

Association between socioeconomic status and influenza-like illness: A study from Western part of India

Ravindra K. Hadakshi¹, Dhruvkumar M. Patel¹,
Mukundkumar Vithalbhair Patel¹, Maitri M. Patel², Palak J. Patel⁶,
Maurvi V. Patel³, Krishnat S Yadav⁴, Himil J. Mahadeviya³,
Ritesh A. Gajjar³, Prathana N. Patel⁵, Harsh D. Patel⁵

¹Department of Medicine, Zydus Medical College and Hospital, Dahod, ²Department of Community Medicine, GCS Medical College and Hospital, Ahmedabad, ³Department of Medicine, B. J. Medical College, Ahmedabad, ⁴Department of Biochemistry, Zydus Medical College and Hospital, Dahod, ⁵Department of Community Medicine, Surat Municipal Medical College, Surat, Gujarat, ⁶Government Medical College, Surat, India

ABSTRACT

Objectives: Health status is associated with socioeconomic status (SES) of the individuals. The aim of this study was to identify any link between the SES and influenza-like illness (ILI). **Materials and Methods:** This observational case-control study was done on 18-70 years old patients presented with ILI (cases) at tertiary care hospital of western India. Controls were selected from demographically matched elective surgery patients except the SES. SES was evaluated as per the Modified B G Prasad 2017 scale and participants were further classified in lower SES (per capita income <2000 INR) and non-lower SES groups. **Results:** 810 cases and 830 controls were compared. Many cases were from lower SES, had poor hand hygiene, and were using soil, mud, ash (SMA) for hand cleaning as compared to the control. Among the cases significant numbers were from lower SES (543/810[67%], $P < 0.02$), many were alcoholics, smokers, had poor hand hygiene, were using SMA for hand cleaning, and had preexisting chronic obstructive pulmonary disease (COPD), while few were having diabetes in the lower SES group as compared to the non-lower SES group. ILI was more common among lower SES class in unadjusted analysis (odds ratio [OR] 1.58, 95% CI 0.89-2.76) and the results were significant even after the adjustment of covariates (OR 1.62, 95% CI, 0.94-2.85). **Conclusion:** Lower SES people were 2.8 times more prone to ILI as compared to the age- and sex-matched control in western part of India.

Keywords: Hand hygiene, influenza, influenza-like illness, Soil, mud and ash (SMA) for hand cleaning agents, socioeconomic status, swine flu

Introduction

Seasonal influenza viruses are of four types A, B, C, and D,

Address for correspondence: Dr. Mukundkumar Vithalbhair Patel, Associate Professor, Department of Medicine, Zydus Medical College and Hospital, Dahod, Gujarat, India.
E-mail: drmukundvpatel123@yahoo.co.in

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of which A and B subtypes can circulate in the environment and cause seasonal epidemics.^[1] In tropical countries like India, influenza may occur throughout the year in the form of irregular outbreaks unlike in cold climate countries where its epidemics are in winter seasons only.^[1,2] These respiratory viruses are transmitted through either air (infected cough droplets) or by direct contact with the contaminated surfaces. These viruses

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remain alive in the environment up to 72 hours.^[1,2] The first influenza-A virus H1N1 (swine flu) strain pandemic occurred in 1918 and it again reemerged in 2009.^[1,3] After this many seasonal pandemics of influenza-A virus with many different strains have been reported from India as well as globally.^[1-3] Influenza may present as mild upper respiratory tract infection to severe lower respiratory tract infections with secondary bacterial infections including deaths.^[3] ILI category A and B are mild and moderate forms of the disease vulnerability.^[3,4] In both these categories, traditional treatment and home isolation are recommended without microbiological confirmation of the diagnosis.^[3,4] Category C is a severe form of the illness and it requires hospitalization along with microbiological diagnostic tests.^[4] Respiratory tract infections caused by other than influenza viruses such as rhinovirus, respiratory syncytial virus, and adenoviruses also present with same clinical features and are difficult to differentiate from influenza.^[4,5] These respiratory viral infections are collectively defined as influenza-like illness (ILI).^[2,4,5] The ILI is widely used terminology for epidemiological study of influenza worldwide.^[5]

Socioeconomic status (SES) is an important determinant of the health status of the citizen in any country.^[6] It is a composite index measured by occupation, education, and per capita income of a person.^[6,7] These three measures of SES play role in preventive and therapeutic strategies of many diseases in the community either individually or in combinations.^[7,8] Income reflects expenditure power, residential locality, diet, and access to medical care; occupation determines social status, physical activities, social responsibilities, and work-related health issues; and education indicates problem-solving capabilities, personality, psychosocial status, and financial resources.^[8] The most commonly used SES scales in India are modified BG Prasad scale, Kuppuswamy scale, and Uday Pareek scale for both urban and rural areas, urban areas, and rural areas, respectively.^[9] Association between SES and noncommunicable diseases has been studied extensively, but very few studies have been conducted for communicable diseases till date.^[7,10,11]

ILI can be prevented with chemoprophylaxis, vaccination, and proper hand hygiene.^[12-14] However, all these preventive measures are either difficult to implement or out of reach for the community of lower SES because of low per capita income.^[8] Patients suffering from ILI many a time first approaches to family physicians or primary health center with initial impression of simple cough and cold illness.^[4,5] As per our knowledge, no previous studies have been conducted to study link between the ILI and SES in India. Aims of this study were to identify any link between the SES and ILI along with demographic and clinical features of the diseases.

Material and Methods

This case-control observational, prospective study was conducted at Zydus Medical College and Hospital, Dahod, India. Before the initiation of recruitment of subjects, the protocol

of research project was approved by the Institutional Ethics Committee. This is tertiary care health center located in the northern region of Gujarat which is in close vicinity of the states of Rajasthan and Madhya Pradesh. All the potential patients of age between 18 and 70 years presented with clinical diagnosis of ILI of all categories as per the Indian ILI 2015 guidelines were included in the study. Control subjects were selected from age- and gender-matched patients subjected to elective surgeries during the study period. Detail history, clinical examination, and appropriate investigations were performed and further treatment was planned accordingly. Written consent from every participant was obtained for publications of the data with preservation of human rights as per the Declaration of Helsinki, World Medical Association 2014 and biomedical journals publications guidelines.

SES was calculated as lower, lower middle, upper-middle, and upper class as per the Modified B G Prasad 2017 scale in both the groups. Patients of lower class and lower middle class (per capita income less than 2000 INR) were classified as lower SES and rest of the patients were classified as non-lower SES in both the groups. We have selected BG Prasad scale because it is applicable in rural as well as urban populations. Personal history of hand hygiene such as handwashing frequencies, duration, methods; and use of cleaning agents for cleaning hands were evaluated for all the participants. SES and hand hygiene details were evaluated as per the prepared interview questionnaires. Proper hand hygiene was defined as washing the hands with soap or antiseptics for at least 20 seconds after using toilets, before preparation or intake of food, and entering home from the workplace. Among hospitalized cases of category-C ILI, whose throat swab for H1N1 influenza came negative were excluded from the study. All the subjects from the case as well as the control groups who did not agree to sign the consent form were also excluded from the study.

Epi Info™ Web Survey Version 1.6 software was used to analyze the data recorded in mean and percentages. Student *t*-test with paired *P* value was used for comparison of continuous variables and Chi-square test for categorical differences between the groups.

Results

830 cases and an equal number of controls were enrolled in the study. Among cases, ILI categories A, B1, B2, and C numbers were 410 (49.40%), 190 (22.89%), 150 (18.07%), and 80 (9.64%), respectively. After 24 hours 20 out of 80 ILI category C patients were having negative throat swab for H1N1 and they were excluded from the study. Finally, 810 subjects in the case and 830 in the control group completed the study. Patients of lower SES having history of COPD and diabetes mellitus patients of higher SES were more affected by ILI as compared to the control. A significant number of ILI patients reported poor hand hygiene as compared to the control. It was also noticed that many patients were using Soil, Mud and Ash (SMA) instead of soap for cleaning the hands in both the groups, but more in the case

group. However, history of hypertension, alcohol consumption, or smoking was found invariably in both the groups but there was no concrete correlation[Table 1].

The higher number of cases (543/810 patients) were reported from the lower SES group as compared with the non-lower SES (267/810 patients) of ILI group ($P < 0.0004$). It was noticed that habit of alcohol consumption, smoking, poor hand hygiene, and SMA use for hands cleaning were more common in lower SES patients as compared to the non-lower SES group. Preexisting COPD patients were more, while diabetics were lesser as a comorbid medical illness in lower SES as compared to the non-lower SES group in the cases [Table 1].

In unadjusted analysis [Table 2], a more significant number of patients were from the lower SES class as compared with the control group (odds ratio [OR] 2.80 [1.58–4.99]). The difference was persisted after multiple covariate adjustments like gender, alcohol consumption, smoking and pre-existing COPD, hypertension, and diabetes (OR 2.82 [1.94–5.15]). Improper hand hygiene and the use of SMA for hand cleaning were also significant risk factors of ILI in adjusted as well as unadjusted analysis.

Discussion

In this study, lower SES patients were 2.8 times more affected by ILI irrespective of age and sex. Almost half of the cases were of category-A (mild) and one-tenth cases were of severe variety category-C ILI in this study. Poor hand hygiene and the use of SMA as hand cleaning agents were identified as significant risk factors associated with the illness. However, they were more prominent in the lower SES group.

As per WHO guidelines, hands should be rinsed with water and soap or antiseptics for at least 20 seconds with interlocking of fingers and cleaning all the surfaces of the hands and wrists, after every toilet visit, before consuming or preparing food, returning from workplace to the home, or touching contaminated surfaces for ideal hand hygiene.^[12,15-28] Proper hand hygiene is proved as an effective mean of preventing many contact-transmitted

respiratory and gastrointestinal diseases.^[14-19] Many investigators have reported that compliance with hand hygiene is poor even in healthcare-related persons.^[17,19,20] So, it is obvious that hand hygiene is likely to be very poor among people with lower SES. In Bangladesh, Pakistan, Nepal and India, like low-income countries, many communities and villagers use SMA instead of soap for cleaning hands due to old generations' social customs and lack of scientific knowledge.^[29] These agents are contaminated with many microorganisms and parasites.^[29] These household substances are not only ineffective for removing microbes from the hands but, in contrast, they are also responsible for transmission of many contact-transmitted diseases.^[29] Our study also matches the study of Hoque where SMA as hand cleaning agents were used by lower SES people and they were affected more by contact-transmitted diseases.^[29] Family care physicians can play a pivotal role in the implementation of preventive strategies and education of ILI because of their availabilities in rural as well as urban area and they are the first to offer treatment in most of the cases.

ILI spread rapidly in crowded and poorly ventilated areas of low-income localities.^[1,2,30-32] Influenza vaccines and postexposure chemoprophylaxis are poorly utilized preventive measures of ILI in the deprived group of lower SES due to financial constraints.^[22,28-32] Use of ILI education materials regarding the knowledge and preventive measures of the disease like hand hygiene are ineffective in this class of people, because of the high illiteracy rate and false faith customs.^[29] In our study, ILI affected significantly higher numbers of lower SES class people. Usually, many of the lower SES people-first approach to faith healers for any illness and they consult doctors only if faith healing fails.^[10] These are the possible explanations for high prevalence of ILI in the lower SES class. Although, very few communicable diseases and SES associations have been studied,^[8] these diseases have higher incidence in the lower SES class.^[8] It is in line with our study, where ILI incidence was higher in the lower SES.

Our study has certain limitations. First, our study population is regional and mainly from the Gujarat state, although our center treats many patients of Rajasthan and Madhya Pradesh states. So, multicenter, large-size studies representing equal numbers from all the regions of the country are required for the validation of

Table 1: Demographic and clinical features of the case group (influenza-like illness) versus control group (elective surgeries) and lower SES versus non-lower SES

Features	Descriptive analysis between influenza-like illness (ILI) and ES; lower SES and non-lower SES					
	ILI (n=810)	ES (n=830)	P value	L-SES (n=543)	NL-SES (n=267)	P value
Age	42±14.16	44±15.28	0.78	40±13.56	42±14.34	0.72
Female (%)	42	38	0.56	45	48	0.30
Lower SES (%)	67	42	0.0004	--	--	--
PHH (%)	12	30	0.001	10	28	0.002
SMA (%)	20	08	0.02	24	12	0.03
DM (%)	07	03	0.77	03	08	0.12
COPD (%)	06	03	0.31	08	05	0.79
Alcoholic (%)	11	13	0.66	21	11	0.06
Smoker (%)	14	12	0.67	17	10	0.15

Table 2: Logistic regression results: lower SES prognosticators

Covariate	Unadjusted O.R. (95% C.I.)	Adjusted O.R. (95% C.I.)
Female Gender	1.18 (0.67-2.08)	Insignificant
Lower SES	2.80 (1.58-4.99)	2.82 (1.94-5.15)
Hypertension	0.80 (0.32-2.02)	Insignificant
Diabetes Mellitus	1.18 (0.38-3.64)	Insignificant
COPD	2.06 (0.50-8.49)	Insignificant
Proper hand hygiene	0.32 (0.15-0.67)	0.34 (0.18-0.77)
SMA for hand cleaning	2.87 (1.20-6.88)	2.88 (1.26-6.96)
Alcoholic	0.83 (0.35-1.95)	Insignificant
Smoker	1.19 (0.52-2.73)	Insignificant

Abbreviations: ES: Elective surgeries (control group); PHH: proper hand hygiene; L-SES and NL-SES: Lower and non-lower socioeconomic status; COPD: Chronic obstructive pulmonary disease; SMA: Soil, mud, ash for hand cleaning.

our study results. The second limitation is the use of only B G B G Prasad scale for classification of SES and it includes only per capita income, while ideal SES should represent occupation, education, and family income together for SES calculations^[4]. The third limitation is, we have excluded microbiologically negative category C cases and minimum ILI patients are from this category. The reason for exclusion was many bacterial, fungal, and allergic upper respiratory tract inflammations may mimic ILI category C. However, it is possible that some non-ILI illnesses patients may have clinical pictures like category A and B and they may have been included in our study.

Conclusion

The lower SES class (Per capita income < 2000 INR) was significantly affected by the ILI as compared to the higher SES. Poor hand hygiene and use of SMA for cleaning hands were significant risk factors apart from the lower SES for this illness. Considering risk and health hazards of ILI, intensive preventive measures are needed at primary health care level to deliver better wellbeing of lower SES people and the prevention of the ILI.

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Ethical approval

The study was approved by Zydus Medical College and Hospital ethical committee, Dahod, India. REF number ZMCH/IEC/2018-19/004 dated 26 April 2019.

Animals used and human rights

No animals were used in the study and human rights were preserved.

Consent of participants

Written consent for participation in the study as well as for the publication of data was taken from individual participants.

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Conflicts of interest

There are no conflicts of interest.

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