last accessed on 2018 May 11].
11. Kumar SG, Majumdar A, Kumar V, Naik BN, Selvaraj K, Balajee K. Prevalence of acute respiratory infection among under-five children in urban and rural areas of Puducherry, India. J Nat Sc Biol Med 2015;6:3.
12. Choube A, Kumar B, Mahmood SE, Srivastava A. Potential risk factors contributing to acute respiratory infections in under five age group children. Int J Med Sci Public Health 2014;3:1385-8.
13. Prajapati B, Talsania NJ, Lala MK, Sonalia KN. Epidemiological profile of Acute Respiratory Infections (ARI) in under five age group of children in urban and rural communities of Ahmedabad district, Gujarat. Int J Med Sci Public Health 2012;1:52-8.
14. Goel K, Ahmad S, Agarwal G, Goel P, Kumar V. A cross sectional study on prevalence of Acute Respiratory Infections (ARI) in under-five children of Meerut district. India. J Community Med Health Educ 2012;2:2161-5.
15. Sharma D, Kuppusamy K, Bhoorasamy A. Prevalence of Acute Respiratory Infections (ARI) and their determinants in under five children in urban and rural areas of Kancheepuram district, South India. Ann Trop Med Public Health 2013;6:513.
16. Mahyavanshi DK, Nagar SS, Patel MG, Nagar SS. A study on the association of the environmental conditions with acute respiratory infections in under five years children of Surendranagar district. Int J Int Med Res 2016;3:26-9.
17. Yadav S, Khinchi Y, Pan A, Gupta SK, Shah GS, Baral DD, *et al.* Risk factors for acute respiratory infections in hospitalized under five children in central Nepal. J Nepal Paediatr Soc 2013;33:39-44.
18. Savitha MR, Nandeeshwara SB, Pradeep Kumar MJ, Ul-Haque F, Raju CK. Modifiable risk factors for acute lower respiratory tract infections. Indian J Pediatr 2007;74:477-82.
19. Fekadu GA, Terefe MW, Alemie GA. Prevalence of pneumonia among under-five children in Este Town and the surrounding rural Kebeles, Northwest Ethiopia: A community based cross sectional study. Science 2014;2:150-5.
20. Islam F, Sarma R, Debroy A, Kar S, Pal R. Profiling acute respiratory tract infections in children from Assam, India. J Glob Infect Dis 2013;5:8-14.
21. Pinkerton K, Harding R, editors. The lung: Development, aging and the environment. Elsevier; 2014.
22. Wu P, Hartert TV. Evidence for a causal relationship between respiratory syncytial virus infection and asthma. Expert Rev Anti Infect Ther 2011;9:731-45.